ESPHM

2022 13th EUROPEAN SYMPOSIUM OF PORCINE HEALTH MANAGEMENT

BUDAPEST/HUNGARY
May 11 - 13, 2022

PROCEEDINGS

BUDAPEST
May 11–13, 2022

INDEX

WELCOME MESSAGE

Dear ESPHM Delegates,
Ladies and Gentlemen,

On behalf of the organizing committees of the 13th European Symposium of Porcine Health Management, it is my greatest pleasure to welcome you to Budapest. This symposium is a very special event because it has been a long time, three years, elapsed since the latest personal meeting of the European pig professionals and it is an extraordinary occasion for the veterinarians in Hungary: we have never hosted such a large-scale swine health and management conference, even though the Hungarian veterinary scientists have recognized traditions in that field.
Our profession is the reaction: we always have to find a proper answer to the challenges given by the highly variable circumstances. 'Crisis management' is probably the best expression describing the circumstances of the recent years. Beside the 'A' acronyms like ASF, AMR which have become the part of our everyday life, the covid pandemic and the most recent extremely sad and regretful war crisis in Ukraine, all have a huge impact on the pig and pork industry. So, we react: the title of the first keynote session of this symposium is the crisis management. You can also follow the most recent scientific news in the keynote topics of sustainable pig production (i.e. trends of the pork consumption and consumer expectations, how to make the pig farms more 'green'), the relationship between the swine and human health through potentially zoonotic diseases and the eradication of some economically important pig diseases.
I am grateful to our outstanding keynote speakers, to the ECPHM Board and the Veterinary Practitioners Council for organizing and performing such a great and up-to-date scientific programme.
A large conference with many attendees requires a solid technical organization background: thanks to Vet International we do have got it here. Implementing such an event without generous support of sponsors is certainly impossible. We gratefully appreciate our sponsors' contribution.
One should never forget: crisis is a possibility for a new development. I wish to all of you an interesting, fruitful and inspiring symposium, a start of new developments, meetings, discussions. Last but not least: do not fail to discover and enjoy the marvellous city of Budapest.
Hungary is friendly welcoming you.

Yours Sincerely

József Földi
Chair of the 13th ESPHM

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The ECPHM is a non-profit organization under the umbrella of the European Board of Veterinary Specialization (EBVS).
EBVS recognises and monitors veterinary speciality Colleges in Europe, recognizes veterinary specialist Colleges. It defines guidelines for the recognition and registration of specialists in areas of veterinary medicine in Europe, and maintains an updated register of European Veterinary Specialists. EBVS encourages and promotes the enhanced utilization and availability of veterinary specialist services to the public and the veterinary profession.

The ECPHM works for the advancement of health and welfare oriented porcine production management in the herd context in Europe, and the increase of the competency of those who practice in this field.

The major objectives of the ECPHM include:

- Establishing guidelines and standards of training for postgraduate education and experience prerequisite to become a veterinary specialist in the specialty of porcine health management.
- Examining and authenticating veterinarians as specialists in porcine herd health management to serve health and welfare of the animals, the economic outcome of the herd, and the production of safe quality product for consumers in a sustainable animal production by providing expert care for pigs.
- Encouraging research and other contributions to the science and practice of porcine herd health management including husbandry, reproduction, epidemiology, pathogenesis, diagnosis, therapy, prevention, and control of diseases directly or indirectly affecting pigs and the maintenance of healthy and productive pig herds. Porcine health management also includes the impact on quality and safety of pork and gives special consideration to herd health and production, production systems and targets, and the management of pig populations.
- Promoting communication and dissemination of knowledge.

The ECPHM is organized through different bodies that take care of the different activities performed:

- the Board represents the College and is its main government body;
- the Education Committee organizes educational events for the ECPHM residents, including the e-learning sessions, the pre-symposium workshop and the summer school. The Education Committee also approves Resident training programs;
- the Examination Committee prepares the annual exam and arranges the examination of residents;
- the Credentials Committee reviews and approves the applications for admittance to the residency program, as well as the applications to sit the exam, and review applications for recertification of the Diplomates;
- the Nominations Committee manages and reviews the proposals for nominations in the different committees and board;
- the ECPHM activities are supported by a permanent Administrative Secretariat in Parma, Italy.

PHM

PORCINE HEALTH MANAGEMENT

PHM PORCINE HEALTH MANAGEMENT

www.porcinehealthmanagement.biomedcentral.com

Porcine Health Management (PHM) is an open access peer-reviewed journal that aims to publish relevant, novel and revised information regarding all aspects of swine health medicine and production. The journal provides a venue for global research on swine health and production, including infectious and non-infectious diseases, reproduction, epidemiology, management, economics, genetics, housing, nutrition, animal welfare and ethics, legislation, food safety, drugs and surgery. This journal is aiming at readers, and attracting authors, with different levels of experience; Diplomates and Residents of the ECPHM and other colleges as well as PhD students and experienced researchers from outside! Anticipated articles include: original research, reviews, short communications, case reports, case-studies and commentaries.

The Editors-in-Chief are **Paolo Martelli** (University of Parma, Italy) and **Joaquim Segalés** (Universitat Autònoma de Barcelona and CReSA-IRTA, Spain).

PHM published a total of 62 articles in 2021, reflecting an overall growth trend for the journal in recent years. The journal has been publishing since 2015, and is now indexed in different databases, including MedLine (PubMed) and, more recently, Clarivate's Web of Science. PHM got its first Impact Factor in 2020 (2.190), and in 2021 the Impact Factor increased to 3.042, maintaining the journal's rank in the first quartile of the Veterinary Sciences category. The journal also continues to maintain a fast turnaround time for authors of nearly 90 days for accepted manuscripts. Articles now collectively receive well over 100,000 unique views by readers per year. A great achievement for a young journal like PHM!

Please use the online submission system to submit your manuscript. For all enquiries about the journal, technical issues, payment of article processing chargers (APCs), etc. please contact: **porcinehealthmanagement@biomedcentral.com**.

There are many reasons to publish in PHM:

- High visibility / PHM's open access policy allows maximum visibility of articles published in the journal as they are available to wide, global audience.
- Speed of publication / PHM offers a fast publication schedule whilst maintaining rigorous peer reviews.
- Flexibility / Online publication in PHM gives authors the opportunity to publish large datasets, large numbers of colour illustrations and moving pictures, etc.
- Promotion and press coverage / Articles published in PHM are included in article alerts and regular email updates.
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Boehringer Ingelheim Animal Health is the second largest animal health business in the world, with net sales of 4.1 billion euros in 2020 and presence in more than 150 countries. For more information visit: www.boehringer-ingelheim.com/animal-health/overview

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Ceva, as a gold Sponsor at ESPHM 2022 is taking the opportunity to communicate the strength in SW vaccines in Europe, being 3rd in the SW biologicals ranking and present the Ceva Lung Program, our exclusive tool to monitor PRDC (Porcine Respiratory Disease Complex) problems.
=>For more information, please come and visit us on our booth #9

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KEYNOTE PRESENTATIONS

SESSION: HOW TO DEAL WITH LARGE CRISIS?

Impact of great crisis on the pig sector

James F. Lowe, DVM, MS, DABVP (Food Animal)
University of Illinois at Urbana-Champaign, Urbana, IL USA
Production Animal Consultation, LLC, Mahomet, IL USA

Biosketch

Dr. Lowe is an educator, advisor, researcher, and farmer based in Illinois. He is a managing member of a Production Animal Consultation, LLC and is an Associate Professor and Director of the i-Learning Center in the College of Veterinary Medicine at the University of Illinois. He holds a DVM and MS from the University of Illinois and spent most the last 27 years working in and with red meat production systems in the US and internationally.

Abstract

It seems that the world lurches from one crisis to the next. Unfortunately, the pig sector has not been immune from crises: disease outbreaks, low market prices, high grain costs, and labor shortages, to name a few. Why do these crises keep happening? Are they under our control? Has the pig sector brought crises on itself? Are there alternative business models that would keep us from moving from one crisis to another? This paper explores these questions by investigating recent crises in the pig sector. Specifically, how industry structure both promoted an epidemic of PEDV in the United States and led to the most profitable year on record for U.S. pork producers, how COVID has impacted production and harvest operations, animal and human wellbeing, and profitability of the pig sector, and how bottlenecks in the market, both foreseen and unforeseen, have impacted the pork sector. The interactions between the underlying market, engineering, and human factors are explored in each example. Lessons from past crises suggest that redesigning business models to increase supply chain coordination, decrease operational interdependence, and shift measurement systems from lagging to prospective indicators would decrease the frequency and severity of crises in the pig sector.

Introduction

In the fall of 1994, things were tough in the U.S. for a pig farmer. Hog prices were $28 a pound (55.80€/kg), and there wasn't much hope for the newly minted veterinarian in the pig industry. The late Ralph Vinson, the first person to figure out you could make a living consulting as a pig veterinarian, was a mentor, neighbor, and fiercely optimistic. I met him one day, and he said, "Jim, don't worry. These things only happen once in your career, and it's good to get it out of the way in year one." I left that encounter and thought, "Okay, it'll be better in the future." Almost 30 years later, wow. How that one crisis at the very beginning of my career turned out to be just one of many, but it prepared me for what has been an exciting ride with exhilarating highs and crushing lows as the industry responded to one crisis after another.

A crisis is generally defined as a time of intense difficulty when vital decisions must be made. I think about crises as challenges, not the little challenges we face daily, but significant challenges that help reshape an industry. Often crises are incited by external factors which are not in our control. What is interesting to me is how our decisions create the opportunity for external factors to negatively impact our industry or protect us from those negative impacts. Crises dramatically impacted the farms I work with, the services I provide, and the skillsets required from veterinarians and producers to succeed.

Pork production is a commodity business. Commodity markets are generally defined as those where the good or service - in this case, meat - is widely available and interchangeable between suppliers, meaning it is not differentiated. In the case of meat, there's also a high degree of substitution with other meats and alternative protein sources. The lack of differentiation in a commodity market means it is almost impossible to achieve pricing power. In general, farmers are

viewed as price takers instead of price makers. In a commodity market over extended periods of time, the total profit of the industry is zero, with the most efficient operations earning profit and those not efficient losing money.
Winners in commodity markets, therefore, are those with the lowest cost of production. Commodity markets are different from other industries where differentiation and pricing power mean that the revenue stream is the differentiator of business success instead of the ability to minimize cost.

As in many other commodity industries, pork production is a capital-intensive business creating a high level of high fixed costs. Low-cost operators have high throughput relative to their investment to distribute the fixed cost over as many units of sale as possible. Throughput is conventionally defined as the revenue less variable cost for a given amount of capital investment. In the pork industry, throughput is defined as revenue less feed cost, or margin over feed cost, relative to the capital investment. Operations focus on cost management by maximizing throughput through their facilities creating only a small buffer in the supply chain. Modern pork production systems are brutally efficient at the status quo, but they are poorly prepared for challenges or external changes due to their lack of buffer capacity.

I've had the good fortune to work in pig farms across the globe, but I grew up and gained most of my knowledge as a pig farmer and veterinarian in the United States. The U.S. pig industry - not just live production, but the production of pig meat - has been the world leader in cost efficiency for the last 40 years. It is not perfect, but the systems created are now being widely adopted across the globe. For good or bad, this means that vulnerabilities built into the design of U.S. systems are being expanded globally, therefore magnifying any known or unknown design flaws in our systems.

The U.S. created the large-scale, low-cost production model by adapting three-site and then multi-site technology, which radically improved our ability to raise healthy pigs at scale. When coupled with innovative business models, multisite production allowed for scaling not previously imagined. Wendell Murphy at Murphy Family Farms looked at the U.S. poultry business and believed that that contract production model could be utilized in pigs and created the new standard for pork production.

Contract production drastically lowered the capital requirements, often by 90%, which allowed massive scaling of individual firms. This low capital cost model allowed considerable increases in throughput. While the return on individual pigs was lower than wholly owned systems, the net total return in the firm was large, and the return on net invested capital was massive.
Contract production resulted in vast amounts of financial leverage in the industry. Individual farmers borrowed money to build buildings, and pig owners only had to borrow money to raise pigs. This off-balance-sheet lending was efficient but created a systemic risk factor in the U.S. industry. When a high-throughput, low-margin business is heavily leveraged, minor disruptions in price or cost create significant challenges for maintaining cash flow to pay the firm's debts.

This increase in scale also meant that the geographic footprint of individual firms expanded exponentially. With a focus on short-term optimization to reduce cost, systems with large geographic footprints using multi-site production created a random pattern of pig movements to ensure all buildings were full all the time. These unpredictable movements resulted in the mixing of pigs within geographies from different sow farms within the same company, from different geographies, and between companies. This created the second systemic risk factor for the U.S.-based production model. Some of the advantages of multi-site production were lost as lateral disease transmission became a more significant risk than vertical disease transmission, which is what multi-site production was designed to eliminate.

Together multisite and contract production resulted in a massive consolidation of the U.S. industry. Consolidation was driven by huge increases in the economic efficiency of the best firms operating in a commodity market of a fixed size, The most efficient firms had a competitive advantage, which allowed them to buy the most inefficient firms created consolidation. Today, the U.S. industry is dominated by 40 to 50 prominent players, many of whom control significant amounts of packing, processing, and even food brands.

As the industry consolidated and maintained high leverage levels, there was pressure to align more significantly between live production and packers. After extremely low pig prices in the fall of 1998 ($8/pound-€16/kg), it became a de facto requirement of lenders to have supply contracts with packers for all money borrowed for live production. In the United States today, less than 2% of pigs are sold on the open market, creating significant challenges with both price transparency and lack of buffer capacity. Packing plants are under the same constraints as live production; throughput is king. This creates the third systemic risk factor, the absence of buffer capacity in the entire supply chain. The best example is that 98% of the pigs are committed to an individual firm for slaughter before they're born which is matched almost 1:1 with the number of shackle spaces for harvest.

In this paper, we will explore three significant crises that have occurred primarily in the U.S. pig production but have had impacts globally to understand what they might tell us about the future. We will relate how these systemic risk factors played a vital role in each of these crises' outcomes and how maybe the most severe impacts of these crises could have been avoided if the production system had been designed differently.

Crisis 1: When an epidemic disease was a disaster

Background

Influenza A virus (IAV) is a segmented RNA virus that infects multiple species. IAV undergoes both antigenic shifts, which is evolution or a change in genetic code, and drift, which recombines gene segments between different viruses. Influenza

is both a zoonotic and reverse zoonotic pathogen, meaning that it can be transmitted from animals to humans or from humans back to animals. Pigs are thought to be a reservoir of the influenza virus and have been described as a mixing pot because of their ability to be infected with both avian and human-like influenza viruses.
History suggests that in the United States, humans have been the sole source of influenza virus for pigs starting in 1918 with H1N1. The second introduction was the H3N2 virus in 1998 which was related to the 1976 human H3N2 strain. Subsequently, there have been multiple recombinations of the external HA and NA genes with the six internal genes. Current circulating viruses in the pig population have internal genes, which are human, swine, and avian in origin, with the two external genes being a combination of H1s and H3s and N1s and N2s. We know from surveillance data that there are multiple zoonotic and reverse zoonotic events each year. It is believed that swine exhibitions are the most common source of zoonotic events because of a high degree of contact between the public and pigs at these shows. There have been documented cases of human-like viruses being introduced in the pig population multiple times per year, with limited transmission within pig populations.

What Happened

In 2009, a novel influenza virus was identified in humans. This was quickly referred to as the swine flu because the virus appeared to be a new strain of H1N1 that resulted from a previous triple reassortment of swine and avian and human flu viruses, which further recombined with a Eurasian pig flu virus most likely in Mexico based upon historical analysis. This virus spread quickly in the human population due to its novel antigenic composition resulting in panic amongst the public and public health officials that a 1918-like flu pandemic was likely to happen. Fortunately, the disease caused by this pandemic virus, A_Californina_H1N1, was relatively mild because there was some residual immunity from previous flu infections and the rapid development of a vaccine to protect people against the most severe forms of the disease. By 2010, the pandemic was declared over by the World Health Organization.
The ramifications for the U.S. and global pig meat industries were significant. Demand collapsed almost immediately at the retail, wholesale, and farm gate levels, primarily due to a lack of consumer confidence. In the summer of 2009, prices were only 58% of prior-year prices, creating massive losses for producers during the most profitable times of the year. This resulted in many inefficient producers exiting the industry and a reduction of breeding intentions by even the most efficient producers to save cash heading into the fall, which is historically the lowest price point per year. This contraction improved prices to above trend line in 2010 and 2011 due to industry contraction. It contributed to the consolidation already well underway in the U.S. pig industry.

The Underlying Factors

By 2009, consolidation in the U.S. pig sector was well underway, having started in the 1990s. This growth of individual firms' size with increasingly intensive production created a significant lack of trust in the food supply. Pig meat was inexpensive for the consumer, which was great and created consumer satisfaction, but consumers did not trust that it was safe. This was a combination of changes in industry structure at the live production and packing level and a food safety system that the public knew little about and had not been materially changed since the 1930s. The fact that the pork was safe was not enough to reassure consumers because they didn't feel it.
In general, the industry and agriculture tend to be very insular and do not communicate well with the public. This lack of information-sharing resulted in a reactive and not proactive response to this crisis. There was little planning by the industry or effort to build relationships with consumers, meaning that once the crisis hit, there were no relationships to go back on. The industry's initial response was denial and not transparency, leading to further distrust for the consumer base that didn't understand where their food came from. The lack of relationships with public health authorities was also critical as their messaging was not helpful to the industry. Still, without prior relationships, it was impossible to have the conversations necessary to change the messaging from the people in charge of the response.
Finally, people want to be reassured in the face of a crisis that creates emotional distress. The industry took a technical response to the approach, forcing the public to process facts and not address their emotional concerns. We fought fear with facts, which was ineffective in assuaging the public that our product was not only safe but was not the source of any of the cases of influenza.

Future Implications

Before 2009, influenza surveillance systems had undergone severe atrophy, resulting in only a limited understanding of the influenza viruses circulating in the population. Building and maintaining effective surveillance systems has tremendous value, particularly for zoonotic pathogens. But, for that value to be realized, there must be transparent and continuous communication of the results, and more importantly, the process, to build trust with consumers. Building trust, given today's media environment, is exceedingly challenging. Boring and routine do not drive clicks or viewers. Suppose the industry wants to successfully communicate our proactive approach to protect public health. In that case, we will need to devise new and creative methods, likely utilizing social media, to get the message out. This will require a degree of vulnerability that many industries have not historically demonstrated, but it is likely a requirement for future success.
We must acknowledge that we have entered a consumer-centric era where supply outstrips demand in developed countries. This means that the consumer has tremendous power in making choices. When we cannot meet their expectations, the consumer can substitute alternative protein sources in our commodity-based business. This will be a fundamental shift in the pig meat industry's function to generate long-term brand value and not short-term operational efficiency. The firms which can solve this problem will be well-positioned to succeed in the future.

When an epidemic disease was fantastic

Background

Multiple coronaviruses have infected pigs globally for decades. Coronaviruses are mucosal pathogens that infect either the enteric or respiratory tract, with enteric forms causing severe disease in neonates. In the United States, TGE, or transmissible gastroenteritis, was discovered in 1946, and it was a common pathogen until the late 1990s, early 2000s when porcine respiratory coronavirus was introduced. Cross-protection between those two pathogens resulted in a dynamic decline in infections and disease in the U.S. This made the U.S. look like Europe, where porcine respiratory coronavirus was endemic, and TGE was never a significant problem.

Porcine epidemic diarrhea virus, or PEDV, was first identified in Europe in the 1970s and became endemic in Asia starting in the 1980s. New lineages for PEDV started emerging in the early 2010s, with a clear separation in genotypes between historical and new lineages. PEDV, like the TGE virus, causes epidemic diseases in individual herds, produces the most severe disease in neonates, and remains persistent in the environment for long periods.

What Happened

In the spring of 2013, PEDV was introduced into the United States. Interestingly, the virus was simultaneously identified at multiple concurrent locations, rapidly spreading across a large geographic area. This suggested that the virus had been present in the United States before its identification. It was only identified because a couple of swine veterinarians got negative results for TGE in their diagnostics but were convinced the disease was TGE. Further diagnostic investigation using broad pan-coronavirus PCRs identified a coronavirus, subsequently identified as PEDV. While this is historically interesting, it also suggests a significant surveillance gap in the U.S. swine industry.

Over the next year, about 10% of the pigs produced in the United States were lost to this disease. The PEDV outbreak was spread across the United States geographically and temporally, meaning that 10% of loss did not occur at one time but occurred over about ten months. This reduction in pigs resulted in a significant increase in price for the remaining pigs in the market. This was due to the principle of price elasticity, where a 1% change in supply or demand does not result in a 1% change in price. In the United States, that number has historically been close to 3%, meaning that a 1% change in supply results in a 3% change in price. Retrospectively, pigs in the United States were worth about 25% more in 2014 than in the prior year, which resulted in record profits for the U.S. industry. These profits resulted from approximately 112% of the income generated, with only 90% of the variable cost due to this reduction in the number of pigs produced. While there was a short-term crisis, the immediate benefits of the PEDV outbreak were substantial for the U.S. industry.

The outbreak also led to further consolidation in the market. More inefficient producers exited the market. That inventory was taken up by more efficient producers, resulting in a higher number of pigs produced. In retrospect, prices fell below baseline for the next five years because of this increased industry efficiency.

The Underlying Factors

A key contributing factor to this outbreak was the geographic distribution of systems. Systems in the United States cover large geographic areas, with pig movement between those regions frequently. As the industry has attempted to control other diseases, such as PRRS, breeding herds have been moved to the periphery of the primary swine-producing regions to minimize the infection rate of the breeding herd. This has resulted in the transportation of pigs across long distances to regions with abundant grain, which also tend to have concentrations of markets and packing plants. This long-distance transportation facilitated the movement of PEDV across geographic areas, with both the pigs themselves and the transportation equipment used to move that livestock.

The second contributing factor was the interconnectedness of systems. Systems in swine-dense regions in the United States routinely share many resources. These resources include standard feed milling and transportation for multiple companies, resulting in indirect contacts between finishing populations through the feed mill. General biosecurity in swine-dense regions of the United States is also low because of sites' all-in/all-out nature. The benefit of multi-site production - with only one age group at a site and emptying that site between batches - is that disease introduction has a limited impact.

Feed trucking is interconnected in many swine-dense regions; livestock trucking is interconnected. There are multiple reasons for this. Contracted transportation companies haul most market animals hauled in the United States. This minimizes the capital investment and the legal liability for moving pigs to market. While it is short-term cash efficient, it results in suboptimization of the trucking process by the transportation companies. Suboptimization results in connections between sites when equipment moves between multiple owners and multiple sites and indirect connections at truck wash facilities.

The final primary means of connection in many regions, particularly in swine-dense regions. These regions have developed supply networks of animal husbandry supplies and building maintenance supplies. These are outside suppliers who work with multiple production companies to create links between sites and facilities, resulting in pathogen transmission. Interestingly, even if maintenance staff is internalized, it's widespread for maintenance staff to move between farms within a joint ownership group due to the nature and size of facilities. This has proven to be just as risky as external contractors at transmitting disease between sites.

Future Implications

There were short-term changes in biosecurity in 2014 that resulted in a dramatic reduction in pathogen transmission. While PEDV has not been eliminated in the United States, its economic impact has been minimized. Unfortunately, other data, e.g., Swine Health Monitoring Project of the University of Minnesota, suggest that diseases such as PRRS continue to be transmitted with a high degree of frequency in the United States, and PEDV continues to infect many sow farms per year. The industry appears to be unprepared for a novel disease introduction, as the existing structure promotes the transmission of infectious diseases. If we think about biosecurity as a form of insurance, it is hard to pay for insurance when the threat is not apparent.

This has obvious implications for the threat of ASF in the United States. While we're currently free of ASF, history tells us an ASF introduction could be devastating. The industry continues to work on response plans, including the U.S. Swine Health Improvement Program, but as of 2022, it appears to be woefully underprepared for a novel disease introduction. The lessons learned in 2014 appear to have been short-lived, and the industry appears to continue to be unprepared.

When a pandemic changed the game

Background

In January 2020, stories of a strange disease in China began to circulate. As the world watched, the U.S. was generally passive. It couldn't happen here, right? I remember attending the American Association of Swine Veterinarians meeting in Atlanta, Georgia, during the first week of March. There was chatter about this COVID disease, and I think everybody was nervous, but the meeting went on as usual except for a few handshakes replaced by fist bumps. What a change of events that occurred. We returned from the meeting, and six days later, the University shut down. It did not reopen for seven months. Shortly after that, all businesses that were deemed non-essential began to close. We've all lived through what can best be described as an odd couple of years, but this pandemic also impacted the pig meat sector.

What Happened

By late March and early April of 2020, the United States had effectively closed all the non-essential businesses to stop disease transmission. This was hugely successful in the short term, but businesses deemed essential suffered significant challenges. Packing plants and agriculture, in general, were considered essential. Businesses and workers were expected to continue to show up to work. Packing plants began to pivot quickly to implement enhanced biosecurity measures and were some of the earliest adopters of masks, separation, and a reduction in density. They screened all people entering the packing plant for temperature daily and had them fill out questionnaires about clinical signs. They built new lunchrooms so that people could sit at one table by themselves. They radically increased sanitation inside the plant and installed dividers between workers on the line. The changes they made in a very short period were nothing less than impressive. Unfortunately, their massive efforts did not translate directly to high degrees of worker confidence that they would not become ill at work. There was little information about how the disease spread and workers became sick. By May of 2020, absentee rates at packing plants were significant.

The U.S. industry is designed so that every available shackle to harvest pig has a pig for it six months in advance. Production and packing plant capacity is nearly one-to-one. When workers started not coming to work, packing plants had to slow down and not harvest as many pigs per day without reducing the number of pigs available to be harvested. Pigs were backed up in the supply chain in a system with no extra capacity for buffer space.

Producers responded quickly. There were discussions about the need for mass euthanasia for pigs that couldn't be harvested. Fortunately, creative producers could avoid this by altering their production flows. Unfortunately, they did this by reducing energy availability to pigs, slowing growth rates, terminating sow pregnancies before farrowing to reduce the number of pigs into the supply chain, and reducing breeding targets by culling sows to reduce the number of pregnant animals. This effectively reduced the supply so that the available packing plant could handle the market pigs available for slaughter.

This reduction in capacity has resulted in dramatic price increases in 2021, with prices above 1.7 euros per kilogram of live weight. Unfortunately, while good, profitability has not been outstanding due to the increase in grain prices secondary to short crops in South America and the ongoing conflict in Ukraine.

The Underlying Factors

This crisis directly resulted from a supply chain designed with no buffer capacity. Every sow place, nursery/grow/finish place, and available shackle was committed for years in advance. It was designed so that the sow farm was the bottleneck, the rate-limiting step of production, with 100% utilization of the supply chain after the sow farm. There were severe consequences when the bottleneck was shifted to the packing plant due to worker shortages. This supply chain design was due to the classic focus on cost in a commodity business.

Worker shortages at packing plants were directly due to fear of becoming diseased. This is entirely understandable, as all of society was scared. However, there were significant differences in the absentee rates between different processing facilities in the United States. As background, most packing plant work in the United States is done by immigrants. It is not uncommon for 15 or more languages or dialects to be spoken at an individual packing plant. This creates significant communication barriers within those plants. It was apparent to many that worked in the industry that trust - or lack thereof - between plant owners and management and workers was a significant cause of absentee rates. Plants where management had developed deep, longstanding working relationships with various ethnic communities within the plants appear to have fared much better than the packing plants where there was a poor understanding of the communities working in their plant and only superficial relationships with those working groups. As we've seen in other crises, building trust in the middle of a battle is brutal.

While not the root cause, outside forces undoubtedly contributed to the lack of capacity in packing plants. Anti-animal-ag organizations used the opportunity to create distrust with our consumers and scare our workers that they were unsafe working in packing plants. In addition, anti-packing sentiment and poorer relations between some of the packing industry and regulators, particularly the Occupational Health and Safety Administration, resulted in increased regulatory scrutiny, often inconsistent and unclear. Regulators have a job to do, and it appears that the lack of building relationships and trust over time contributed to some of the regulatory challenges that individual plants faced.

Future Implications

Given the consumer-centric era that we've entered, where consumers have more power than producers, situations like 2020 in packing plants indeed call into question if the low-cost, high-efficiency model, with no buffer in the supply chain,

is sustainable. Consumers expect and want affordable and safe food. The pig meat industry has done an outstanding job of supplying that, but as the market has changed and crises become more impactful given industry structure, do we have to redesign our supply chains to address these external challenges?

The 2020 challenges following COVID also question the role of technology and automation within the industry. While the pig meat industry has been a proponent of automation, it is still an industry that relies on a tremendous amount of manual labor. It also has not adopted digital tools to coordinate supply chains standard in many other industries. One could argue that despite the high degree of alignment in the U.S. industry, there is no supply chain coordination, likely due to the historically combative nature between producers and the packer/processor industry. The crisis created by COVID indeed calls into question if the adoption of further automation and better supply chain coordination is necessary to be successful in the future.

Unfortunately, in early 2022, we still have a poor understanding of where the virus originated. While it was likely from a wild animal, we don't have enough surveillance to understand which wild animal or if it had been passed between humans for an extended period before it was identified. Political considerations aside, this lack of knowledge threatens our ability to understand and manage future pandemics. In addition, we still have an emerging understanding of the disease itself. Why are some people so mildly affected and others severely affected? Why does the immune system appear to dysregulate? Which control strategies (e.g., lockdowns, masks) are essential in minimizing the cumulative frequency of severe disease? These questions that have implications for human health have significant implications for animal health. The interrelationship between humans and animals, not only with disease but as our responsibility to be stewards of the animals that we raise, means that we need a deeper understanding of these factors to prevent future crises like this one.

History will predict the future... maybe.

The pig meat industry has been highly successful at responding to crises. We've redesigned production systems, continued to drive incredible efficiency, produced a wholesome and safe product, and reduced our environmental footprint exponentially. The question before us is, does the existing system have enough resiliency to respond to current crises? The concentration of control and capital in a capital-intensive business may create systemic vulnerabilities like those seen in the banking industry in the crisis of 2008-2009. What are the underlying systemic risks in the system that are both known and unknown?

Given the macro changes in the environment, consumer power, consumers demanding further understanding of their food, society demanding a reduction in carbon output, and reduced use of antibiotics, fundamental changes may be required for the firms to be finically successful. Agriculture has always focused on producing food at a low cost. The U.S. farmer takes a tremendous amount of pride in our ability to feed the nation and large parts of the world and raise people out of poverty. As developed nations have static demand and many developing nations have started to produce their meat, the developed economies of Europe and the Americas may have to think differently about their customer.

The market tells us that there is a space for value-added production. There's undoubtedly been niche value-added production, but that doesn't feed the masses, and it's not scalable. Certified Angus Beef® (CAB) in the United States is a consumer brand focused on differentiated quality that continues to grow with record profits. The price differentiation between CAB and choice beef in the United States continues to grow. This suggests that alternative production models focusing on differentiated and repeatable quality have a place in the market.

Does a consumer focus help us survive crises? My answer is yes. It provides enough margin to allow us to make the investments, so that small or even large external challenges are not magnified within our industry. Just as veterinarians led the adaptation and adoption of three-site production, which is the single most significant technological change in the last 40 years, veterinarians can transform the industry into more resilient and capable of withstanding crises, therefore profitable in the long haul. That opportunity means we may have to think differently, act differently, and have different skills than we've traditionally thought necessary. With change comes uncertainty; with change comes opportunity. Our goal should be to capture opportunity before someone else does.

SESSION: HOW TO DEAL WITH LARGE CRISIS?

ASF successful eradication stories

Petr Šatrán, DVM, Ph.D.
Director of Veterinary Section and Deputy CVO
State Veterinary Administration, Czech Republic

Biosketch

Academic Career
1988 – 1993 Veterinary medicine doctor, University of Veterinary and Pharmaceutical Sciences Brno, Faculty of veterinary medicine
1999 – 2003 Ph.D. Graduate in the area of Veterinary epidemiology and infectious diseases. Specialization for microbiology, immunology and veterinary epidemiology. University of Veterinary and Pharmaceutical Sciences Brno, Faculty of veterinary medicine.
2005 Attestation I. degree – general approach, Veterinary epidemiology and infection disease, Food hygiene, EU and national Legislation. State veterinary administration in cooperation with University of Veterinary and Pharmaceutical Sciences Brno
2006 Attestation II. degree – specialization in infectious diseases and epidemiology Veterinary epidemiology, Communicable disease, CR and EU Legislative in relation to Animal Health. State veterinary administration in cooperation with University of Veterinary and Pharmaceutical Sciences Brno

Professional Experience
Since 2017 State Veterinary Administration of the Czech Republic, Director of Veterinary Section and Deputy CVO
2015 – 2017 Permanent Representation of the Czech Republic on EU, Brussels
2004 – 2015 State Veterinary Administration of the Czech Republic, Head of animal health and welfare department
2001 – 2004 Lecturer at University of Veterinary and Pharmaceutical Sciences Brno, Department of infectious diseases and veterinary epidemiology.
1997 – 2000 Head of the laboratory of bacterial respiratory infections of livestock at Veterinary Research Institute, Brno
1994 – 1996 Private veterinarian

Abstract

Eradication of ASF in the Czech Republic

The Czech Republic detected its first occurrence of African Swine Fever virus (ASFv) after passive surveillance that started in 2014. ASFv was detected in two wild boars, which were found dead on 21 and 22 June 2017 in the cadastral territory Příluky u Zlína, Zlín District, Zlín Region.

The National Reference Laboratory for ASF, the State Veterinary Institute Jihlava, confirmed the positive finding of ASFv on 26 June 2017. Since 15 April 2019 there were 230 cases of ASF registered in wild boar involving 212 cases of wild boar found dead and 18 cases of hunted wild boar.

The last ASF positive cases in wild boars were detected on 8 February 2018 in hunted wild boar and on 15 April 2018 in wild boar found dead – however, these carcasses were decomposed (three to six months old). All positive cases were detected in a small area (only 89 km2) in the Zlín District. In domestic pigs, no outbreak of ASF was detected in the Czech Republic. There are currently no positive cases of ASF within the territory of the Czech Republic.

After confirmation of the first ASF positive cases, the country took immediate veterinary measures in accordance with the European Commission's Council Directive 2002/60/EC and national legislation (Veterinary Act No 166/1999 as amended and decree No 202/2004 on measures for the prevention and control of ASF). The country took additional veterinary measures depending on the development of the epidemiological situation.

The infected area (Zlín District) was defined on 27 June 2017 (Commission implementing decision (EU) 2017/1437). The area with intensive hunting was determined around the infected area on 13 July 2017. On the basis of result of passive surveillance and yearlong home range, the authorities defined the high-risk zone for ASF in the infected area on 18 July 2017 and the low-risk zone (infected area without high-risk zone) for ASF in the infected area on 21 July 2017.

Veterinary measures were established, including a ban on all hunting activities in the infected area and a ban on feeding wild boars. Investigation of the epidemiological situation was carried out in the whole defined infected area, including an inspection of the surrounding site of the place where wild boar were found and tested positive for ASF.

The authorities ordered an active search of wild boar carcasses in the infected area. Searching was provided by local hunters under biosecurity measures and supported by payment for each found dead wild boar. Only official veterinarians carried out sampling in rendering plants. Odour and electric fences were installed on the outer periphery of the high-risk zone for ASF ('core zone' – 57 km2) and a ban on entering the core zone without permission of the municipal office was imposed.

In the core zone, hunting was strictly prohibited. Exceptions from the hunting ban were allowed later, but only for approved local hunters trained by the Czech State Veterinary Administration (SVA) applying biosecurity rules during hunting and transport of hunted animals for ensuring no disease spread.

The SVA trained about 1,300 hunters. However, only individual hunting was allowed after having obtained sufficient data on disease spread, primarily in the low risk zone (about a month after the first findings) and secondary also in the high risk zone (since 11 September 2017). All wild boars hunted in the infected area had to be safely disposed of in rendering plants and tested for ASF. Carcasses were identified with a 'seal', collected in a plastic bag and carried to the nearest road (collection point) where dedicated vehicles transported them to the rendering plant. An official veterinarian sampled carcasses at the rendering plant.

In an attempt to reduce the number of pigs in the high-risk zone at the end of the epidemic phase of ASF infection, the SVA cooperated with the Czech police. Hunting of wild boar in the high risk zone by police snipers started on 16 October 2017.

Snipers were trained for wild boar hunting and on biosecurity during hunting and were employed in a high risk zone and hunted 157 wild boars in total, eight of them were positive for ASF. The SVA collected all shot wild boar, safely transported them to the nearest road and then official veterinarians sampled them at the rendering plant. There was a significant reduction in the number of pigs in the area at the end of the event. At the same time positive findings outside the core zone occurred.

As wild boar carcasses constitute the greatest risk for the spread of ASF in wild boar population, the SVA ordered users of hunting grounds in the infected area to carry out an intensive search for wild boar carcasses from 22 March 2018 until 22 April 2018. There was a payment for searching and every carcass found. In total 56 carcasses were found during this action, ten of them were ASF positive. All ASF positive carcasses were about three to six months old. Infections and subsequent death of these wild boars occurred at the end of 2017 or January 2018. Samples with positive results were sent to European Reference Laboratory for ASF, located in Madrid, Spain. The laboratory confirmed the presence of DNA of ASFv by PCR. Cultivation tests showed that no live virus was present in the samples and that the carcasses did not pose any risk for the further spread of ASF.

Parallel to that, the SVA acted to prevent the introduction of ASF into the domestic pig population. Since July 2017, there have been extraordinary official controls of holdings focusing on biosecurity. One of the main duties ordered in the infected area was to increase biosecurity and strictly avoid contact between wild boar and domestic pigs. Only after SVA approval, it was allowed to move pigs. It was also forbidden to use straw and grass as a feed and feed cereals from the last harvest from the infected area. Pigs had to remain inside stables and special working clothes and shoes had to be used. A ban on keeping pigs in backyard holdings was endorsed in the high risk area.

Municipalities in the whole Zlín region had to perform a census of all pig holdings until the end of January 2018. A duty to check all pig movements, a system of early detection, regular visits and checks by veterinary inspectors and system of testing of sick/dead animals in pig holdings also contributed to minimise the risk of ASF spread. Intensive communication campaigning happened through the media, information leaflets, training of hunters and with help of private veterinarians. That all resulted in the fact that no case of ASF in wild boar was detected outside the infected area in the Czech Republic. In addition, no outbreak was detected in domestic pigs in the Czech Republic.

The passive surveillance continues of found dead wild boar as well as road kill throughout the whole territory of the Czech Republic. Feeding of wild boar is not allowed in the entire territory of the Czech Republic with the exception of baiting for hunting. The authorities continue to follow a surveillance programme as well as preventive measures at holdings with domestic pigs. Sick or dead pigs, for which ASF cannot be excluded on clinical grounds, are tested for ASF in accordance with the provisions set up in the diagnostic manual. Official farm controls continue targeting biosecurity. Last but not least, a ban on feeding of domestic pigs with kitchen and catering waste was put in place.

It was not possible to confirm the source of the infection, however, according to genotyping it is the same strain circulating in the Eastern European countries since 2007. Due to the distance from the nearest outbreak, it can be assumed that the transmission was by human activity.

Eradication was successful due to:

- The level of surveillance allowed early detection of the first case of ASF.
- The veterinary measures prevented the spread of ASF in the wild boar population, that is why all positive cases were detected in a small area (only 89 km2) in the Zlín District.
- A significant reduction (almost complete depopulation) of the number of pigs in the area with ASF positive cases, leading to a stop of the virus circulation.
- The veterinary measures preventing the introduction of ASF into domestic pig holdings.

SESSION: ERADICATION OF INFECTIOUS DISEASES: THE PRRS EXAMPLE

How to define an eradication program?

Heiko Nathues, Prof. Dr. med. vet.
Clinic for Swine, Vetsuisse Faculty, University of Bern, Switzerland

Biosketch

Prof. Dr. med. vet. Heiko Nathues graduated from the University of Veterinary Medicine in Hannover, Germany in 2004. He spent some month in a specialised pig & poultry practice in Northern Germany.
From late 2004 until 2011 he was employed at the Field Station for Epidemiology of the University of Veterinary Medicine Hannover in Bakum, Germany, where he also obtained his Dr. med. vet. in 2007 and his PhD in 2011. Awarded with a Marie-Curie Intra-European-Fellowship he joined the Veterinary Epidemiology, Economics and Public Health Group of the Royal Veterinary College in London, from 2011 to 2013. He also obtained a Postgraduate Certificate in Veterinary Education.
In 2013 he finalized his habilitation and received the venia legendi for 'Pig diseases and population medicine' from the University of Veterinary Medicine Hannover. Since the same year, he is a professor at the Vetsuisse Faculty of the University of Bern, Switzerland, where he is heading the clinic for swine. His primary areas of interest are diagnosis, epidemiology and control of porcine virus- and mycoplasmal-diseases.
Prof. Nathues is a Diplomate of the European College of Porcine Health Management (ECPHM), certified as EBVS™ European Veterinary Specialist of Porcine Health Management and currently the President of the ECPHM. Since April 2017 he is representing the PHM college in the EBVS, and since April 2021 he is the Vice-President of the EBVS and a member of the Executive Committee.

Abstract

Eradication of infectious diseases in pigs
Lessons learned & challenges in the future

In recent years, the eradication of infectious production diseases in pig farms has become more and more popular all over the world. This development is partially based on good experiences that were made elsewhere and have been published in journals or presented in conferences numerous times. Other reasons to eradicate infectious production diseases and to obtain a 'specific pathogen free' (SPF) status include higher revenue for animals that are sold to other farms or even access to new markets. In any case, eradications remain costly and challenging, whereby the confirmation of the SPF status on herd level is still lacking an international and sometimes national standard that allows reciprocity of recognition. This paper highlights the lessons we have learned in previous attempts to eradicate infectious diseases in pig herds. Moreover, a critical review of recent methods to confirm successful eradication and/or SPF status will be presented.

Understanding the epidemiology of an infection
Thorough understanding of the epidemiology of the infection in question is of utmost importance and is not the same in every individual case. An attempt to eradicate a disease from one herd might be successful, whereby the same protocol does not lead to success in another herd, region, or country (Neirynck et al., 2020). Ideally the transmission of the pathogen into the herd, the spread of the infection within the herd, the persistence of infection in individual animals or groups of animals and, finally, the time and way of elimination of the pathogen from animals and/or their environment is known. However, this complete understanding of the epidemiology is not valid for many infectious

production diseases in pigs or at least is not present in a given farm setting where the herd is infected, e.g. with Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) (Arruda et al., 2019).
The lack of information about the susceptible subpopulation, the uncertainty regarding the time that an infected individual remains infectious and thereby exposes others, and the level of protection of acquired immunity in recovered individuals lead to failure, not only in combating a pandemic such as SARS-CoV 2 (Muñoz-Fontela et al., 2022), but also in managing infectious diseases in pigs (Dorjee et al., 2013). In order to correctly assess the epidemiological situation of an infection in a given herd, veterinarians should be well aware of the susceptible group of pigs, the incubation period, and the persistence of the infection in individual pigs. For PRRSV, numerous studies describe such parameters (Corzo et al., 2010; Pileri and Mateu, 2016), although important facts such as the persistence of PRRSV for more than 250 days in single animals (Wills et al., 2003) is often neglected in the field.

Evaluating the socio-economic value of an eradication

Before starting any eradication programme, a spatial and socio-economic analysis (Figure 1) should highlight the feasibility and the monetary benefit. A partial budget analysis supports an informed decision regarding a particular eradication concept that is most applicable to the individual herd.

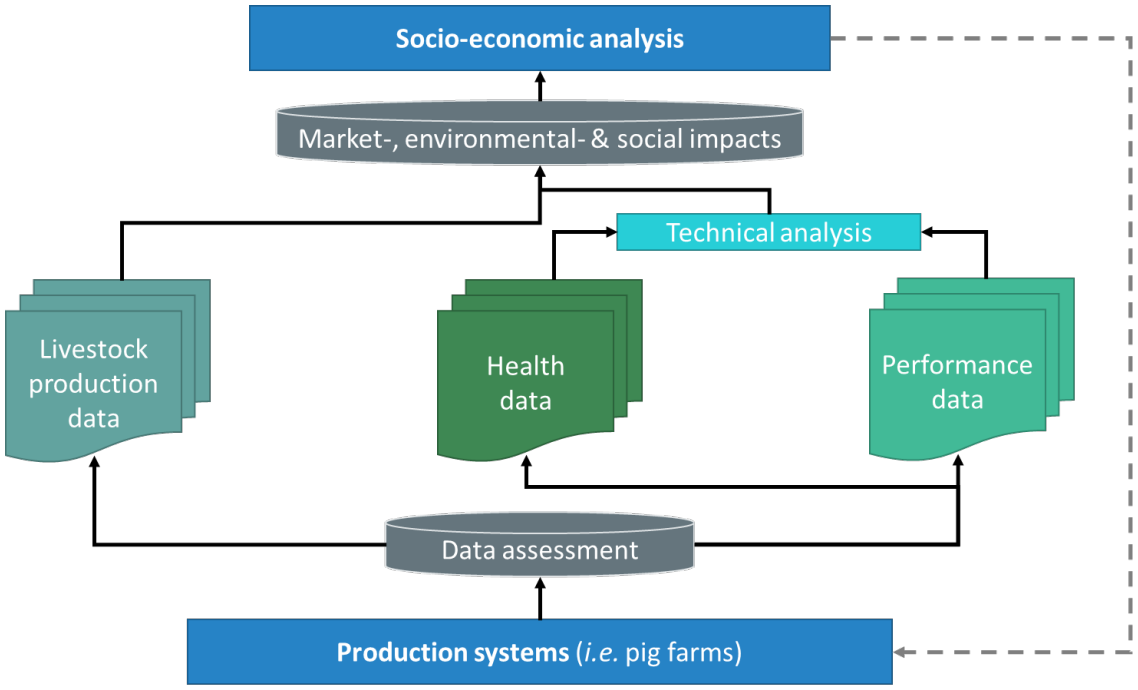

FIGURE 1: OUTLINE OF A SOCIO-ECONOMIC ANALYSIS IN LIVESTOCK FARMS

Such spatial analyses have been conducted for PRRSV in areas of different pig density (Fahrion et al., 2014), where the significant increase in the risk for re-infection was linked not only to the distance of neighbouring pig herds, but also their production type (i.e. sow herd vs. fattening herd vs. 1-site production system).
Economic analyses have been published for *Brachyspira hyodysenteriae* (Cadetg et al., 2019), Porcine Circovirus Type 2 (Alarcon et al., 2013) and PRRSV (Nathues et al., 2017). These studies have in common that in addition to health and performance data also livestock and market data were considered in the partial budget analysis. This process warrants a better estimation of the expected value, when eradication is selected as the combat tool for the particular infection. If spatial (i.e. geographic) or economic specifications put the 'long term success' of an eradication programme in question, then farmers shall be thoroughly informed and also advised to carefully consider the risk of failure or re-infection. In certain scenarios, tailor-made vaccination programmes in combination with other prevention measures might be more beneficial compared to eradication (Nathues et al., 2018).

Applying sustainable eradication concepts

Next to the concept of total depopulation and repopulation, which nearly always results in an elimination of the pathogen from the herd, the 'Swiss method of eradication' has been proven very successful in the field. In Norway and Switzerland, the Swiss method has been used to eradicate Enzootic Pneumonia on the national level (Stark et al., 2007; Gulliksen et al., 2021); both countries are considered free of the disease today. Remarkably, these efforts on national level achieved SPF status for both pig populations, where today even no more infection with *Mycoplasma hyopneumoniae* can be found, although the eradication programmes aimed at combating the (clinical) disease rather than the pathogen itself.
Apparently, the Swiss method, which is based on completely eliminating the susceptible subpopulation from a herd (i.e. the number of animals neither 'infectious' nor 'recovered' equals zero) can be used in case of other infections as well. The 'Close & Roll-over' concept that is applied to eradicate from PRRSV can be seen as a modification of the Swiss method, where the subpopulation of susceptible pigs is reduced to zero by not introducing new PRRSV uninfected pigs into the herd during six months, while waiting for all other pigs to become 'infectious' and thereafter becoming 'recovered'.

Other eradication concepts that are based on mass treatment with antimicrobials instead of partial depopulation and elimination of the susceptible subpopulation have been used for *Brachyspira hyodysenteriae* and *Mycoplasma hyopneumoniae*, but they were either unsuccessful on the spot or characterized by another breakdown in a very short period (Yeske et al., 2020). Taking this evidenced low rate of success and the concept of prudent use of antimicrobials into account, such concepts do not reflect state of the art and cannot be recommended in future.
In any case, the eradication concept must be well selected based on the individual situation in the pig herd, the farmer's social and economic capabilities, the epidemiological situation, and other aspects (Table 1).

TABLE 1: PROS AND CONS OF THE DIFFERENT ERADICATION CONCEPTS

	Pros	Cons
Depopulation/Repopulation	- Works with nearly every infection - Very high success rate	- Very expensive - Loss of genetic material
Close & Roll-over (load, close, homogenize)	- Cost efficient - Saves genetic material - Positive cash-flow	- Uncertainty of success
Test & Removal	- Potentially most cost efficient - Saves genetic material - Positive cash-flow	- Only when prevalence is <25%! - May fail due to false negatives
Others (mass treatment, etc.)	- Easy to apply	- Uncertainty of success

Defining appropriate sampling strategies to control the success

Noteworthy, appropriate sampling strategies being necessary to control the success at the end of the eradication and to continuously monitor the new status of the herd should be designed in advance. Otherwise, farm owners might be upset about the cost of controlling and maintaining the new SPF status of their herd. Once the eradication has been achieved, only monitoring programmes with highest sensitivity will truly evidence the accomplishment and build up trust among business partners. Inadequate sampling schemes, convenience-driven sampling sites, and 'low-budget-testing' increase the risk of false negative results and extended periods to detect breakdowns, i.e. re-infection of the herd, which might poses highest risk along the whole production chain.

The World Organization for Animal Health (OIE) still recommends whole blood samples or serum for the direct and indirect detection of most viral pathogens. This is also valid for PRRSV, where other sample sites such as oral fluids or processing fluids are not mentioned at all. The problem of 'alternative' sampling sites is not only the fact that others than veterinarians, who are able to examine herd health in parallel, collect those samples, but also the significant reduction of sensitivity and specificity of such samples when correctly compared to serum samples (Prickett et al., 2008; Kittawornrat et al., 2010; Steinrigl et al., 2014; Pepin et al., 2015; De Regge and Cay, 2016). Nowadays, some studies try to compensate the lower quality of such samples (oral fluid or processing fluid from docked tails or tongues of dead animals) by increasing the number of sampled animals (De Regge and Cay, 2016; Baliellas et al., 2021). However, this approach only works in very large pig herds and does not account for inevitable future developments such as ban of tail docking, etc., where the 'alternative material' will no longer be accessible.

The sample size and frequency of testing needs to be adopted to the individual herd, taking the risk of infection / re-infection into account. For most infectious production diseases, a maximum possible prevalence of 10% and a confidence of 95% is accepted, when calculating the exact sample size. However, in case of PRRSV the maximum possible prevalence might be reduced to 5% in case of significant impact of an infection, e.g. in a boar stud, in a PRRSV free country, etc. As soon as the population is dynamic (i.e. regular introduction of new animals such as gilts, etc.), the testing should be repeated at least every three months (Holtkamp et al., 2011).

Designing tailor-made programmes

Summarizing all mentioned necessities for a successful eradication of an infectious production disease in a given pig herd, it becomes obvious that tailor-made programmes are required on herd level and, in case this is favoured, on regional and national level. This not only applies to the verification of the initial success of an eradication programme, but also to the period thereafter, when SPF status is maintained.
It is strongly recommended to decide for the best options, which often does not correspond to the cheapest. This regards to the selection of the concept of eradication and also to the sampling site, sample size and testing interval once a SPF status has been achieved. Nevertheless, open and transparent communication of these efforts will underline credibility and thereby facilitate trust among farmers, veterinarians and other stakeholders involved in the production of healthy pigs.

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SESSION: ERADICATION OF INFECTIOUS DISEASES: THE PRRS EXAMPLE

The experience of the National PRRS eradication program in Hungary

István Szabó PhD, DVM
National PRRS Eradication Committee of Hungary

Biosketch

István Szabó DVM, PhD graduated as a veterinarian in 1976, and pstgratueted as Specialist in Veterinary Laboratory (bacteriology and serology) from the University of Veterinary Medicine Budapest. Fifteen years experience in everyday livestock veterinary practice (including swine, cattle and geese). During this period led a farm owned laboratory making bacteriological, virological, food hygiene, feed content and radioimmunoassay test for monitoring the animal health status, and productivity of farm animals. 7 years as a lecturer at the College of Animal Husbandry at Hódmezővásárhely (Hungary). 20 years experience with animal health product industry, working as country manager (in Hungary and Russia) and technical director of Northern and Central European Region of Pfizer Animal Health. 16 year experience in execution and manage of animal disease eradication program (Aujeszky disease, PRRS) at country level. Currently is member of the National PRRS Eradication Comitte of Hungary, founding member of the Hungarian Association for Porcine Health Management.

Abstract

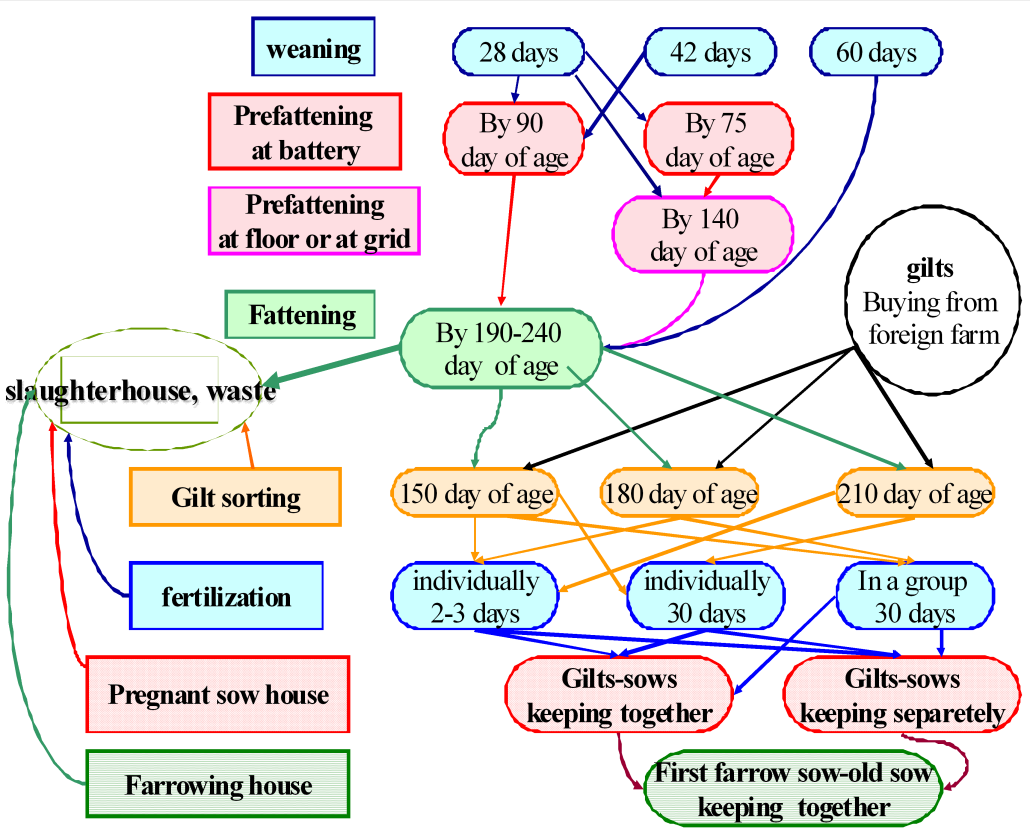
PRRS eradication of pig HERDS in Hungary 2014-2022
composed by István Szabó[2] PhD, DVM
co-authors: Imre Nemes[2], Lajos Bognár[1], Tamás Abonyi[2], Zsolt Terjék[2], Tamás Molnár †[2], Ádám Bálint[1]
[1]Chief Vet of Hungary
[2]National PRRS Eradication Committee of Hungary
[3]National Food Chain Safety Office Veterinary Diagnostic Directorate

Pig breeding in Hungary has been characterised by the parallel presence of two different forms of farming for many decades. Large-scale pig farms produced pigs for the market, while *individual farmers (backyard farms)* keeping one or two sows and a limited number of pigs for fattening (1–10) typically raised pigs for on the spot processing and consumption. Already before the accession of Hungary to the European Union, the evolution of these pig-farming types indicated a significantly decreased role of individual farmers on the market. In 1997, their ratio was 53.7%, in 2004 (i.e. in the year of Hungary's accession to the EU) it was 41.6%, while in 2016 only 24.2% of the pigs were kept in backyard pig farms (data from the Central Statistical Office of Hungary on 1 December 2018).
Hungary has an exceptionally large herd size (2,933 animals/herd in 2016) in large-scale pig farms compared to other EU member countries, the second highest after Denmark (3,182 pigs) (Eurostat, https://ec.europa.eu/eurostat).

A characteristic feature of *large-scale pig breeding herds* of Hungary is that they predominantly (>85%) belong to the farrow-to-finish type. This leads to the concentration of reproduction, farrowing, prefattening, fattening and replacement gilt units in the same farm. In the vast majority of Hungarian farms, only breeding boars or semen are imported from outside resources. There are no uniform housing technology, feeding, disease control, preventive or therapeutic treatment protocols in the large-scale pig farms in Hungary. Most of the large scale industrialised and specialised swine units had been built in the 1970s, according to the technological level typical of that period. Since then, the costs spent on their renovation or full reconstruction were much less than would have been necessary (Figure No.1). Most recently, some farms based on the multi-site production principle have been built, where different stages of finishing pig production (farrowing, nursery, fattening) take place in different farms. This technology is significantly more advantageous in terms of infectious disease control.

Figure No.1

Variability of the technological processes of large scale pig farms in Hungary



Production of *fattening pigs* in Hungary traditionally takes place in three different forms: the vast majority of pigs slaughtered in Hungary are produced by large, specialised, so-called 'farrow-to-finish' pig farms. In recent years, the type of large-scale breeding herds has appeared where only weaned piglet or prefattening production is carried out at the breeding establishment, and either prefattening or fattening is performed at other holdings, frequently run by a different owner (multi-site system). In the case of large-scale fattening farms (with a minimum of 100 pigs/holding), the pre-fattened pigs may originate from the same holding, from other herds of Hungary and sometimes from abroad. The large-scale fattening farms operate in two different ways: all-in/all-out system or continuous operation sites [1, 2, 3].

According to the slaughterhouse data, the average live weight of a pig at slaughter is 104–118 kg and the carcass weight is 83–95 kg.

Pork consumption per capita in Hungary significantly declined in the 1990s, and since the 2000s pork and poultry meat has accounted, in an equal ratio, for 90% of the meat consumption of the Hungarian population. Domestic pork consumption per person was 33 kg on average in 2021 (Central Statistical Office of Hungary).

Porcine reproductive and respiratory syndrome (PRRS) is a major infectious disease of swine causing the highest economic damage worldwide. It is estimated that the average PRRS outbreak reduced production by about 7.4% compared to the disease-free period, and it resulted in 1.92 fewer piglets per sow. In the US, PRRS results in a loss of $ 114.71 per sow and $ 4.67 per slaughter pig [4]. In Scotland, PRRS costs for the pig sector up to £ 80 per sow and £ 3.5 per slaughter pig.

According to the above, if we estimate the loss due to PRRS infections in Hungary which produces about 4 million slaughter pigs or 170000 breeding sows, it is close to 5 billion HUF (≈14 m€) per year.

The Pig and Food Chain Safety Strategy of the Hungarian Government (2013–2022) highlights the need for the eradication of porcine reproductive and respiratory syndrome virus (PRRSV). An important part of the strategy is that pork production is of major importance for the Hungarian agricultural economy despite the significant decline of the swine population in the past years. Following the successful implementation of the Aujeszky's disease eradication programme [5], elimination of PRRSV from each pig in Hungary would greatly facilitate the growth of market opportunities.

The legal background of the eradication programme was set out in Decree 3/2014 (16 January) VM of the Minister of Rural Development. The programme with state involvement has been approved by the competent committee of the European Union. According to the principles of the eradication programme, the National PRRS Eradication Plan specifies the measures to be taken against PRRSV, and identifies the competent executives of the programme. In order

to ensure the uniform implementation of the plan, on 18 February 2014 the Chief Veterinary Officer of Hungary appointed a National PRRS Eradication Committee to address any professional, epidemiological, administrative or other issues arising during the process. The officials (Ministry of Agriculture, The Ministry, National Food Chain Safety Office (NÉBIH)) hold discussions with all domestic pig farmers' representative bodies during the planning period of eradication. Even National PRRS Eradication Committee (NEC) asked all pharmaceuticals companies having registered vaccine against PRRS in Hungary, sharing their suitable professional eradicating program, and for help in its implementation.

Hungary has been subdivided into seven regions based on the Nomenclature of Territorial Units for Statistics (NUTS) of the European Union. In the seven regions, there are 19 counties and an additional unit, Budapest (capital of Hungary).

The porcine reproductive and respiratory syndrome (PRRS) eradication programme for pigs in Hungary is clearly based on the territorial principle. This means that PRRS should be eradicated from the entire pig population of a single administrative unit (district, county and region) within a specified period. This is the only approach by which the infection or re-infection of PRRSV-free pig herds can be avoided with high probability.

Materials and methods

The eradication of a specified infectious disease from an animal species in a country has essentially three phases: planning, organisation and execution of the eradication campaign [6]. The most important element of the planning process is to know the animal health status of the given livestock population in the country. In this regard, the decisive factor is the recording of the animal/herd, the geographical location of the infected animals and the distribution of the infected animals/herds among the production sectors.

In the process of PRRS eradication, during the 'preparation and planning' phase it was necessary to determine the location of PRRSV-infected swine herds in the country. This method required the establishment of strict qualification rules that clearly determined which pigs were considered to be infected, suspected of being infected or free from PRRSV. Based on these criteria, clear requirements had to be formulated for the classification of swine farms with regard to PRRS.

Decree 3/2014 (16 January) VM of the Minister of Rural Development served as a basis for this work. According to that regulation, all pigs are PRRSV infected which

(a) show characteristic clinical signs or post-mortem lesions, and the presence of PRRSV is confirmed by virological examination;
(b) in which PRRSV or its genome can be detected;
(c) show signs of the disease, and are kept in breeding or fattening pig herds in which the district authority has established the presence of the disease;
(d) have been seropositive as confirmed by two different types of serological tests from the same sample.

Those pigs are suspected of being infected with PRRSV which

(a) show clinical signs or postmortem lesions suggestive of the disease, and for which laboratory evidence of the disease has not yet been confirmed or ruled out;
(b) give a positive or inconclusive serological test result, and infection has not yet been confirmed or ruled out;
(c) have been kept during the previous 60 days with infected pigs, or have been inseminated with semen from infected pigs.

At the same time, the regulation made it clear that PRRS is a notifiable animal disease in Hungary. The main principle of the decree is that each large-scale pig farm and each settlements having pig have to be certified by the district veterinary authority regarding their PRRS status. The decree specifies a herd free from PRRSV if

(a) material conditions of the disease control (biosecurity) measures are available in the herd;
(b) the herd has been subjected to annual qualification and immunity checks in accordance with this regulation, and has been found to be free from infected animals;
(c) in the case of breeding herds, the sows or gilts have been bred with a certified breeding boar, or have been inseminated with semen from such males.

Taking into account the principle of territorial eradication, version 1.0 of the National PRRS Eradication Plan was prepared and issued as directed by the Chief Veterinary Officer of Hungary during the 'organisation' phase (2014–2016).

The plan identified the counties that had been classified as 'areas under eradication processes' (the area defined by the National Food Chain Safety Authority where eradication processes are going on under the provisions of the Departmental Government Office for Food Chain Safety and Animal Health) according to the regulation. These areas included the whole region of Northern Hungary, i.e. Nógrád, Heves, Borsod-Abaúj-Zemplén (BAZ) and Szabolcs-Szatmár-Bereg counties, as well as Vas, Zala and Somogy counties.

The National PRRS Eradication Plan specified the establishment of separate PRRS eradication plans for each large-scale pig holding, including large breeding swine farms. The eradication plan was approved by the competent county veterinary authority until 31 May 2015.

From 2014 onwards, a laboratory serological certification regime for pig farms was carried out each year as specified by the Decree. The tests, required for certification, were carried out at state expense. Based on the results of the examinations, the herds were certified by the veterinary authority.

If the pig farm was certified as infected by PRRSV

a.) *backyard farms:* the authority ordered the depopulation of the herds with state compensation, but without the need for repopulation.
b.) *large-scale fattening units:* at this early stage of eradication after sending the pigs to slaughter

premises has to make careful cleaning and disinfection, and only PRRSV-free animals were allowed to be repopulated.

c.) The management of *large-scale breeding swine herds* had complete freedom to decide whether eradication of the PRRS virus was to be carried out by complete depopulation-repopulation, herd closure, test and removal, applying more stringent site management methods, rationalisation of infection chain interruption and by the introduction of systematic laboratory testing processes.

The criterion was to find an optimal method suited to the particular technological processes of the swine herd that according to the current state of science was likely to lead to a PRRSV-free status with high probability within a certain time period defined by competent authority.

Development of the eradication plan by the management of the swine herds was assisted by the PRRS Expert Veterinary Team delegated by the Chief Veterinary Officer of Hungary and by the specialist representing the manufacturers of vaccine products authorised for use against PRRS in Hungary. The professional assessment of the Eradication Plans was supported by the opinion of the National PRRS Eradication Committee upon the request of the Official Approval County Veterinary Authority.

At its 85th General Meeting in May 2017, the World Organisation for Animal Health (OIE) approved the international PRRS regulations in the Terrestrial Animal Health Code. As a result, the concept of PRRSV-infected pigs and a pig suspected of being infected with PRRSV has already been changed in version 4.0 of the National PRRS Eradication Plan.

According to this new regulation, all pigs are PRRSV infected

(a) in the samples of which PRRSV other than vaccine strains has been detected;

(b) which are epidemiologically related to PRRSV-infected pigs, and from which a specific antigen or RNA of PRRSV has been detected, which is not the result of vaccination;

(c) which are epidemiologically related to PRRSV-infected pigs, and from which a sample of the PRRSV vaccine strain, or its antigen or RNA has been detected, unless it has been demonstrated that this was due to vaccination of the individual;

(d) which are epidemiologically linked to PRRSV-infected pigs, and from which specific antibody against PRRSV has been detected, unless it has been demonstrated that this was due to vaccination.

Those pigs are suspected of being infected with PRRSV which

(a) show clinical signs or postmortem lesions suggestive of PRRS, and laboratory evidence of the disease has not yet been established or ruled out;

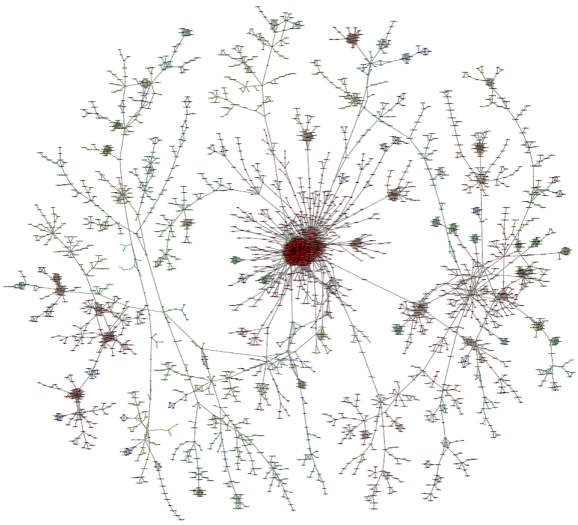
(b) have not been vaccinated and have given a positive or equivocal result in a serological test, and the infection has not yet been confirmed or ruled out;

(c) have been kept during the previous 60 days with infected pigs, or have been inseminated with semen from infected pigs.

Because of this interpretation, the Decision of the Chief Veterinary Officer of Hungary made it possible to introduce the concept and category of 'vaccinated free' (VF) large-scale breeding swine herds. This term applies to all three breeding types of large-scale swine farms (from breeding to slaughter, from breeding to pre-fattening and from breeding to weaning). In principle, the breeding stocks can be immunised without any time limit, but the progeny must be proven free from PRRSV by laboratory methods (ELISA, PCR) in any age group. Vaccination during the fattening process (including lactation, nursery, fattening) is not allowed in these farms; therefore, the tests must not show seropositivity in the progeny, and all animals must be free from PRRSV including even the vaccine virus.

From the beginning, the laboratory test to detect antibodies to PRRS was an ELISA (Ingenasa, Spain) according to the recommendations of the manufacturer. Seropositivity was confirmed or ruled out by another serological test, indirect immunofluorescence (IIF). In addition, the virotype PRRSV RT-PCR Kit (Qiagen, Germany) was applied for direct virus detection according to the manufacturer's instructions in the blood sample in question. In case of a positive PCR test, sequencing of the PRRSV ORF5 gene was also attempted. Based on the sequence data, the 'similarity network' image was performed, and the sequences were classified. For the similarity network representation, we involved 2,966 PRRSV ORF5 sequences identified in Hungary from 2003. Based on this similarity network, we determined case by case the most probable source of introduction of PRRSV to a certain infected swine herd (Figure No.2).

Figure No.2
Similarity network of 2965 PRRSV ORF5 sequences (including all ones recognised in Hungary from 2003-2022).



The second, 'Eradication Phase' of the process began on the basis of the Decision of the National Chief Veterinary Officer published in November 2017. The decision banned the introducing of non-PRRS-free fattening herds to Hungary for fattening, so that only PRRS-free nursery pigs could be used for fattening. By 30 June 2018, according to the decision, all Hungarian large-scale fattening pig farms had to be certified for PRRS freedom. From the second half of 2018, taking into account the need to eradicate the disease from large breeding establishments, we have stabilised the PRRS status of large-scale fattening farms, and we paid special attention to those farms that had not reached PRRS-free status yet for different reasons ('Freedom Maintenance Phase'). The farms that used prefatteners from PRRS-infected large breeding establishments had to apply disease control measures ensuring that the herd in question did not pose a risk of infection to non-infected units in their environment [3].
The following methods were used in all three phases of the eradication for large scale fattening units:

a.) Quarantine of all herds for 60 days;
b.) PCR and serological test for PRRS 48 hours after the arrival of the prefattening animals;
c.) Serological test for PRRS at the end of the quarantine period. In 2017, as part of the 'Eradication Phase', based on the decision of the National Chief Veterinary Officer (2017):
a.) Only pigs coming from PRRS free farms were allowed to be used for fattening in Hungary;
b.) If any diagnostic test after 48 hours of arrival, or 60th days of quarantine gave even one positive result, a second test had to be carried out, and if it gave the same result, the stock had to be sold for slaughter within 15 days or placed outside Hungary, so that the infected stock would not compromise the PRRS status of that area.
c.) From 2019, PRRS free status of herd of origin has to be certified by local official veterinary authority (regardless of the country of origin).

PRRS eradication from independent, large-scale fattening herds was carried out differently depending on the technology used. Where the all-in/all-out system was used, the infected stock was slaughtered and replaced with a PRRS free herd. In farms using continuous production, the infected herd was sold from time to time, without having to be repopulated until the last delivery. After cleaning, disinfection and restocking, repopulation was done with PRRS-free animals.

Results

Backyard farms:

In 2012–2013, during the 'Surveillance Phase', pigs were kept in nearly 60% of the settlements in Hungary. Of the examined backyards, PRRS-seropositive individuals were found in nearly 4% in both years.
According to Decree about eradication of PRRSV in Hungary, seropositive animals were culled on the basis of an official procedure, so that on 31 December 2015 the PRRS-free status of small-scale of Hungarian swine herds was declared. This free status was confirmed in the 2016, 2017, 2018, 2019, 2020 and 2021 monitoring programmes of PRRS carried out in small-scale swine populations.
Blood samples for the PRRS laboratory test from seropositive individuals were positive with two different serological methods (ELISA, IIF). In the studies, we attempted to confirm the presence of the virus by direct virological tests in individuals showing seropositivity. None of samples originated from breeding sows were PCR positive. The PRRSV PCR positivity was observed in small-scale herds when irregular animal transport without veterinary certification was carried out or when infected nursery pigs were placed into small units for fattening purposes. This epizootiological connection was confirmed by the phylogenetic analysis. There was no infection that could have been traced back to using so-called 'hidden boars'. In this period when tonsil samples were collected at the slaughterhouse from earlier seropositive sows, all of them were PRRSV PCR negative.

Large-scale breeding farms:

Out of the 470 large-scale breeding farms in Hungary, 345 were classified as PRRSV free (73%) and 125 (27%) as PRRSV infected at the beginning of 2014. The total number of sows of 470 farms was 186 404, of which 68 226 (37%) were kept in infected farms.
The average number of sows in the herds was 396; the average sow number in non-infected and infected farms was 343 and 546, respectively. With the exception of twenty farms, all of them were of the farrow-to-finish type.
During period of eradication process (from 2014 till 2021) 40 large scale breeding farms, which were free from PRRSV became infected. So altogether 165 large-scale breeding farms had to create its own eradication plan. Finally, 94 out of them had been eradicated by depopulation-repopulation method (with 69111 sows), six reached Vaccinated Free (VF) status, and others left off swine business, found to be seronegative during certification process, or turn to producing fatteners (Table No. 1).

Table No. 1

PRRS eradication at large scale breeding swine farms in Hungary 2014-

	Infected large-scale breeding farms	Sows on infected farms	Average number of sows / farm
2014. basic year	125	68226	546
became infected during eradication program (new cases) (2014-2022)	40	29927	748
ERADICATION PROCESS	Breeding farms total	Sows total	Average number of sows / farm
DE-POP - RE-POP total	94	69111	735
FV status	6	5842	974
Other (liquidated, found to be free, turn to fattening etc.)	65	23200	357
TOTAL Hungary	165	98153	595

Based on the similarity network analysis we were able to determine the reason of the infection of the above mentioned 40 large scale pig farms, infected during 2014-2022. 40% of them became infected by PRRSV origin of imported nursery pigs into Hungary. Almost 50 % of the cases the mediator of infection was vehicle transport: either to slaughterhouse or died animals (Table No.2.).
At 15th of February 2022, we could declare that 99 % of large-scale breeding farms, having 97 % of sows kept on large-scale breeding farms are free from PRRSV. Six farms, (1 % of total, having 3% of sows kept on large scale breeding farm in Hungary) are free of wild virus strain of PRRSV, and the offspring is free of PRRSV.

Table No.2

Farms became infected between 2014 and 2022 in Hungary

Total number of the farms		40	
Types of the farms:	Farrowing-finishing	29	73%
	Farrowing-weaning	2	5%
	Farrowing-nursery	4	10%
	Farrowing-nursery + separated fattening	3	8%
	Farrowing-nursery+ some fattening	2	5%
Number of sows of farms	less than 100	8	20%
	between 101-500	8	20%
	between 501-1000	13	33%
	above 1001	11	28%
Origin of infecting virus	Nursery pigs imported from abroad	16	40%
	virus existing in Hungary before 2014	24	60%
Mode of infection	related to the transport of animals to slaughterhouses	10	25%
	died animals transport	9	23%
	breeding and fattening farms are to close to ech other and import nursery pigs were infected	7	18%
	irregular personal trafic on the farm	6	15%
	Sperm	2	5%
	even airborn could be	2	5%
	two farms one, common manure lake	1	3%
	we could not clarify exactly, but foreign virus	2	5%
	it was only seropozitív (PCR negative)	1	3%

Large-scale fattening farms:
Distribution of pigs imported to Hungary from EU member states

In 2015, 188 (61.2%) out of 307 large-scale fattening farms registered by the Hungarian veterinary authorities kept PRRS-positive animals. Of the total number of fattening places on these farms, 63.9% was PRRS positive. At national level, there was no significant difference in the number of infected and free stocks per holding. In 2013, 46% of pigs coming to Hungary as fatteners originated from the Netherlands, 39% from Germany, and 12% from Slovakia. The rest arrived from Denmark, Austria, the Czech Republic and Slovenia. In 2016, the Netherlands accounted for 46%, Germany for 33%, Denmark for 10% and Slovakia for 6% of imports of fatteners to Hungary. PRRS eradication, new rules regarding to importation, for large-scale fattening units induced major changes in Hungary for countries exporting pigs to Hungary: pigs imported from The Netherlands decreased significantly and at the same time from Denmark, Czech Republic and Slovakia increased.

Pigs imported from The Netherlands
The prefatteners from the Netherlands came to Hungary through two wholesale companies into Komárom-Esztergom County. One of them maintained its production by operation of farms of prefattening pigs in both Hungary and the Netherlands. The Hungarian breeding establishment and its separated fattening unit were free from PRRS.
The other two large-scale fattening farms in the group imported the prefatteners from the Netherlands produced on its own site. Practically in all consignments PCR and sequencing detected wild-type viruses that were responsible for PRRS infection on the Dutch farm and these viruses clustered with other Dutch import viruses representing two different genetic clades (PRRSV1 clade 1A and PRRSV1 clade 1F that was highly similar to the Lelystad reference strain). The pig herds on the Dutch breeding site were vaccinated with the Porcilis PRRS (MSD) vaccine, so the virus strain of the vaccine was found several times in samples from the imported animals.
The Hungarian fattening farm, which housed the fatteners from the vaccinated breeding flock infected with PRRS in the Netherlands, applied proper biosecurity measures ensuring that the import of PRRS virus from infected pigs did not result in any case in infection of other Hungarian pig farms.
In 2018, the company group established a so-called 'fourfold free' (meaning brucellosis, Aujeszky's disease, leptospirosis and PRRS free) breeding establishment in Hungary and since then all of its Hungarian fattening farms have met the PRRS freedom requirements.
All Dutch companies owned by other enterprises (by the initial letters of their names: Ko., Cr., K-A B., L. and partner sites: Eg., Ne.) had PRRS infected status. These pigs were transported to Hungary at 4 weeks of age, where they were adapted to the local conditions for 30 days in different settlements. They were taken to large-scale fattening farms in different parts of the country at 60 days of age. In these cases, the 60-day quarantine period was carried out at two separate sites.
In case of one of the farms of the company group, potentially PRRS negative weaned piglets were sent to Hungary which originated from the Dutch breeding stock vaccinated against PRRS a long time (nearly one and a half years) ago. The chosen piglets with continuous supply were placed in a 18,000-seat plant in Hungary. Within 48 hours after arrival in Hungary, the laboratory testing of piglets for PRRS (PCR) was performed in all cases. PRRS virus free status was confirmed at the end of the quarantine period (90 days of age) by PRRS serological test based on 95% confidence at 5% prevalence. This procedure, from the end of 2015 to December 2016, resulted in the production of more than 80,000 PRRS-free pigs.
At the end of 2016, a company in the Netherlands, infected with another PRRS virus, caused infection of many Hungarian herds, and these viruses formed a unique unassigned clade. Later on, further Dutch farms of the company were infected, and in 2017 PRRS virus arrived in Hungary with pigs from these farms. This virus (28370 NEBIH 2017 HU) was not only the source of the PRRS infection for a large number of fattening farms, but also for several large breeding farms, and these viruses formed a well-defined group within clade 1G. In the case of a large breeding establishment, the infection occurred due to non-compliance with the disease control rules. Not more than 10 meters isolation distance was between the PRRS-free large breeding facility and the PRRS-infected fatteners that arrived from the Dutch farm.

Pigs imported from Slovakia
A significant number of fatteners arrived from Slovakia. Slovakian import animals have been shown to be infected several times both with different wildtype and vaccine PRRS viruses.
A PRRSV2 lineage 5 (Shi et al., 2010) live modified vaccine virus containing the US strain used on these farms appeared in the importing large-scale fattening farms in Hungary (50708 NEBIH 2014 HU). The vaccine in question is neither authorised nor registered in Hungary.
The same Hungarian farms were infected with another PRRS virus strain that had previously been detected in Slovakia (KC522643_13M_2007_SVK, a PRRSV1 Clade C lineage 1g strain). This virus strain (8727 NEBIH 2016 HU) has also been introduced to Hungary by import of fatteners.
In an unknown way this virus infected one of the largest domestic (Hungarian) swine integrator, located near the Slovakian border. Owned by one of the largest Hungarian integrators, its three large-scale, from breeding to nursery, PRRS infected breeding farms significantly contributed to the PRRS infection of large Hungarian fattening herds. The fattening pigs derived from these herds and subsequently arriving in the fattening integration resulted in a high level of infection. From 2017 onwards, the Hungarian company has implemented a depopulation-repopulation eradication programme at all three sites, and from the beginning of 2019, only PRRS-free prefattened animals introduced into the integration.

Pigs imported from Denmark
According to the Danish rules of exporting fatteners from Denmark to Hungary, the Danish partner had to certify that the animals are free from PRRS at farm level. In Denmark the only possible way to load the fatteners on the pig farms was if the truck was only in the green zone within 7 days before loading.
Since Hungary, Slovakia and the Czech Republic belonged to the red zone, pigs could be loaded only from an EU-certified loading station (collecting station). The animals were transported as follows: from the Danish breeding establishment the Danish lorry (internal transport) carried the pigs to the collection station. There, after a certain time, the pigs were transferred to the truck transporting them to Hungary. This truck was checked and disinfected with a certificate prior to entry to Denmark. The animals were then transported to the place where they were kept in Hungary within 24 hours. In many cases, during their stay at that collecting station, pigs from PRRS infected and free herds were kept in the same air space, so they could be infected with various PRRS viruses, although they had been reared in a PRRS-free plant. In this way, Hungarian swine farms were infected with the aforementioned American modified live virus vaccine strain (32607 NEBIH 2017 HU and 55352 NEBIH 2018 HU) from Denmark. In the same way, infection of Hungarian large-scale fattening units took place from Denmark with a European PRRS virus strain (36750 NEBIH 2017 HU). As a consequence of these events, the largest Hungarian importer decided to continue the import of fattening animals only if the Danish partner accepts laboratory test results of the Hungarian National Reference Laboratory (NRL) for PRRS, the animals are investigated for PRRS (PCR and ELISA) 48 hours after arrival, and in the case of positivity of any PRRS test, the animals are transported at the expense of the exporter from the farm to the slaughterhouse or for fattening outside of Hungary. Using these rules, the number of PRRS-infected Danish fatteners decreased dramatically.

Pigs imported from Germany
As far as the import of fatteners from large-scale breeding pig farms is concerned, our experience showed that the practice of Germany was best suited to the Hungarian requirements. Although no official veterinary certificate was issued for PRRS status in the absence of appropriate regulation, due to the long-term partnership efforts, reliably free stocks arrived in Hungary for further processes.
Shipments were usually accompanied by a certificate from the farmer or the official veterinarian. The rules of the fattening unit in farrow-to finish herds the eradication of the virus from large breeding herds plays a pivotal role in the PRRS eradication programme. In Hungary, 80–85% of the large-scale pig breeding farms are farrow to finish ones.

Use of vaccines during the eradication process
It is a remarkable experience that large-scale, continuously running fattening pig farms should be very careful about the use of live attenuated vaccines, as in these cases the vaccine virus will persist for a long time. This is illustrated by the decision of the management of a major Hungarian pig producing company. The company had a farrowing to nursery pig farm with a continuous flow of 1,000 sows, and three farms where the fatteners arrived. The strategy of PRRS eradication was to empty the breeding site by depopulation-repopulation process, and then gradually replace the fattening units. Following the introduction of PRRSV-free piglets, a live PRRS vaccine (ReproCyc, Boehringer Ingelheim, Germany) was used in one of the three fattening units. Unexpectedly, due to severe shortcomings of biosecurity measures on the farms the virus strain of the vaccine spread to the other two farms where no vaccination took place. The farms did not get rid of the vaccine virus during continuous operation. Later, in a transport related to a PRRS infected pig farm, wild-virus infection occurred among fatteners, and both the wild-type and the vaccine PRRS virus strains were detected by laboratory methods in the herd. Subsequently, all three herds had to be replaced in order to obtain the PRRS-free herds.

Current state of PRRS eradication in fatteners
At the end of 2021 each large-scale fattening swine unit in Hungary is free of PRRSV. Based on our opinion the biggest threat to Hungarian swine units to maintain their PRRSV free status is the not enough well controlled import of nursery pigs. We believe in the effectiveness of the rules implemented from 2017, even tightened ones, when Hungary requests an official certificate of the herd of origin of nursery pigs confirming its PRRS free status.

Some new professionally interested results of the eradication
DIVA PCR test application

The developed DIVA TaqMan RT-PCR assay is cheap, flexible, easy to apply in different herds using different MLVs, and can be modified based on the sequence data obtained during the permanent monitoring examinations. Based on its simplicity the test can be applied even in basic diagnostic laboratories, and can serve as a significant complementary assay for PRRS control and elimination/eradication.
The DIVA PCR method provides several opportunities compared with general PRRSV PCR assays.
1.) It helps evaluate whether the wild-type virus persists, and if so, in which age group(s) in herds using long-term MLV vaccination. Based on these results, a herd-tailored programme can be developed for control or eradication of PRRS.
2.) Several pig producers believe that the applied MLV is not efficacious, and the only solution for better results is change for the product of a different vaccine company, which may lead to recombination with serious consequences (Kvisgaard et al., 2020). The DIVA PCR helps understand whether the vaccine itself, or the vaccination regime and the inner biosecurity measures have to be changed and improved.
3.) PRRSV is a major causative agent of the porcine respiratory disease complex, (PRDC). Applying the DIVA PCR in breeding herd, wild-type PRRSV-free offspring can be produced, i.e., PRRSV negative fatteners can be developed, contributing to more economical mass production.

4.) In epidemiological situations when wild-type PRRSV infection occur in the close proximity of a PRRSV-free herd, performing the DIVA PCR provides application of MLVs together with strict diagnostic monitoring. It also helps restoring PRRS-free status with gradual cessation of vaccination [8].

(Details are coming in a publication)

Detection of a potential route of PRRSV infection in large scale farrow- to –finish swine farms
For PRRS, stabilisation of a given herd is defined as the production of PRRSV-negative piglets from PRRSV-positive sows. In our study, we found that in a large scale farrowing finishing type, PRRS infected pig farms, post-vaccination monitoring of 30 piglets per batch is not sufficient to guarantee virus-free status even in the progeny of a long time-immunized sow population. In our opinion, this requires a much larger number of tested animals - in our case at least 3 piglets/ litter. The reason for this is that in the case of sows, after mass vaccination, as much as 1% wild-type virus positivity may occur, and such a monitoring test will detect the infecting, wild-type virus in piglets. The culling of such litters and sows, together with strict inner biosecurity control measures, may result in a safer way of PRRSV-free progeny of large-scale breeding farms [9].

Similarity network analyses for determining the source of infection
A crucial element of PRRSV control is revealing the epidemiological link between new outbreaks, and identification of the origin of introduction. In order to achieve this goal, several classical phylogeny methods are applied in eradication programs worldwide. In the phylogenetic tree representation, leaves are sampled pathogens, while internal nodes are most recent common ancestors of the sampled and transmitted pathogens. The drawback of this approach is that if genetic diversity is high, and large number of samples are analysed, the presence of the large number of internal nodes makes phylogenetic tree representation inconclusive, and difficult to analyse.
Minimum spanning phylogenetic networks overcome these disadvantages by representing the sampled pathogens as nodes, and genetic distances (similarity scores) as edges. The shortcomings of this approach are:
(1) every PRRSV sequence will be connected to the network, even if the similarity scores are low. In these cases the algorithm will use the edge with the highest available similarity score and connect the node to the network. These connections will have low alignment scores and most likely do not represent any connections between the two connected sequences,
(2) in an MST, each node has one or two connections, and in one network multiple MSTs could exist,
(3) if multiple identical PRRSV strains exist, their similarity scores will be the same and their
localization in the MST will be interchangeable.
In contrast to previous network algorithms, by using our network analysis, we were able to generate a graph where each node was connected with high alignment scores, without applying a predefined, arbitrary cut-off or computationally extensive algorithms, and connections with low similarity scores were clear outliers and were easy to identify. To avoid random selection of nodes by these caveats, and to make sure that each high similarity score gets presented in the final network, we enriched each node with high alignment score edges, using data from the fully connected network and the result of the Prim`s algorithm [7].

Genetic Variability of PRRSV Vaccine Strains Used in the National Eradication Programme, Hungary
In our study, 2342 PRRSV ORF5 and 478 ORF7 sequences were analysed. In relation to the viral strains in live attenuated PRRS vaccines, we found that: (i) 832 of the ORF5 sequences (35.5%) showed greater than 98% homology to any vaccine strain used in the particular pig farm; (ii) among the 832 sequences showing similarity to the vaccines, 618 (74.3%) were Porcilis, 179 (21.5%) were Unistrain (formerly Amervac) and 35 (4.2%) were considered to be derived from Reprocyc; (iii) regarding the vaccine strain associated sequence similarity data, the majority of Porcilis strains showed absolute (100%) homology or very high sequence identity (i.e., 99.1–99.9%), while a minor fraction of Porcilis derived sequences showed lower sequence identity (98–99%). Of interest, the Unistrain derived sequences and the Reprocyc derived sequences showed an inverse pattern of homology. Based on these findings Porcilis seems to maintain its stability, while the variability of the Unistrain and the Reprocyc strains was significantly higher. It is also important to note that whenever sentinel animals were housed among fattening pigs previously raised in the colony and previously immunised with Porcilis vaccine, all sequences obtained from the sentinel animals showed greater than 99% similarity to the ORF5 region of the vaccine virus. An unvaccinated fattener group kept in the same airspace with breeding gilts immunised with Porcilis PRRS vaccine has been found to be PCR positive, and the PCR product from their sera 100% matched to the vaccine virus (the fatteners were not immunised). For some fattener herds, it is likely that the import of prefattening animals or their sows were immunised at the place of origin with the Porcilis PRRS vaccine. Of the 74 sequences derived from these cases, only two were less than 99% similar to the ORF5 region of the vaccine strain.
Based on our investigations, we have the following conclusions:
(1) The ORF5 region of the strain of the Porcilis PRRS vaccine showed that irrespective of the way the vaccine virus entering the body of the pig (vaccination or “infection” with after vaccination shed virus), it is consistently stable and such genetic change does not occur during the period of entry that would interfere with virus vaccine sequencing. The PRRSV strain found in the Porcilis PRRS vaccine does not seem to be prone to significant genetic changes. If the PRRSV ORF5 or ORF7 sequence is at least 98% similar to the Porcilis PRRSV strain, it is safe to say that Porcilis PRRSV strain was detected.
In the case of the Unistrain PRRS (Amervac) vaccine, genetic changes occur relatively rapidly, often to a considerable extent, after administration of vaccine. The relatively limited data available for the Reprocyc PRRS vaccine does not allow a similar conclusion to be made.

(2) Comparison of the ORF5 and ORF7 regions of PRRSV with the ORF5 and ORF7 regions of the three live vaccines can be estimated that if they are 99% similar, it is likely that the sequence detected in the sample is a consequence of a direct application or indirect spread. However, care should be taken with regard to the ORF7 section of the Porcilis PRRS vaccine strain, which is 100% identical to the ORF7 section of the Lelystad PRRS strain. We found that a 100% match between the PRRSV ORF7 sequence detected in the blood samples of a given swine herd and the ORF7 sequence of the Amervac PRRSV strain means in the epidemiological sense that the sequence of the live attenuated PRRSV ORF7 used for vaccination has been detected.
(3) Based on sequence analysis, the sequencing of the PRRSV ORF5 section alone is sufficient in most cases to determine the PRRSV sequence identity. With care, useful information is also obtained by analysing the PRRSV ORF7 sequence.
(4) For spreading the infections among herds, epidemiological investigation is greatly facilitated by the sequencing of PRRSV ORF5 and ORF7. During the epidemiological investigation it is important to know the origin of the herd tested and the knowledge of the immunisation applied in the surrounding farms. Knowledge of vaccine(s) used for immunisation against PRRS over several years in the investigated population is also essential. It is also indispensable to know the age of the sampled animals, the type of production and the time of arrival at the farm. In the eradicating process, when using live attenuated virus vaccines, the PCR positivity is very important to determine whether it is caused by the wild type virus or the vaccine virus.
(5) In relation to sequence distribution along the stages of the eradication programme, as the eradication process approached the final stage, more and more pig farms became free from the disease, and stopped vaccination. Therefore, the number of sequences of vaccine origin decreased. In contrast to the wild-type viruses where viral evolution, and emergence of new variants occurred along the long-term eradication process, only limited farm-specific vaccine sequence evolution was observed.
(6) Several PRRSV ORF5 and ORF7 sequences may be present at the same time in a single herd. Knowledge of a sufficient number of well-characterised PRRSV ORF5 and ORF7 se-quences available over the years is a pre-requisite for an adequately performed epidemiologi-cal investigation. It is necessary to evaluate as many PRRSV ORF5 and ORF7 sequences as possible in an infected herd from several animal groups and from different age groups. The use of a similarity network method can provide reliable and easy-to-understand information for sequencing. In this way, it is possible to determine with sufficient certainty the origin of the infection and to detect any further infections as soon as possible. In similarity network representation, the Porcilis strains are organised into a single node confirming the genetic stability of this vaccine strain. In contrast, the Amervac and Reprocyc strains do not form a node but a dense network, and develop farm-specific minor lineages. These data can serve as useful information that may contribute to further PRRSV vaccine development [10].

Coding-complete sequence of a vaccine-derived recombinant porcine reproductive and respiratory syndrome virus strain isolated in Hungary

Porcine reproductive and respiratory syndrome virus 1 is a major cause of swine morbidity and mortality in various parts of the world, including Hungary. A national elimination programme to reduce the associated economic burden was initiated in Hungary in 2012. Using extensive laboratory surveillance, we identified and isolated an unusual PRRSV strain. The complete coding sequence of this isolate was determined and analyzed. The genome of this Hungarian PRRSV1 strain, HUN60077/16, is 15,081 nucleotides in length. Phylogenetic and recombination analysis showed a mosaic structure of the genome where a large fragment of ORF1b and the genomic region coding for ORF3 to ORF7 showed a very close genetic relationship to the vaccine virus Unistrain, while the ORF1a region, the 3' end of ORF1b, and the whole ORF2 were only distantly related to this or any other PRRSV1 strain whose genome sequence is available in the GenBank database. Genomic characterization of PRRSV strains is crucial when possible vaccine-associated cases are identified. This approach not only helps to identify genetic interactions between vaccine and wild-type PRRSV1 strains but may also be needed to prevent trust in commercial vaccines from being undermined [11].

Preliminary observations concerning the integration of amplicon deep sequencing in the PRRS eradication program
During the national elimination program in 2016, conventional sequencing approaches failed to identify the causative strains in numerous clinical specimens. An amplicon deep sequencing protocol was introduced to overcome the issues related to Sanger sequencing.
The authors compared two amplicon deep sequencing protocols and the more robust method was chosen to sequence either ORF5 or ORF7 products on an Ion Torrent PGM platform.
Based on initial sequencing results the conventional (i.e. fragmentation and adapter ligation based) library preparation method was used in this pilot study. The majority of samples contained one sequence variant of PRRSV, whereas a minority of specimens (n = 5), that originally could not be sequenced by the Sanger method, were classified as mixed infections with different PRRSV strains of major and minor variants. We conclude that amplicon deep sequencing is a useful alternative to Sanger sequencing when multiple strains (e.g., at some point of the PRRS elimination process) co-circulate in swine farms [12].

Epidemiology conclusions from a comparative study of PRRSV ORF5 sections of three neighbouring countries
We compared the PRRSV ORF5 sequences detected in laboratory studies of PRRSV in 3 neighbouring Central European countries (Austria, Hungary, Slovenia) that could lead to conclusions that can be used in the practice of daily disease control.
We found that airborne transmission of PRRSV does not play a major role in these 3 countries. Although the prevailing wind direction between countries is likely to cause infections from Austria to Hungary and Slovenia, no evidence has been found to this effect by analyzing the relatively large number of sequences.

Moreover, we have supported the opinion of Slovenian experts that by the time of their accession to the European Union, PRRS infection of swine herds in a PRRS free country was due to free and unrestricted trade of pigs. We found that the analysis of the PRRSV ORF5 sequences of the 3 countries showed that the greatest risk of infection is the unrestricted trade in prefattening animals. The practice whereby the product is not delivered directly from the producer of the prefatteners to the buyer, the fattener, but for a certain period of time animals are kept in a collection centre, plays an important role in the spreading of PRRS virus. During the time spent here, since the herds in different phases of PRRS (acute, semi-acute, chronic, or even free) are often in the same airspace, there is a good chance that the animals being traded will become infected with PRRSV. We advise all fattening pig producing farmers to contract in a written form the carrier for the economic losses for any damage that may be caused in this way. More importantly, the development and practical application of PRRS import rules for fatteners should be a prominent part of any PRRSV eradication program, as it is - by our experience- the most likely source of infection in this region [13].

Elimination of porcine reproductive and respiratory syndrome virus infection using an inactivated vaccine in combination with a roll-over method in a Hungarian large-scale pig herd

Complete depopulation-repopulation is the safest and fastest one among the applied methods to eradicate PRRSV from a population, but also the most expensive method. Another possible way to eliminate an endemic PRRSV infection is to replace the infected breeding stock by gilts reared isolated and protected from PRRSV on an infected farm. With this method, it is possible to maintain production on the farm. The authors report the first, successful elimination of PRRSV in a Hungarian large-scale pig farm using an inactivated vaccine and segregated rearing of offspring approach [14].

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SESSION: HEALTHY PIGS, HEALTHY HUMANS

Zoonotic threat: the mink experience

Tijs Tobias, DVM, PhD, MSc, Dipl. ECPHM
Utrecht University, Faculty of Veterinary Medicine,
Department of Population Health Sciences, Farm Animal Health unit,
the Netherlands

Biosketch

Tijs Tobias (DVM, PhD, MSc, Dipl ECPHM) is an assistant professor in porcine health management at Utrecht University and a registered veterinary epidemiologist. His research focuses on epidemiology of infectious diseases as well as animal welfare of pigs. Dr. Tobias is involved in national and European projects regarding e.g. Hepatitis E virus and Influenza virus in pigs and serves as an expert for national and European bodies regarding pig welfare. Tijs Tobias served as secretary of the ECPHM from 2018-2021. He is a member of the Dutch Animal Welfare committee for Notifiable disease control.

Abstract

History and principles of control of epizootics

Control and eradication of animal diseases have a long history. It is one of the main reasons we all sit in this hall today again (D.V.). Outbreaks of disease, and consequently the death of affected animals required for food and draft power, posed a huge threat for food security, prosperity, warfare, and public health. It was the veterinary school in Lyon (France) that was opened to teach the principles of Lancisi for control of Rinderpest (FAO, 2015). Rinderpest infected more than forty domestic and wild animal species, among which wild swine, and Rinderpest epizootics killed millions of animals (Morens et al., 2011). The successful control of Rinderpest relied on the use of currently well-known intervention tools as isolation and removal of animals that were infected or suspect of the disease. Effective vaccines became only available from the mid-1900s (Morens et al., 2011). It is said that the epidemiological tools developed for control of cattle plagues were later to become essential for combatting human diseases. Remarkably, three centuries ago, this knowledge was gained without even knowing the exact causality of disease, i.e. micro-organisms, at that time. Still, nowadays this knowledge proved essential for control of both well-known diseases, as well as for those still unknown.

To understand how control measures have contributed to effective disease control, we should consider the concept of infectious disease transmission. Both the transmission of infectious disease as well as the effect of control measures can be described and studied by mathematical modelling, e.g. using compartmental models. Such models can be used on individual animal or human, as well as on farm or regional level. As an example, a SEIR-V model will be presented briefly. In short, in a population with Susceptible individuals (S), a fraction of S becomes infected by contact with Infectious (I) individuals with rate β per unit of time. In case of a period of latency, the animal, farm or unit becomes infected but may not yet be infectious to others, here defined as Exposed (E). The rate at which Exposed (latent infected) individuals become Infectious to others occurs with rate ε. Subsequently, I become immune, R, and do not infect others by rate γ. Besides infection derived immunity, vaccination may be applied and in case of perfect vaccine effectiveness, vaccinated individuals (V) cannot contribute to transmission. The transmission rate (β) is determined by the contact frequency and the probability of infection per contact by I. After the first notifications of SARS-CoV-2, the first modelling studies quickly appeared, which stressed particular characteristics of transmission of the disease and effects of potential control measures (e.g. Anderson et al., 2020). Basically, such modelling studies all focus on implementing some of the epidemiological tools mentioned earlier (Table 1) and assess, amongst others, the effect on duration and size of the epidemics, to support decision making on control measures. Basically, all measures aim to affect either the transmission rate (β) or specific population fractions.

Control measure	Affecting modelling parameter / fractions	Prerequisites
Movement restrictions	Decreases β	Know where the pathogen is / who is infected
Quarantine	Decreases β	Know the latency and incubation period (have testing capacity)
Isolation / Formation of *cordon sanitaires*	Decreases β	Know the virus is only within the affected area / cordon sanitaire Restrict contacts with outside
Rapid testing and isolation of infected (reinforced surveillance)	Decreases β (and ε in case of mass testing)	Test capacity and willingness Isolation capacity Contact tracing capacity and knowledge
Disinfection	Reduces β by indirect / environmental contact	Knowledge on pathogen characteristics, survivability and inactivation
Vaccination	Increases V (decreases S and E)	Vaccine (availability) Vaccine effectiveness Distinguish vaccinates from infected
Infectious animal culling	Reduces I	Culling and rendering capacity
Pre-emptive culling	Reduces S (and E)	Culling and rendering capacity

Table 1; Disease control measures and the expected effect on specific parts or rates of infectious disease models.

Another important tool in outbreak control is contact tracing (Fraser et al., 2004; Klinkenberg et al., 2006) to detect Exposed and Infectious individuals. Contact tracing should be followed by imposing measures upon those infected to limit further transmission. The effectiveness of contact tracing on the extent of the outbreak highly depends on the fraction of transmission by those that are infectious but still in the incubation period and not showing clinical signs, as well as on the transmissibility of the pathogen (Fraser et al., 2004). This means that in case of high transmissibility and many subclinical cases, a lock down or transport ban may be needed to limit further spread. Next to the measures of limiting contacts between I and S, veterinarians always have one more option that public health bodies do not have, which is the culling of the infected and suspected animals, or even pre-emptive culling in case spread cannot be contained (e.g. as used in outbreaks of CSFv in 1997 (Pluimers et al., 1999) and FMDv in 2001 (Tildesley et al., 2009). The effective tool of culling the infected animals has proven its success, although with variable levels of acceptance. Even in the 1700s, farmers refused to comply to control measures, despite risking financial and even corporal punishments (McVety, 2018).

In zoonotic disease, and in case of anthropozoonotic transmission events, one has to consider disease dynamics in two (or more) host populations in which both the absolute numbers, as well as parameter values, will not be similar. In addition, the frequency of contact between the hosts and the probability of infection contracting the disease from the other host needs to be known. For that reason, one also needs to know or assume the extent of undetected spread of the pathogen in the other host. In turn, in the event of further change of the pathogen in one of the host species, e.g. by continued mutation and evolution, infection dynamics and outcome of infection in one host may again change and affect the probability of infection for contracting the disease by the other. The effect of control measures in one host on disease dynamics in the other relies mostly on the relative importance of the effective contacts between these hosts. These contacts can be direct, as well as indirect, involving the environment where the pathogen can survive. Thereby, the survivability of the pathogen outside a host affects infection dynamics. Thus, it is essential to know which hosts can harbour a potential infectious pathogen and how it behaves in that host and its environment, e.g. can the host or host system become a reservoir for the pathogen and thereby affect the control in humans or can the pathogen evolve in the host and become even more of a threat for the other host? The outbreak of SARS-CoV2 in mink has exemplified these phenomena, as well as the inevitable need for culling for control. Next, the course of events and actions that were taken in controlling SARS-CoV-2 in mink in the Netherlands will be presented. Finally, the lessons learned will be discussed and attention will be raised for future emerging diseases relevant for pig veterinarians.

SARS-CoV-2 in Dutch mink

At the beginning of 2020, the Dutch mink farming sector comprised of 126 farms with ~2.3 million females and 500 – 120.000 mink per farm. In April 2020, two months after notification of the first human cases of SARS-CoV-2 in the Netherlands, about 1,200 human cases were hospitalised on the Dutch intensive care units (ICU); reaching ~85% of the maximum ICU capacity at that time. As early as March 2020, reports from other parts of the world became available

about SARS-CoV-2 in other animals, such as dogs, cats, ferrets (e.g. Shi et al., 2020). The Dutch Expert group on Zoonoses concluded at that time that the risk of animal infections with SARS-CoV2 was not negligible, but limited and advised to take precautions in handling (farm) animals that could be at risk, including for owners of mink and ferrets (Anonymous, 2020). These precautions included hygiene measures and the advice not to enter animal facilities when symptomatic.

Mid-April, farmed mink fell ill characterized by dyspnoea and nasal discharge, followed by anorexia and mortality (Molenaar et al., 2020). Diseased mink were send for necropsy to the Animal Health Service (Deventer, the Netherlands). An interstitial pneumonia was found but tests for differential diagnostic causes returned negative results. In turn, SARS-CoV-2 was confirmed by PCR. In the following weeks, the infection was diagnosed on other mink farms, with variable clinical signs (Molenaar et al., 2020; Oude Munnink et al., 2021). On April 24th, the Ministry of Agriculture, Nature and Food Quality (LNV) convened about the findings in mink, in liaison with a representative of the Ministry of Public Health, Welfare and Sports (VWS), and on April 26th SARS-CoV-2 it became obligatory to report respiratory signs and increased mortality in mink to the authorities. Reporting did not result in depopulation yet, nor was it clear at that time whether it was anthropozoonotic or also zoonotic events that occurred on the farms.

On May 15th, when in total four farms were diagnosed as infected, it was reported that a mink farm employee was infected with SARS-CoV-2, most likely due to contact with infected mink. Moreover, it became clear that infections in mink could also run a subclinical course and yet result in further transmission. Based on these findings, on May 19th the Dutch minister decided to define SARS-CoV-2 as 'notifiable disease in mink', thereby enabling compulsory preventive and control measures. The control measures were first aimed to prevent further spread of SARS-CoV-2 to other farms and people, by installing transport bans for animals and manure, and advise for use of personal protection. Contact tracing was performed to track the source of infections. Culling was not advised nor deemed necessary yet. As indicated before, it is important in case of emerging diseases, to investigate which species are or can be potential reservoirs that could either be a risk for humans or act as a distant host population in which the virus can evolve more or less independently. An extensive research program by a consortium of experts on animal and public health ("A One Health SARS-CoV-2 in mink consortium") was launched (Minister van LNV, 2020).

In the Netherlands, a One Health policy structure for the event of a zoonotic disease outbreak was available. Activating that structure fully meant that next to the ministry of LNV, the ministry of VWS became responsible for outbreak control. In May and early June 2020, another five farms became infected before it was concluded that the compulsory preventive measures and transport bans were not sufficiently effective to prevent further infections (Oude Munnink et al., 2021). On June 3rd, it was decided to cull the mink on infected farms (Anonymous, 2021).

As the culling of infected mink farms was ordered from June 2020, during summer 2020, it appeared that new infections in Dutch mink farms kept on occurring (26 infected farms on August 1st, followed by a new peak of infections cumulating to 51 farms infected at Sept 1st (Lu et al., 2021)). The Dutch parliament agreed to bring forward the ban on mink farming from December 31st 2023 to March 2021. As effectively all mink farms were pelting their animals, or were already depopulated at the end of 2020, mink farming was stopped at the end of 2020.

In other countries, mink farms were also found infected, but different approaches were chosen varying per country. In Denmark, mink farms were found infected in June 2020, but at first it was not decided to cull animals. It was only on November 4th 2020 when it was ordered to (pre-emptively) cull all farmed mink (Larsen et al., 2021). The reason for the depopulation in Denmark was the detection of specific mutations of the virus in mink (Larsen et al., 2021) and the appearance of variants with these mutations in the local human population (Hammer et al., 2021). Retrospectively, a rise of incidence of SARS-CoV-2 human cases in the affected regions was also linked to the findings in mink farms (Dall Schmidt and Mitze, 2022). In Dutch mink, these mutations were not found (Lu et al., 2021). Viral variants in Dutch mink evolved from strains circulating in humans, but these variants were not found to spread to other people in the local community. Whether the Dutch SARS-CoV-2 strains in mink within each cluster were caused by one introduction and subsequent spread between farms, or by multiple introductions from the human population to the farms is still unclear. Also, conventional risk factor studies have not yet been conclusive to identify the introduction routes onto farms. The most likely source of infection was man, but also other routes, including animal, dust, or faeces acting as vectors cannot be ruled out completely. Noteworthy, findings in Denmark about the spread of strains between mink farms lead to similar conclusions (Boklund et al., 2021). The transmission of SARS-CoV-2 among mink was very efficient, so mink farms were in fact a potential reservoir for the virus to sustain and evolve further. Even when the animals would not have been culled, the virus would likely have been able to recirculate on these mink farms as mink with an infection derived immune response show to be susceptible to re-infection (Rasmussen et al., 2021).

Why did the Netherlands ban mink farming and what can be learned?

We have to go back to 1989 when the Political Party Radicals, a "radical-Christian" party which was later fused to the current 'Groen-Links' party, already called for a ban on fur farming. Retrospectively, this call can be considered the kick-off for the ban on mink farming per 2023, not 2021. In the nineteen-nineties, indeed fox and chinchilla farming were banned. Mink farming was banned by law in 2013, followed by a transition period of ten years to enable earn back of investments until end of 2023 (Anonymous, 2021; Kester, 2020). The reason for fur farming can be discussed, but in itself it was an economic viable farming sector, also in the Netherlands. Reasons for the political ban on fur farming were related to animal welfare reasons, intrinsically related to the practices of mink farming on the one hand (isolated female mink held in wired cages with limited possibility for natural behaviour). On the other, hand killing animals for

reasons of luxury only was and is considered unethical. Fur animal carcasses are not used for consumption (de Graaf, 2020).

What the pig sector can learn from the historical events leading to the Dutch ban on mink farming is, to my opinion, the divergent development of ethical norms and values in the mink farming industry on the one side and the society on the other. Also in pig, and other livestock, farming the divergence on perspectives is ongoing. Therefore, the lesson learned maybe to work towards convergence of norms and values around animal welfare and ethics of farming.

Surveillance for SARS-CoV in other animals in the Netherlands

As stated before, initially the scientific community considered pigs as a potential host for SARS-CoV-2 for multiple reasons. Pigs are a known host for multiple endemic as well as emerging corona-viruses, such as TGEv, PRCV, PHEV, PEDv and SADS. Also, pig studies with SARS-CoV-1 and MERS-CoV found that pigs could be infected, but that they acted as dead end host. Multiple studies were initiated worldwide, which basically all concluded that SARS-CoV-2 was not effective in infecting pigs, evidenced by incidental serological reactions in experimentally challenged pigs only, and that those pigs were not able to transmit the virus (reviewed in Sikkema et al., 2022). As from other pathogens it is known that behaviour of pathogens may behave differently under field conditions compared to experimental conditions (e.g. Orsel et al., 2007), observational studies are considered essential for further risk assessment. Two observational studies were conducted in the Netherlands, a serological prevalence study and an outbreak investigation. Evidence for SARS-CoV-2 transmission among pigs was not found (Sikkema et al., 2022).

Mink were not the only animals infected in the Netherlands. The "One Health SARS-CoV-2 in mink consortium" reported that both domesticated and stray cats and farm dogs were found to become infected with SARS-CoV-2 (van Aart et al., 2021) as well. Although incidentally other cats and dogs are also reported to become infected (Zhao et al., 2021), these findings did not result in compulsory notification of SARS-CoV-2 in companion animals. The rationale for the latter maybe two fold. First, historically the Dutch have pre-emptively culled thousands of backyard poultry in order to control Avian Influenza in 2003, but it later decided to change the approach for the future as infections in this type of farming contributed only marginally to the epidemic (Bavinck et al., 2009). A relative low risk of single infected dogs and cats for driving the epidemic seems comparable for SARS-CoV-2, and was also judged as such by the Dutch zoonoses expert council (Anonymous, 2020). Based on further studies, recently it was reported that infections of cats and dogs did indeed not form a reservoir for SARS-CoV-2 in the Netherlands (Stegeman, 2022). Second, the societal acceptance of culling farm animals has already declined substantially over the years. Culling of companion animals is almost beyond the imaginable.

Other lessons learned

Back to the SARS-CoV-2 in mink. It must be noted that something particular occurred in combatting the outbreak in Dutch mink. Handling mink requires training and expertise. Mink farmers always benefit from keeping, handling and killing the animals with minimal discomfort and distress, as negative outcomes will affect pelt quality directly. The legal framework, as well as the personnel experience and competency, was in place to have mink farmers catch and kill their animals, as they usually did before pelting (Council of the European Union, 2009), for depopulation of the farms. In the Netherlands, mink farms were depopulated by the authorities, in close collaboration with the farmers, using their own mobile carbon monoxide gassing equipment. The killing of pigs, those that suffer, as well as those that need to be culled as being infected or suspect, or even pre-emptive, in the European pig industry has been mainly a subject of the veterinary authorities. The subject has gained mostly negative attention in media when animal welfare was at stake. The pig industry could learn from the mink sector to just settle this subject properly, according to the legal framework and in line with societal norms and values, and do not leave room for discussion.

In Denmark, the decision making process and decision to pre-emptively depopulate all mink farms led to an unpleasant aftermath. Depopulation of millions of mink was performed over a very short time period resulting in limitations of rendering capacity. In turn, the events led to debate and law suits against the prime minister on the legal justification of the pre-emptive culling. The media attention was further spurred by exploding carcass burial sites (Erdbrink, 2021). The pig industry may take note that sufficient carcass disposal capacity is not only the responsibility of the government. Images of mass carcass disposal just do not tell well, as we remember from the UK in 2001 with burning carcasses on the newspapers front pages and YouTube videos of mass carcass disposal in China due to combating ASFv. It does not contribute to convergence with societal norms and values about animal farming.

Future pandemics in pigs

A new zoonotic pandemic that does infect pigs is inevitable. In fact, history teaches us that the interconnectedness of animals and humans due to development of societies and agricultural food systems, has led to the rise of many infectious diseases in man (Wolfe et al., 2007). As such, domesticated pigs are even suggested as hosts for the ancestors of rubella, mumps, rotavirus and pertussis (Wolfe et al., 2007). Although most of these diseases are restricted to human nowadays and have their origin in animal hosts long times ago, it does not exclude future evolutionary events. For that reason, mankind, and in this case pig veterinarians in particular, need to be vigilant especially for so-called emerging diseases.

Emerging and re-emerging diseases are defined as those diseases due to newly identified and previously unknown infections which cause public health problems either locally or internationally, or those diseases that have been known before and are rapidly increasing in incidence or geographic range (World Health Organization. Regional Office for

South-East, 2014). In fact, in 2018, WHO updated a list of diseases to prioritise global R&D as "it concerns severe emerging diseases with potential to generate a public health emergency, and for which insufficient or no preventive and curative solutions exist" (WHO Research and Development Blueprint, 2018). For this audience, it is noteworthy that pigs are susceptible for most of those diseases, or even that reports on infections in pigs are already available, except for Lassa fever and Crimean-Congo haemorrhagic Fever.

In short, experimental and observational evidence for Rift Valley Fever virus infecting pigs suggest that pigs can be infected (Clarke et al., 2021; Lubisi et al., 2020), but also that the prevalence in pigs is very low (Lubisi et al., 2020). For SARS-CoV-1 (Weingartl et al., 2004) and MERS-CoV2 (Vergara-Alert et al., 2017), pigs are considered a dead-end host as it proved possible to infect pigs, but not to cause infections in contact exposed pigs. As discussed before, susceptibility for SARS-CoV-2 infections seems even lower (Sikkema et al., 2022). For Zika disease virus (Nunez-Avellaneda et al., 2021), Reston (Haddock et al., 2021) as well as Ebola viruses (Atherstone et al., 2021; Fischer et al., 2020), and for henipaviruses (Hendra and Nipah virus) (Weatherman et al., 2018) evidence for more extensive natural occurring infections in pigs is reported. Pigs are often not the sole or most important host and pigs often get infected either contact with mosquitos, bats or humans. In addition the list comprises of any yet unknown disease or not yet listed, defined as "Disease X". Whether Disease X will hit or is present in pigs is uncertain. Still, the reservoir forming capacity of these viruses in pigs is what we should be aware of. Pig veterinarians have the key competences to study, understand as well as influence the system the pigs are kept in to prevent and control such emerging infections.

Challenges for the pig farming community and pig veterinarian

The case of SARS-CoV-2 in mink exemplifies that a One Health Approach is effective to study and combat pathogens. Close cooperation between veterinarians, both in practice as well as in other institutes, public health officials and researchers with various expertise was essential in early warning, risk assessment and risk mitigation and control measures.
Molecular epidemiology as tool for typing and tracking of viral strains and evaluation of outbreak control proved essential in this pandemic and an unprecedented number of SARS-CoV-2 strains has been analysed worldwide. Inference of that data has been used nearly real-time for both SARS-CoV-2 in humans, as well as in animals and it led to different conclusions for SARS-CoV-2 in mink the Netherlands and Denmark as well as subsequent different control measures. Capacity building about pathogens in pig farming and sharing such data within a OneHealth network should be considered another lesson.

There are parallels to draw between control of SARS-CoV-2 control in mink and controlling emerging zoonosis in pig, but also significant differences. An important difference from the mink case is that pig farming is meant predominantly for food production, which, justifies the use of animals for most people. Although there is political drive to reduce the extent of pig farming in particular areas in the world, the extinction of a farming sector seems not at stake at the moment. Still, pig farming practices seem to diverge from the public moral opinion on animal husbandry. The consumer paradox between public opinion and consumer behaviour is clearly described for the Netherlands. Consumers prefer low priced high quality meat whereas publicly, civilians advocate for animal freedom and high prices. In case of a zoonotic outbreak in pigs, politicians may reason differently on continuing farming practices at a similar or larger scale than is currently practiced.

Another important lesson we need to draw from the SARS-CoV-2 pandemic is the vulnerability of our food system to the extent that transport and slaughter capacity can drop suddenly due to human disease resulting in local crises for pig farmers and even resulting in culling of pigs.

In the subject of killing animals veterinarians need to stand up. As shown, both from a mathematical modelling perspective, but also historically, in virtual all animal health crisis, culling of the infected and suspected seems almost inevitable. For that reason, veterinarians need firstly to prevent infection of as many as possible, and secondly work on responsible killing methods of animals both in times of crises as well as during farming practices.

For prevention, the pig veterinarian has a vital role in early warning and detection of novel pathogens and zoonoses. The responsibility for this role of the (pig) practitioner is actually laid down in Chapter 3, article 12 of the European Animal Health Law (European Union, 2016). Early warning and rapid notification is essential to prevent undetected spread of a pathogen. In addition, the pig veterinarian should advocate for preventive measures that limit the probability of introduction of pathogens on farms, as well as those that prevent spread and endemicity of pathogens on farms by raising awareness about the interaction between animal health and human health.
Finally, the need for convergence of norms and values in society and in (pig) farming has become clear from the Dutch mink farming case. Whether pig production still matches public perception and acceptance can be questioned. Although pig production is important for food security and food waste appraisal we have to work actively together to converge with societal norms and values.

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SESSION: HEALTHY PIGS, HEALTHY HUMANS

The growing issue of influenza infections in pigs and the related zoonotic risk

Timm Harder
Institute of Diagnostic Virology, Friedrich-Loeffler-Institute, Greifswald, Germany

Biosketch

Timm Harder, Germany, is a virologist with a veterinary background and broad interest in influenza viruses particularly of avian and porcine hosts. Study fields range from diagnostic improvements, molecular epidemiology, and pathogenicity, to applied preventive measures and regulatory issues. He is head of the national avian influenza reference laboratory at Friedrich-Loeffler-Institute, Isle of Riems, Germany. The laboratory is an active member in international networks of the World Health Organization for Animal Health (O.I.E., OFFLU) and the Food and Agriculture Organization (FAO) of the UN for research and diagnosis on animal influenza.

Abstract

Authors
Christin Hennig[1], Annika Graaf[1], Philipp P. Petric[2,3,4], Laura Graf[2,4], Martin Schwemmle[2,4], Martin Beer[1], Timm Harder[1] *
[1] Institute of Diagnostic Virology, Friedrich-Loeffler-Institut, 17493 Greifswald-Insel Riems, Germany
[2] Institute of Virology, Medical Center, University of Freiburg, 79104 Freiburg, Germany
[3] Faculty of Medicine, University of Freiburg, 79104 Freiburg, Germany
[4] Spemann Graduate School of Biology and Medicine, University of Freiburg, 79106 Freiburg, Germany

* Correspondence: timm.harder@fli.de, Institute of Diagnostic Virology, Friedrich-Loeffler-Institut, Suedufer 10, 17493 Greifswald-Insel Riems, Germany

Background
Swine influenza caused by influenza A viruses (IAV) directly affects respiratory health and indirectly impairs reproduction rates in pigs causing production losses. In Europe, and elsewhere, production systems have intensified featuring fewer holdings but, in turn, increased breeding herd and litter sizes. This seems to foster swine IAV (swIAV) infections with respect to the entrenchment within and spread between holdings. Disease management of swine influenza is difficult and relies on biosecurity and vaccination measures. Recently discovered and widely proliferating forms of self-sustaining modes of swIAV infections in large swine holdings challenge these preventive concepts by generating vaccine-escape mutants in rolling circles of infection.

Main body
The most recent human IAV pandemic of 2009 rooted at least partly in IAV of porcine origin highlighting the zoonotic potential of swIAV. Pigs constitute a mixing vessel of IAV from different species including avian and human hosts. However, other host species such as turkey and quail but also humans themselves may also act in this way; thus, pigs are not essentially required for the generation of IAV reassortants with a multispecies origin. Since 1918, all human pandemic influenza viruses except the H2N2 virus of 1958 have been transmitted in a reverse zoonotic mode from human into swine populations. Swine populations act as long-term reservoirs of these viruses. Human-derived IAV constitute a major driver of swIAV epidemiology in pigs. Swine-to-human IAV transmissions occurred rarely and mainly sporadically as compared to avian-to-human spill-over events of avian IAV. Yet, new swIAV variants that harbor zoonotic components continue to be detected. This increases the risk that such components might eventually reassort into viruses with pandemic potential.

Conclusions
Domestic pig populations should not be globally stigmatized as the only or most important reservoir of potentially zoonotic IAV. The likely emergence from swine of the most recent human IAV pandemic in 2009, however, emphasized the principal risks of swine populations in which IAV circulate unimpededly. Implementation of regular and close-meshed IAV surveillance of domestic swine populations to follow the dynamics of swIAV evolution is clearly demanded. Improved algorithms for directly inferring zoonotic potential from whole IAV genome sequences as well as improved vaccines are still being sought.

Keywords: (swine) Influenza A Virus, mixing vessel, zoonotic potential, reverse zoonosis, surveillance

Despite the current dominance of SARS coronavirus-2, influenza A viruses (IAV) remain an imminent global threat to public health and even more so for livestock welfare worldwide. Due to the segmented nature of their RNA genome and their error-prone RNA replication machinery, IAV are genetically highly flexible and may adapt rapidly by genetic drift and genetic shift to new hosts. Hence, IAV in both avian and mammalian host species are capable of evading innate as well as natural and vaccine-induced adaptive immunity of their host populations and of overcoming species barriers.

Swine influenza A viruses (swIAV) of the subtypes H1N1, H1N2 and H3N2 co-circulate globally and seasonally independently causing respiratory disease and indirectly reproductive losses in pigs. Thereby, swIAV compromises animal welfare and invokes economic damage in the pig industry. In addition, swine populations have been the source of generating human pandemic IAV as demonstrated in 2009 when a new reassortant IAV of the H1N1 subtype emerged in pigs in Mesoamerica. This virus harbored gene segments derived from human, avian and porcine origin. Pigs have previously been proposed to act as a "mixing vessel" for IAV of different host origins. Co-infections in pigs with IAV of porcine, human or avian origin can generate novel reassortant swIAV, bearing zoonotic or even pandemic potential. This is partially based on the presence, high density and distribution pattern of the two viral entry receptors, used by avian and mammalian IAV, in the porcine respiratory tract.

The majority of sporadically reported, natural infections of pigs with avian and most human seasonal IAV has not succeeded in building stable lineages that independently circulate in the swine population, although such spill-over events may occur more frequently than previously thought. Nevertheless, reverse zoonotic transmissions of some IAV from humans into pig populations had a major impact on the establishment of IAV lines that circulate in pigs since decades: Historically, the first of these lines, H1N1 (classical, 1A according to the most recent nomenclature), was transmitted in the wake of the 1918 Spanish flu, the first well-documented human pandemic associated with a high case-fatality rate in the human population in the 20th century. Three additional human IAV pandemics were noted in the past century, whereof two of these viruses also ended up in pigs, the H3N2 virus of the 1968 "Hong Kong flu" and the H1N1 virus (seasonal, 1B) of the so-called "Russian flu" in 1977. The sole exception seems to be the H2N2 pandemic virus of the "Asian flu" of 1958. To date there is a single avian lineage, H1N1 (H1 avian-like/H1av or 1C), that has established stable circulation in the European and in parts of the Asian pig population since the late 1970s.

1. Zoonotic swIAV infections are reported regularly but cases mainly remain sporadic

An ever-increasing intensification of pig production worldwide and the growing cross-border trade, also in live pigs, acts to expand the interface between pigs and humans. The industrialization of livestock production may create new reservoirs of IAV and favor reciprocal IAV transmissions between species. Zoonotic interspecies transmission of IAV at the swine-human interface usually requires an exposure of a highly susceptible individual to a high virus load. Such occasions are potentially enabled for example at agricultural fairs, live animal markets or in swine holdings. In general, close contact to swine raises the risk for human infections with swIAV. Two cohort studies examining antibodies against swine H1N1 and swine H3N2 IAV showed significantly higher antibody titers in swine workers compared to the general public suggesting an increased occupational risk of swIAV infection. It should be noted, however, that serological cross-reactions with human IAV antigens frequently interfere with result interpretation of such studies. Detection of replicating swIAV in human hosts, in contrast, clearly proves infection. Sporadic zoonotic IAV infections originating from pigs are regularly detected. In the majority of cases, only individual humans are affected. Rarely, clustered outbreaks were reported, which were caused rather by a common source of infection (e.g., pig fairs and shows in the US) than by efficient human-to-human transmission. The establishment of stably circulating lineages in humans from such events has been extremely rare. As already mentioned, an important exception is the most recent human pandemic virus H1N1pdm09, whose origin has been narrowed down to pig populations in Mesoamerica.

The first major outbreak of swIAV in a human population dates back to 1976 and affected recruits in a military base in Fort Dix, New Jersey, US: A total of 230 soldiers contracted swIAV of the H1N1 subtype, including one fatal case. The virus was introduced after the winter holiday season and spread rapidly within one unit. However, further human-to-human transmission outside the training group was limited. It still remains unknown how the virus entered the base and why it did not spread beyond Fort Dix, as no soldier stated previous contact to swine and no corresponding case outside the military base was reported. Apart from this event, between 1958-2009, 73 isolated swIAV cases in humans were reported worldwide with a case fatality rate of 10%. In April 2009, first infections with a novel H1N1 swIAV were described in children in the US. Within two months, several ten thousand cases in 74 countries had been reported, confirming the high contagiosity of this virus. The genetic constellation of this novel virus consisted of gene segments from avian, swine and human origin. The 2009 pandemic strain rapidly re-entered the swine population via reverse-zoonotic transmissions, which have been detected frequently, worldwide, and are continuing up to this date. As a consequence, reassortment events with circulating authentic swIAV strains have increased genetic diversity which may favor the emergence of

novel reassortant swIAV with enhanced zoonotic potential. However, timely detection of such strains and their proper risk evaluation remain challenging even to date. Detection of swine-origin H1N1pdm09 in the human population would require full genome sequencing and species-specific mutation pattern definition.

Among such novel swIAV "v"ariants (flagged with a "v" to indicate the swine origin) H3N2v caused clustered, local outbreaks of zoonotic influenza in North America. In 2012, 306 cases of infection were reported after direct or indirect exposure to (asymptomatically) infected swine. All "variant" viruses harbored the matrix (M) gene segment derived from the pandemic H1N1pdm09. In experiments in pigs, the M segment has been identified as a determinant of respiratory transmission efficiency. In addition, a combination of the neuraminidase (NA) and M genes of H1N1pdm09 was found essential to facilitate efficient transmission and replication in pigs. Initial concerns of a higher human-to-human transmission rate through the H1N1pdm09 derived M gene proved to be unjustified though. Further clustered zoonotic transmission events occurred in the United States and were related to agricultural fairs and live animal markets with severe incidences in 2016 and 2017. To date, a total of 483 cases of novel swIAV infections in humans have been reported to the Centers of Disease Control and Prevention in the United States since 2010, including not only infections with H3N2v, but also with H1N1v and H1N2v.

In China, recently a new genotype (referred to as G4) emerged and gained predominance in swine populations since 2016. G4 is a reassortant Eurasian avian-like H1N1 virus, which contains 2009 pandemic and triple-reassortant derived internal genes. It preferentially binds to human-type receptors and was claimed to bear the potential to transmit efficiently between humans, although evidence was based on serological data alone as no productive virus infections in humans have been reported to date.

In Europe, cases of swIAV infections have been documented in a variety of countries affecting mainly swine farmers, staff of swine holdings or their (younger) family members. Most patients showed influenza-like symptoms and the infections run a benign course. In Germany, between 2007 and 2021, several swIAV cases were reported, affecting mostly children, teens and one immunocompromised adult. The majority of human infections in Europe was caused by the Eurasian avian-like H1N1 swIAV which is the most prominent subtype in European pig populations. This subtype also shows the largest antigenic distance to the H1 IAV circulating in the human population. Although, the surveillance of swIAV has intensified since 2009, it cannot be excluded that the true number of cases of human swIAV infections is higher than suggested by the low number of reported cases, as symptoms in humans are indistinguishable from seasonal influenza. Since swIAV are circulating year-round in swine populations, presentation of flu-like symptoms in patients outside the human influenza season of a certain region combined with a history of occupational contact to pigs should raise suspicion justifying virological examination of such cases.

2. The pig is not an exclusive "mixing vessel" for IAV

The mixing vessel hypothesis was coined by Scholtissek et al. They defined pigs as a reassortant machine for IAV of various host origins. This concept builds on the susceptibility of pigs to various IAV from mammalian as well as avian sources. Depending on the species origin, these viruses have distinct predilections for sialic acid (SA) receptors of the SA α2-6Gal (human-adapted) or the SA α2-3Gal type (avian-adapted). Presence of both receptor types in the respiratory tract of pigs is a prerequisite for their function as a "mixing vessel". In line with this hypothesis and despite the gross dominance of SA α2-6 receptors, especially in the upper respiratory tract of pigs, as shown by virus binding studies, lectin histochemistry and enzymatic analyses, porcine-adapted IAV often retain binding affinity to both receptor types. Switches in receptor binding efficacy is regulated by very few amino acids in the receptor binding unit of the viral hemagglutinin (HA) attachment protein. In particular, positions 190 and 225 impact receptor specificity.

The initial assumption of Scholtissek et al. that swine are essentially required to generate reassortants between avian and mammalian IAV, however, has been challenged as both receptor types have also been detected in humans, quails and other avian species, particularly, in turkeys. While the receptor distribution in tissues and their densities at the cell surface differ grossly between those species, they resemble each other closely in the human and porcine respiratory systems. Likewise, different isoforms of ANP32A in several avian species facilitate a more mammalian-like adaptation of the IAV polymerase in these birds, further challenging the necessity of pigs as a unique mixing vessel.

It should be noted that there is no evidence for the participation of swIAV-derived genome segments or of pigs as mediators of infection in the generation of the human pandemic viruses of 1918, 1957 or 1968 since the origin of reassorted segments in those pandemic viruses have all been traced to avian hosts. However, the initial host species in which the pandemic avian-human IAV reassortment occurred remains elusive, and very little surveillance for IAV in swine populations has been carried out at that time.

3. The "poor pig" hypothesis: Pig populations suffer more frequently from reverse zoonotic IAV infections than humans from zoonotic swIAV transmissions

There is no easy answer to the question why apparently more often IAV is transmitted from humans to pigs than vice versa. Receptor-bearing, permissive host cells in both species should be accessible with similar ease for viruses in the upper respiratory tracts.

Differences in population structures and population immunity of pigs and their keepers provide a possible first explanation: Adult staff working in swine holdings or having otherwise occupational exposure should have at least partial cross-immunity to different influenza subtypes due to previous exposure to human seasonal and/or pandemic

IAV through multiple infections or vaccinations. In fact, the adult human population was shown to possess cross reactive antibodies in hemagglutinating and neutralizing assays against various swIAV subtypes. In contrast, the porcine population structure in modern production systems is extremely flat, and the majority of individuals consists of piglets which present an inexperienced immune system. Maternal immunity passed on to the piglets via colostrum has been shown not to be effective in preventing suckling piglets from swIAV infection although they do not develop overt clinical signs. Despite early infection in life, the animals regain susceptibility to IAV infections after 6-12 weeks, in line with constant turn-over and the decline of maternal immunity. Thus, in intensive piglet-producing farms, a substantial part of the swine population is permanently available as susceptible hosts of IAV while the adult staff of such holdings likely refers to a much broader repertoire of adaptive IAV-directed immunity. This would pose a higher obstacle for swIAV to cross the human species border as compared to human IAV infecting newborn or juvenile pigs. In line with these thoughts, case reports of human infections with swIAV list a surprisingly high number of children, adolescents or immunocompromised patients. This could signal a higher susceptibility to swIAV of the younger age sector of the human population due to their limited repertoire of cross-reactive IAV immunity. Thus, personnel in pig farms should receive annual vaccinations against seasonal influenza and staff with respiratory symptoms during the influenza season should avoid contact with pigs in order to reduce the risk of human-to-swine IAV transmission.

_The high density of susceptible porcine individuals in large holdings might not only provide advantageous conditions for transmission and spread of swIAV but also of human-origin IAV that are not optimally adapted to pigs. Co-circulation of an optimally adapted porcine IAV with a newly introduced human IAV would provide reassortment opportunities that could foster further adaptation of the human IAV.

4. A plea for regulated, close-meshed IAV surveillance of domestic pig populations

The relationship of porcine and human populations with respect to mutual transmissions of IAV is complex. Swine populations reportedly maintain the circulation of swIAV with zoonotic and rarely (pre)pandemic potential. Thus, the importance of pig populations as a source of zoonotic IAV should not be underestimated. On the other hand, decades of intensive pig rearing have not produced frequent swine-to-human transmissions that resulted in new, sustained human IAV lineages. Recently, insight was gained into the capacity of other species, including humans themselves, to act as mixing vessels of IAV of different host origins. In addition, direct avian-to-human IAV transmission events have frequently been reported, in particular for high pathogenicity avian IAV associated with high case fatalities. Thus, pig populations should not be globally stigmatized as the sole reservoir of potentially zoonotic IAV. The emergence of the most recent human IAV pandemic in 2009, however, has clearly demonstrated the principal risk of swine populations in which IAV circulate unimpededly. Therefore, the most important lesson to be learnt is to implement regular and close-meshed IAV surveillance of domestic swine populations to be able to follow the dynamics of swIAV evolution. The appropriate tools, such as real-time RT-PCR and next generation sequencing, are well established. However, improved algorithms for directly inferring zoonotic potential from whole genome sequences are still being sought to avoid human staff of swine holdings or visitors of agricultural fairs as involuntary sentinels for swIAV with increased zoonotic potential. Transboundary exchange of such data via shared databases would also facilitate the constant update and improvement of effective vaccines for swine as the most important preventive measure to reduce the viral load at the porcine-human interface. With regard to further improved risk assessment, it would be interesting to examine whether sera from children and adolescents who have had less exposure to IAV infections also show lower cross-reactive antibody titres and, hence, increased susceptibility to porcine IAV compared to adults.

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A list of references is avaialble from the author.

SESSION: SUSTAINABLE PIG PRODUCTION

Significant aspects of marketing pigs & pork in the near and far future

Jörg Altemeier
Head of Animal Welfare and Animal Health,
Tönnies Holding ApS & Co. KG, Rheda-Wiedenbrück, Germany

Biosketch

Education: Veterinarian and chemist.
After completing his studies, he first worked as an assistant at the University of Veterinary Medicine Hannover, then at a private owned Institute in Hanover and at SGS.
Today Head of the Animal Welfare and Animal Health Unit of the Tönnies Group.
Managing Director of Health Analytics GmbH, an accredited laboratory company owned by the Group.
Member of animal welfare and animal health-relevant committees, e.g. EU Animal Welfare Platform, Round tables animal welfare, ASP expert commissions, Zoonotic Advisory Board NRW etc.

Abstract

The entire value chain "pig and pork" is in a process of change – in the European Union and their individual Member States as well as in other European Countries.

From the multitude of challenges, the following selected aspects should be addressed at this point:
- Health: serological Salmonella monitoring
- Health: Impact of African swine fever on the marketing
- Animal Husbandry: Labeling of different forms of Husbandry and Animal Welfare
- Animal Welfare: reported violations and reactions

It should be noted that this report does not report on the results of scientific research mainly, but on practical experience.

Decades of Salmonella monitoring by means of serology - has it paid off?

According to the food safety standard of the german Association "QS Qualität und Sicherheit GmbH" (QS Quality and Safety) pigs from certified farms are being sampled and serologically tested after being slaughtered.
Based on the lab results the farm is being sorted quarterly into one of three classes and receives an information about the scoring. The higher the class, the more often antibodies have been detected.
The scoring may have an influence on acceptance, marketing and payment of the pigs and the usability of the pork.
In the first years after the monitoring has been implemented, the percentage of farms being in the worst class has become less and less. But now we observe a slight increasement. There are assumptions that there are connections with the significantly reduced use of antibiotics and the changing husbandry conditions. Scientific investigations are now needed to clarify this.

African Swine Fever (ASF) – Impact on the marketing of pork

The EU's legal framework concerning ASF is essentially formed by the

- Animal Health Act (Regulation EU) 2016/429),
- Implementing Regulation (EU) 2021/605 (with specific measures for the control of African swine fever) and
- Delegated Regulation (EU) 2020/687 (rules for the prevention and control of certain listed diseases).

In addition, the Member States may have implemented national regulations.
In general, the legally compliant slaughter and cutting of animals as well as the marketing of meat and by-products from restricted zones I and II involves more effort, but is feasible in practice. The higher expenditure results, in particular with regard to the restricted zone II, e.g. from the additional controls during livestock purchasing and during delivery, from the separate slaughter and cutting and the subsequent sorting in the cold store.

In comparison, the slaughter and cutting of animals from restricted zone III (ASF in domestic pigs) is a real challenge. This results on the one hand from more and stricter legal requirements regarding the supply, movement and slaughter and cutting of the animals, on the other hand and above all from the requirements regarding the processing and marketing of the products (national/ EU/ non-EU).

For example heat treatment of the products enables the affixing of the oval health mark and thus EU-wide distribution, but significantly restricts the possible product range. At the same time, all extremely valuable parts like filet and schnitzel must also be subjected to heating, which makes no economic sense. As an alternative to heat treatment, under certain circumstances a purely national marketing with a oval health mark is legally possible, but this, as can be seen in affected European member states, is difficult in terms of customer acceptance. From the point of view of slaughterhouses and cutting plants, it is therefore very important to prevent the spread of ASF, especially in domestic pig herds – and thus the establishment of restricted zones III – under all circumstances. Therefore, the highest degree of conscientious and sustainable biosecurity is crucial at all levels.
Due to the different global consumption habits, the products obtained from pigs are in different demand. Some products are difficult or impossible to place in the national or EU market and must be exported in order to achieve meaningful added value. Well-known examples of this are paws, tubes and tails. In the course of the occurrence of ASF in some EU member states, important destination countries have stopped the imports of German pork (and products) or the veterinary certificates agreed intergovernmentally can no longer be issued by the German authorities and accompany the export goods, as they require Germany's ASF freedom (in relation to domestic and wild boar populations!) for a given period of time (usually 12 months).

In order to make exports, which are of essential importance for economic reasons and also in terms of sustainability, possible again, it is necessary to continue to work hard to reach bilateral agreements with the target countries, which include e.g. regionalisation or compartmentalisation concepts.

Current developments in labeling 'better husbandry' & 'higher welfare standards'

Since a couple of years we have several animal welfare and husbandry related standards and labeling systems in the European Union. The majority of the standards is owned by associations or companies (e.g. NGOs or big food producing companies). In Germany one of the biggest retailers started a husbandry labeling system, consisting of four different levels, which became something like a national standard in the meantime.
On EU-level a new animal welfare labeling is being discussed and in Germany the quite new minister for agriculture announced the introduction of a completely new developed, obligatory (!) husbandry labeling system, consisting of four levels.
It must be discussed and clarified for each system, how the farmers will be motivated to invest and produce more costly the food of tomorrow. Together with the retailers a communication strategy has to be implemented, which explains the added values (and the resulting increasement of the prices) to the consumers.

Effects of reports about animal welfare violation - the media & consumers reactions

In several member states of the EU we have reports about animal welfare violations - either on farm-, but also on transport- and slaughtering-level. Most of the time those reports, covering relevant pictures or video sequences, are being published by investigative journalists or animal rights associations. Those reports do not criticize just the involved farms, haulage companies and slaughterhouses, but also the local authorities and, in general the meat consumption.
The credibility of those reports and their interpretations may be questionable in some cases, but in some cases not.
The short and long term effects of those reports may range from auditing and banning suppliers to improvements of processes and trainings and, finally, less acceptance of meat products.
Finally the solution is to deal with the animals ethically and legally perfectly – all the time.

Conclusion

All stages of the pig value chain (covering feed producers, farmers, transporters, butchers, processors, retailers and, of course, veterinarians) must realise immediately that the principle of "business as usual" does not work any longer.
If pig farming and pork should be possible and accepted in the future, we need a healthy and sustainably under "best practise" conditions manufactured product, which is being sold for an appropriate price that ensures economically worthwile work for all parties involved.
Whether Biosecurity to prevent diseases like ASF, hygienic production to prevent e.g. Salmonella, proper housing and handling to prevent "bad pictures" and the loss of acceptance: we do not need all of that randomly.
We must practise all of these requirements anytime and everywhere.

SESSION: SUSTAINABLE PIG PRODUCTION

New trends in pig nutrition for future challenges in pig production

Ricardo Neto, DVM
Animal Nutrition & Health division, Kemin
Herentals, Belgium

Biosketch

Ricardo Neto is a Doctor of veterinary medicine, graduated from UTAD in Portugal and he worked in specialized pig practice in England for 4 years. After this period in practice he joined the pharmaceutical industry supporting and launching the first PCV2 vaccine in the UK and Ireland and later the first Swine influenza vaccine. Following the pharmaceutical industry he joined the feed additive industry. Throughout his career, he held local, regional and global positions.
Ricardo Neto joined the Animal Nutrition & Health division of Kemin Europe as Technical Service Manager Health Western & Southern Europe to support the intestinal health portfolio.

Abstract

Future challenges and nutritional tools to ride them off
Ricardo Neto, Carmen Coetzee, Luis Conchello, Alexandra Desbruislais, Luis Gonzalez Sanchez, Valentine Van Hamme, Eric N´Guetta, Ester Bolsens.

Introduction
Pig domestication from wild boars started in what is now Turkey and East Asia around 9,000 years ago (Frantz et al, 2015). Throughout history, pig farming have faced many challenges, both from a disease and farming practices point of view.

Being very adaptive from an environmental point of view allowed the pig to play quite a big role in the growth of the human population, also the fact that it is an omnivore monogastric, meaning it can play a key role in recycling resources close to human settlements.

With the shift in demographics, farming and pig farming had to follow the demand, but also the changing needs of society. In 1900, worldwide, there were 6.7 rural dwellers to each urban dweller; in 2010 there is less than one rural dwellers to each urban dweller and the trend is for the ratio to keep decreasing (Satterthwaite D. et al (2010)).

The pig farming industry has been going through challenges ever since pigs started to be farmed, from disease outbreaks or zoonotic diseases that lead to religious bans on eating pork to economic challenges. Currently, as happened many times cyclically, the pig industry is facing lower profit margins per pig, or negative profits with prices lower than marginal production costs, (Rocadembosch J. Et al, 2017).

More recent challenges to the European pig production are the ban of antimicrobial growth promoters, since 2006 which led producers and veterinarians to rightfully concerned about maintaining performance and health. The ban was part of the EU's food safety strategy and considerations about public health, particularly the reduction of the use of non-essential antimicrobials to address antimicrobial resistance problem, (IP/05/1687 Brussels, 22 December 2005). A short term performance impact has been reported by some countries, such as Spain, Denmark, Greece and Finland, while others (Bangladesh, Korea, Romania and the Netherlands) have reported no effects on animal performance (Kiers A. 2014).
Performance in Europe kept improving despite the ban of AGP´s, thanks to interventions in management, genetic improvement, vaccines, prebiotics, probiotics and acidifiers.

In 2013, a new challenge was faced by the EU pig industry, the ban of sow crates during gestation. This was led by welfare concerns and image, with sows not being able to exhibit the natural behavior and also not able to turn around when housed in sow stalls, sows also often developed stereotypical behaviors, adding strength to the argument against this housing system. Even though the ban was not taken to the degree that the UK producers took it, as the cost of production is lower with crates because the housing space per sow is less for the crate than for group housing (McGlone J. J., 2013).

The pig industry is therefore fit, adaptable and quickly recovering from new rules and regulations. New challenges will be just around the corner, most of these are important to align with views the EU and consumers have for a sustainable farming and particularly sustainable pig farming. With the word sustainability being so widely and loosely used, it is important to ensure the pig industry is seen as sustainable, but in a way that can ensure pig farming is viable and plays its role in ensuring a sustainable farming and society.

What is sustainability

First use of this term is credited to Hans Carl Von Carlowitz (1645-1714) focusing on management of forest resources, taking in consideration the replantation, growth periods and harvest.
On 25 September 2015, the 193 Member States of the United Nations adopted the 17 Sustainable Development Goals (SDGs) of the **2030 Agenda for Sustainable Development**, global objectives expected to guide the actions of the international community over the next 15 years (2016-2030).(FAO)

Looking more specifically into livestock production, the EU goal is to (Rauw W.M. et al (2019)):
- Enhance competitiveness and the economic viability of animal production systems;
- Improve the adaptation of livestock to vulnerable diseases and increasingly extreme weather patterns associated with climate change;
- Solve issues related to diet and health, environmental impact and animal wellbeing

With the human population rising and expected to reach 11 billion people by 2100, food production also needs to rise to reach the 2nd goal mentioned before, end hunger, achieve food security and improved nutrition whilst promoting a sustainable agriculture.

At Kemin, we focus our sustainable action using a triple-bottom-line approach that encompasses three overlapping areas: Healthy People, Healthy Planet and Healthy Business. These three lenses provide the framework we use to measure the impact of our efforts. Each lens includes both an internal and external scope. The internal scope addresses, for example, how we can improve our internal operations, sourcing and production processes. The external scope looks at how our solutions (products and services) can sustainably transform lives, animal welfare, the environment and our customers' operations, to name a few.

Pig production needs to be sustainable, and applying the goals mentioned before, we need to look at 3 points the pig industry impacts:
- Healthy people, quality of life, supplying safe and quality protein
- Healthy planet, reducing the environmental impact of the pig farming industry, and ensuring resources are safeguarded for the coming generations
- Healthy businesses, the pig farming industry needs to be healthy, profitable and in a strong position to drive a changes ahead of consumer pressure

A few challenges can be identified as quickly approaching and again demanding the ability for the pig industry to adapt. These will keep the pig industry aligned with both the FAO goals for sustainable development goals and the EU vision for farming. Some of the fast approaching challenges we can identify are:
a) **Antibiotic reduction and more restricted use of antibiotics – Antibiotic stewardship**
b) **Ban of Zinc Oxide being used at high doses**
c) **Feed sources, environmental feed impact and food affordabilty**

a. Antibiotic stewardship

Starting with antibiotic stewardship, a point that is considered by the WHO as one of the biggest threats to global health, food security, and development today. In pigs, the use of antibiotics is common not only for treatment, but also for controlling the spread of infection (metaphylaxis), preventing infection (prophylaxis)- particularly in periods of stress – as well as reducing vulnerability to infections. Outside the EU, antibiotics are used for improvement of feed efficiency and promotion of animal growth.
The WHO already has recommendations for the responsible use of antibiotics:
- Only give antibiotics to animals under veterinary supervision.
- Don't use antibiotics for growth promotion or to prevent diseases in healthy animals.
- Vaccinate animals to reduce the need for antibiotics and use alternatives to antibiotics when available.

The use of antibiotics varies from country to country or region to region, in a review by *Lekagul A.*, et al (2017) it was noted that a vast majority, 93% of total antibiotics administered were for prophylaxis, whereas metaphylaxis or treatments were much smaller at 7% of total antibiotics in Belgium. In the same review, it was found antibiotics were commonly used during suckling and post-weaning period and gastrointestinal infections being the most common reason for using antibiotics, Schaekel F. el al. (2017) also found that the large majority of suckling pig holdings use antibiotic treatments

(95%).
A frequent problem in suckling pigs that inevitably leads to the use of antibiotics is neonatal diarrhea, often associated with Clostridia.

Clostridia are Gram positive, some oxygen tolerant, others obligately anaerobic, spore forming bacteria that are found in soil, water and in the intestinal contents of various mammals, birds and reptiles, and can cause disease in people and animals. Enteric *Clostridium perfringens* is classified according to the toxins produced by the different strains, disease being mediated by the production of these toxins, e.g. the convention has been that *C. perfringens* type A produces α-toxin (cpa) and *C. perfringens* type C produces α-toxin (cpa) and ß-toxin (cpb). *C. perfringens* types A and C, as well as *Clostridium difficile*, are the main Clostridial species associated with disease in swine The major toxin produced by *C. perfringens* type A is α-toxin (cpa), but most *C. perfringens* type A strains from disease cases produce ß-toxin (cpb) (Songer & Uzal, 2005).
Baker et al. (2010) noted that the diagnosis of neonatal scours due to *Clostridium* species had become increasingly common, and Chan et. al. (2012) stated that *C. perfringens* type A was considered by some to be one of the most common causes of neonatal diarrhea associated with increased pre-weaning mortality. Eastaugh (2008) cited reports on the incidence of Clostridial infections in pre-weaned pigs from 21 to 61%.
Prophylactic and treatment approaches include antibiotics, probiotics and vaccines but antimicrobial therapy has produced inconsistent outcomes with multi-drug resistance recorded from *C. difficile* swine isolates in Spain, McKenzie P. and Carter R. (2018).

At Kemin we believe it is important to use antibiotics responsibly, for this we need a holistic approach. The success of reducing antibiotic usage and reliance depends firstly on the implementation of fundamental management practices. Secondly, by using alternative (non-antibiotic) solutions improving or sustaining the health and welfare of the animals, as a result, performance and productivity can be maintained and in some cases increased. We believe that we, veterinarians must switch from a reactive, curative approach (with antibiotics) to a preventive approach using alternative solutions such as vaccines, bio-security tools, nutritional supplements, etc. The options are endless and with this, difficulty in picking the right option arises.

To select antibiotic alternatives, the following criteria should be followed:
- Prevent pathogens
- Perform an anti-inflammatory activity (direct or indirect) or immune modulating effect
- Improve performance
- No resistance issues and no withdrawal periods

Probiotics are a potential alternative to metaphylactic and prophylactic antimicrobial use, in vitro studies have demonstrated the efficacy of a *Bacillus* sp. PB6 against common foodborne bacteria and pathogenic bacteria infecting pigs, (Salmonella enterica subsp. Typhimurium (ATCC 14028), S. aureus (ATCC 25923 AT), E. coli (ATCC 35218 EC), and C. perfringens (ATCC 13124), Aljumaah M. R. et al. (2020), Clostridium septicum, Clostridium sordelli (kemin internal reference TL-10-0008). Efficacy in vitro and in vivo of Bacillus sp. PB6 against Clostridium difficile has also been demonstrated, Neto R. et al (2021).

Because *in vitro* results don´t always translate in the same results when tried in vivo, a trial was carried out to investigate the replacement of colistin with *Bacillus* sp. PB6 from weaning at 4 weeks of age to 11 weeks of age (Nguyen & Carter, 2019). Landrace x Yorkshire x Duroc piglets were weaned and moved to nursery pens at 4 weeks of age with 120 pigs allocated to a control group (i.e. 3 pens of 40 pigs/pen with equal numbers of barrows and gilts/pen) and another 120 pigs to a treatment group (i.e. 3 pens of 40 pigs/pen with equal numbers of barrows and gilts/pen). The feed offered to the control pigs contained 180ppm of colistin, 300 ppm of amoxicillin, and 150ppm of tiamulin from 5 days of age through to weaning at 4 weeks, and also from weaning to 9 weeks of age. From 9 to 11 weeks of age, the control feed contained 180ppm colistin and 40ppm florfenicol. The treatment diet was the same as the control diet, except it did not contain colistin at any stage, but contained Bacillus sp. PB6 from weaning through to 11 weeks. Body weight, daily weight gain, feed conversion ratio, and pig deaths were recorded through to 11 weeks of age (Table 1).

Measure	Control (antibiotic regime)	Treatment (colistin replaced by *Bacillus* sp. PB6)
4-week ave. weaning weight/pig, kg	6.2	6.2
11-week ave. weight/pig, kg	33.4[a]	35.0[b]
Ave. daily weight gain, g/pig	486	514
Feed Conversion Ratio	1.530	1.507

Table 1. Pig performance from weaning (4 weeks) to 11 weeks of age. [a,b], means with different letters in rows differ significantly, P<0.05

There were 6 deaths in the trial ascribed to complications from a live PRRS vaccine administered 3 days after weaning. The removal of colistin and its replacement with *Bacillus* sp. PB6 in the treatment group did not result in decreased

growth rate or feed conversion efficiency, but instead the 11 week body weight was significantly higher for the *Bacillus* sp. PB6 treatment group with pigs being 1.6 kg heavier on average which was associated with a 5.8% faster growth rate.

Zinc Oxide ban

Zinc oxide is poorly absorbed through the gastrointestinal tract, the bioavailability of Zinc from ZnO is typically only 20%, meaning a significant amount of the zinc ends up being excreted in the feces unabsorbed. As pig feces end up in the environment, used as a fertilizer, it may pose a significant risk, to the environment, particularly aquatic environment.

Due to the environmental concerns and due to the risk of contributing to the development of bacterial resistance, it was decided to not allow the use of high doses of Zn (>150 ppm) in finished piglet, during the post weaning period. The mode of action of ZnO is still not fully understood but it is accepted it has a significant impact in immunity, gut integrity controlling undesirable bacteria (such as *E. coli*) and microbiome and because of this we need a holistic approach, as no single product can directly replace ZnO.

As this requires a holistic approach, we need to consider a number of solutions:

• We need to look at a solution to support the immune system. Supplementing the diet of piglets with beta-(1,3)-glucan from an algae source supports the faster maturation of the immune system and aids intestinal villi length and IgA production, all key for a successful weaning. Administration of this immunomodulator post weaning also resulted in increased villi length and IgA of piglets in the post weaning period (Kemin internal reference TL-17-00067). To assess the benefits of this beta-(1,3)-glucan to weaned piglets challenged with E. coli a trial was carried out, where it was shown that supplementation of piglet diets with algal beta-(1,3)-glucan results in reduced incidence of diarrhea following the challenge of weaned piglets with an enterotoxigenic *E. coli*, $p<0.05$ (Kim K. et al (2019).

• We need to find a solution to control harmful bacteria that take advantage of the challenges of weaning such as *E.coli.* As a solution, we can use encapsulated sources of calcium formate and citric acid which can assist in the control of enteric gram negative (*E.coli* and *Salmonella*) infections in pigs. Encapsulation is important to ensure undissociated acids are delivered to where the target bacteria will be. Kercher R. (2000) showed that is it is possible to replace an antibiotic post weaning (Colistin) with an encapsulated acid to control challenges post weaning, reducing the mortality from 3.1 to 2.5% and oedema associated mortality from 1.9 to 0.3 %.

• Third, to support the microbiome, we can rely on probiotics, with some having specific activity against certain microbes favoring beneficial bacteria, a *Bacillus* sp. PB6. An *in vivo* study carried out to assess the effect of *Bacillus* sp. PB6 on controlling diarrhea in piglets during the post weaning period was carried out, it was shown that supplementation of piglets diets post weaning with 1x108 CFU of Bacillus sp. PB6 / kg of finished feed resulted in a significant reduction of the number of days with diarrhea and frequency of diarrhea in the first week post weaning ($p<0.05$), with no significant difference between the animals treated with *Bacillus* sp. PB6 and the animals receiving Zinc Oxide at 3kg / t ($p>0.05$), Kemin internal reference (Tan Boon Fei and Chan Poh Soon, 2017).

• Fourth, the intestinal integrity can be supported with butyrates, these need to be sustainably released along the intestinal tract of pigs. Butyric acid acts as the energy source for intestinal enterocytes, improving intestinal tract integrity, tight junctions and nutrient absorption.

• Lastly it is important to support feed digestion. The pharmacological use of zinc oxide has been shown to stimulate gastric secretions in piglets. Specifically, the use of high levels of zinc oxide has been linked to increased activity of several pancreatic proteases (Bonetti et al., 2021). This in turn reduces the undigested protein substrate present in the hind gut. Fermentation of protein in the gut leads to the production of potentially toxic substances such as ammonia and amines. This is a predisposing factor to intestinal proliferation of pathogenic bacteria (i.e. *Clostridium, E.Coli*) which favours the conditions for the development of post-weaning diarrhoea. Application of exogenous enzymes to increase nutrient digestibility to postweaning piglet diets at 1000 g/t of feed have shown that crude protein digestibility is increased by 3%. This would result in 5.4 g less crude protein being excreted per kg of feed consumed (Kemin Internal Reference 18-00134). When the amount of nitrogen excreted is calculated as a result of this reduction, this equates to a reduction of nitrogen excretion of 0.864 g of nitrogen excreted per kg of feed.

A trial was carried out to assess the potential to successfully replace ZnO used at high doses. Piglets were fed either a control diet (with high doses of ZnO) or an alternative diet through the pre-starter and for the pre-starter trial diet, a total replacement of zinc oxide dosed at 3kg/t was carried out (Figure 1). Additionally, a partial replacement of 3kg/ton of feed free organic acids with 5kg/ton of feed of coated organic acids of feed was carried out. To help the microbiome cope with weaning, continued supply of *Bacillus* sp. (PB6) at 2x108 CFU per kg of feed. The trial showed the alternative to ZnO performed as well as the zinc oxide in the pre-starter with regard to weight gain and diarrhoea. In the starter, better feed intake (FCR kg/kg: - 0.66, 0.67), and an improved final weight of 4.8 and 3.6kg could be observed, respectively (kemin internal reference TL-18-00090).

In Denmark, Carlson D. et al (2022)) carried out a trial to assess a premium diet, combining highly digestible feed stuffs and additives that promote digestion and intestinal health to keep post weaning diarrhea and performance at least at the same level as a diet containing medical doses of zinc (Control). 1072 piglets were allocated in either a Control (n=538) or test group (n=534) averaging 4.2 kg body weight, the control group was fed a control diet containing 3000 ppm of ZnO, the test group was fed a highly digestible reformulated diet supplemented with milk powder, heat treated

wheat and barley, soy protein concentrate, porcine plasma powder, cellulose fibers, a *Bacillus* sp. PB6, organic bound iron and zinc, high vitamin and amino acid dosing and a microencapsulated source of formic acid, citric acid, and phytomolecules. An acid blend was given in the drinking water. Diarrhea was scored, body weights and feed intake were recorded throughout the study. Average daily gain (ADG) and Feed Conversion Ratio (FCR) were calculated. Carlson D. et al observed no difference in diarrhea scores between both groups (P> 0.05). During the first two weeks, the SR-Elite group had a numerically higher ADG (198 vs. 173 g/d (P>0.05)) and an improved feed utilization (1.78 vs. 1.96 FUp/kg gain (P<0.05)) compared with the Control. FCR was also improved in the SR Elite group during the overall 43 day test period (1.38 vs. 1.44 kg feed/kg gain).

These trials show that taking ZnO at medical doses from the weaning piglet diets may not be easy, but the tools to succeed are available and it is possible to actually turn this challenge in to an opportunity.

Feed sources and food security

The use of imported soya is widely regarded as unsustainable due to deforestation, soil erosion and Land Use Change (LUC) associated with South American soya bean growth. Likewise, the cost can vary significantly due to inclement weather or fuel prices. As such, investigating viable local protein for livestock feed is vital for industry sustainability.

Soya is recognized as a high quality protein source in pig diets because it is rich in limiting amino acids lysine, threonine, and tryptophan and it also seems to have a better digestibility. Despite all the positives of feeding soya to pigs the environmental impact of unsustainable farming practices that leads to deforestation soil erosion and monoculture is putting the animal protein industry under pressure to find other feed sources.

A trial to assess the impact of substituting soya with faba beans treated with a dual-action, organic acid based surfactant mould inhibitor specifically for preservation of field beans (Myco CURB® BNS) was carried out in finishing pigs. Pigs were allocated to one of two groups, a control group or a group in which part of the soya was replaced by beans, the diets were fed in a 1st stage finisher (16.7% soya and 12.45 for the control and Bean group respectively and 10% of treated beans) feed for 4 weeks (35-65 kg live weight) followed by a 2nd stage finisher feed (65 kg – slaughter, with 12.5.% and 4.77% soya for the control and Bean group and 20 Beans in Bean group). At slaughter all pigs from the same treatment group were slaughtered together.

Overall, substituting a proportion of the soya with treated beans resulted in no significant difference in performance, or carcass parameters (Table 2). In the control treatment, 10 pigs died or were culled during the trial compared to 8 pigs from the Bean treatment. This meant that 886 pigs were sold from the control group, and 888 from the bean group. Additionally, in the control group 13 carcasses were partially condemned and 4 fully condemned by the slaughterhouse. In treated pigs, only 9 carcasses were partially condemned and 3 fully condemned.

	ADG, g	***ADFI, g***	***FCR***	***Days on trial***	***Deadweight, kg/Carcass Wt***	***Lean weight, %***	***P2 backfat thickness, mm***
Soya	980	2,650	2.710	83.67	(98.06)	62.56(61.83)	11.18
Myco CURB® BNS treated beans	990	2,690	2.717	83.42	(98.58)	62.33(61.64)	11.40

Table 2. Effects of substituting most of conventional Soya as protein for Myco Curb BNS treated beans on pig performance and carcass traits

There were no significant differences in performance between the two treatments for any parameter measured. Mortality and slaughter-house condemnations were reduced in the group fed the bean treatment. So, in this study, substituting soya with 10-20% treated High Moisture Beans did not cause any significant differences in performance or carcass quality but led to a 30% reduction in kg CO2/kg of pig meat and a 60-70% reduction in environmental footprint from harvesting and processing the beans. In this trial it was demonstrated we can improve the sustainability of the industry without sacrificing pig performance by supporting the use of alternative crops to soya.

The portion of income spent on food varies between countries. The EU consumption expenditure on food represents 13% (EUROSTAT, 2019). Some feed processing solutions can contribute 7% to food cost reduction, due to cost savings in production and higher yield outputs (Kemin Document, 2021).
*With feed representing the largest portion of animal production costs, identifying ways to reduce feed costs, is key to reducing the cost of food for the consumer.
There are a number of small nutritional interventions that are simple and inexpensive to make that overtime, can significantly reduce GHG emissions and environmental footprint. The first of these is the application of exogenous enzymes to increase nutrient digestibility. KEMZYME® PLUS is a multi-enzyme product containing protease, amylase, xylanase, beta glucanase and cellulase. When KEMZYME PLUS is added to postweaning piglet diets at 1000 g/t of feed studies have shown that crude protein digestibility is increased by 3%. This would result in 5.4 g less crude protein

being excreted per kg of feed consumed (Kemin Internal Reference 18-00134). When the amount of nitrogen excreted is calculated as a result of this reduction, this equates to a reduction of nitrogen excretion of 0.864 g of nitrogen excreted per kg of feed. Currently the EU produces approximately 9 million tons of piglet feed every year. Therefore, if KEMZYME PLUS was utilized in all 9 million tons of feed, nitrogen excretion would be reduced by around 7776 tons* per year and ammonia emissions would be reduced by 9442 tons versus not using exogenous enzymes to increase nutrient digestibility.

*Calculations – CP in diet= 180 g/kg. CP digestibility was increased by 3% in the referenced trial. CP= N*6.25
CP digestibility in control = 180 g/kg * 0.752 = 135.36 – CP excreted = 180 – 135.36 = 44.64 g/kg
CP digestibility in KZP 1000 = 180 g/kg * 0.782 = 140.76 – CP excreted = 180 – 140.76 = 39.24 g/kg
Differences between treatments = 5.4 g CP per kg of feed - 5.4 / 6.25 = 0.864 g of N per kg of feed
9 million tons of piglet feed in EU – 9 million tons * 0.864 kg of N/ton of feed = 7776 tons reduction in N excreted
N * 17/14 = 9442 tons of ammonia

Lysophospholipid-based nutrient absorption enhancers (LYSOFORTE® EXTEND, Kemin) have been demonstrated to substantially reduce feed costs via diet reformulation to a proven matrix. This solution works by improving all three phases of fat digestion (emulsion, hydrolysis and absorption). As lipids have encapsulating properties, dietary fats can surround other nutrients, limiting the access of digestive enzymes, and consequently reducing nutrient digestibility. Due to the unique mechanisms of LYSOFORTE EXTEND, in improving the emulsification and hydrolysis phases, other nutrients are released from the fat matrix and therefore, digestive enzyme activity is increased subsequently improving the digestibility of other nutrients. Additionally, lysophospholipid supplementation has been shown to enhance the gene expression of collagen, resulting in longer and stronger intestinal villi (Brautigan et al., 2017). As a result of this mechanism the improvements in generalized nutrient absorption are found (Wealleans et al., 2020).

However, this is not the only benefit. Due to significant increases in CP digestibility, nitrogen excretion is also reduced. In a recent study, the use of lysophospholipids improved CP digestibility by 3.7 % compared to a non-treatment control (Kemin Internal Reference 18-00011). When this is translated into equivalent nitrogen excretion, this would equate to a reduction in nitrogen excreted by 1.2g per kg of feed, which could result in an annual reduction of nitrogen excretion of 30,000 tons* (36,430 tons of ammonia), this has the potential to have substantial environmental benefits, particularly with regard to climate change, eutrophication, acidification and pollution of air and water courses. As such, the use of feed additives can represent a viable strategy to not only support producers, but also the plant and community.

Conclusion

There are measurable and proven improvements across the three foundational pillars of sustainability (people, planet and business) as well as improving KPI's for processing, and animal production phases which mutually contribute to improved sustainability from a social, economic and environmental aspect, through the feed to food chain.

The pig industry needs to remain healthy, economically viable and profitable. With the feed prices that have been seen over the last few years, strategies to reduce feed costs, improve feed efficiency and reduce waste (for example ensuring a lower mortality or reducing feed waste due to contamination) can support this.

The three points mentioned before: healthy people, planet and businesses must be interconnected and cannot be taken separately. This makes for a significant challenge, but there are tools available to support the pig producing industry through these challenging times and ensure we have a sustainable pig business fit and healthy for generations to come. Ensuring feed production becomes more efficient will bring significant savings in terms of wasted energy, resources, and money. Improving efficiencies (FCR,) decreasing attritions (mortality), ensuring the pig industry is a pillar of the antibiotic stewardship and proactively fights for the protection of habitats will all contribute to a sustainable pig industry for generations.

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ORAL PRESENTATIONS

HHM-OP-01

PRRSV INFECTION DYNAMIC AND RISK FACTORS IN GROWING PIGS IN MIDWEST US

J. Angulo [1], S. Jansen [2], M. Yang [2], A. Rovira [2], P. Davis [2], J. Zimmerman [3], M. Torremorell [2]
[1]*University of Minnesota / Zoetis*
[2]*University of Minnesota College of Veterinary Medicine*
[3]*Iowa State University College of Veterinary Medicine*

Background and Objectives

The objective was to describe the frequency of wild-type-PRRSV infections and risk factors in wean-to-finish (W-F) pigs originating from PRRSV negative/stable herds located in medium to high dense pig regions in the US Midwest.

Material and Methods

Sixty-three W-F sites from 10 companies were enrolled in an observational prospective cohort study in the Midwest US. W-F selection criteria included: 1) pigs sourced from PRRSV negative/stable breeding herds, 2) pig placement in all-in/all-out sites 3) willingness to collect monthly oral fluids, 4) willingness to share site level information on production/management practices. Sixty sites fulfilled the inclusion criteria, most of them were vaccinated(54/60). Oral fluids were collected at each W-F at 30-8-12-16-20, and 25 weeks post-placement using fixed spatial sampling (8 ropes/site). Oral fluids (n=2,585) were tested by PRRSV RT-PCR (N=2,303) and ELISA(N=2304). Sequencing was performed at each positive sampling event strategically. PRRSV-ORF5 sequences were aligned/classified as WT-PRRSV using a cut-off of >2.0% nucleotide difference from vaccine references. Enrollment surveys implemented using google-forms at the beginning of the study

Results

WT-PRRSV detected in 8/10 production companies and in 42% (25/60) W-F sites. Distribution of wild-type-PRRSV postweaning was 17% (8wks), 25% (12wks), 33 (16wks), 17%(20wks) and 8% (25wks) (P=0.087). Survival analysis showed 53% survival probability at 25wks post-placement. Increased WT-PRRSV infection odd ratio observed when outsourced trucks were used for disposal of dead pigs. A decrease risk observed for receiving pigs from a single source, having all-in/all-out by site, truck driver helping unloading pigs, having dedicated equipment to the site for moving dead pigs.

Discussion and Conclusion

WT-PRRSV infections were prevalent in growing pigs and distributed throughout the growing period being more frequent towards the end of the growing phase. We identified some practices that appear relevant to improve biosecurity and minimize the risk of WT-PRRSV infection in wean-to-finish pigs.

HHM-OP-02

CLOSTRIDIUM NOVYI VACCINATION REDUCES SOW MORTALITY IN LATE GESTATION

L.K. Tolstrup [1], S. Bertelsen [2], A.M. Strunz [1]
[1]*Hipra Nordic Aps*
[2]*Porcus ApS*

Background and Objectives

Clostridium novyi (C.novyi) is an anaerobic bacterium responsible for sudden death in sows during the peripartum. Alpha toxin causes liver necrosis and degradation of vascular endothelium resulting in bloated cadavers with air-filled livers. The aim of this study was to evaluate the difference in herd sow mortality patterns during the peripartum depending on their vaccination status against C. novyi.

Material and Methods

Farm data was collected retrospectively from 18 farms between October 2020 and October 2021. Information of all acute dead sows such as ear tag number, parity, death date, insemination date and farrowing date, for a period of 6 months was recorded. Farms were characterized according to two variables: mortality pattern and immunization against C. novyi. If a farm had relatively more dead sows during the peripartum it was classified as a C. novyi sow mortality pattern and if they had been immunized against C. novyi for at least 3 months, they were considered as vaccinated farms.

Results

From the 18 farms under study, 12 had the typical C. novyi pattern, 9 of which were not vaccinated. The 6 remaining farms without the C. novyi pattern were vaccinated. The odds ratio was 35.5 [1.5; 804.5], p=0.003, giving that the odds for having the typical C. novyi sow mortality pattern is 35 times higher if the farm is not vaccinated against C. novyi.

Discussion and Conclusion

This study shows that vaccinating against C. novyi is a valuable tool in reducing sow sudden death during the peripartum. In this period, sows hold a great value and reduction of these deaths will result in a wider profit margin for the farm. The sow mortality pattern provides knowledge about the farm risk and should be used as a tool concurrently with qPCR test on liver samples from dead sows.

HHM-OP-03

CONSTRUCTION OF A PRESCRIPTIVE MODEL TO PROPOSE PERSONALIZED IMPROVEMENT TRACKS TO PIG FARMERS

A. Buchet [1], L. Daluzeau [2], J. Ivanauskaite [3], I. Trestcov [3], N. Tishin [3], B. Riera [4], J. Legaud [5], V. Florian [6], D. Duivon [7], S. Chouët [8]

[1]COOPERL INNOVATION, Pôle innovation en Sciences Animales, 1 Rue de la Gare, 22640 Plestan, France

[2]MSD Santé Animale, 49071 Beaucouzé, FRANCE

[3]MSD IT Hub, Na Valentince 3336/4, 150 00 Prague 5, Czech Republic

[4]Cooperl, Data Sciences, 1 rue de la Gare, 22640 PLESTAN, France

[5]Cooperl Groupement, 21 Rue d'Armor, Maroué, 22403 LAMBALLE-ARMOR CEDEX, France

[6]Selas Hyovet, 22640 Plestan, France

[7]MSD Santé Animale, Beaucouzé, France

[8]MSD Animal Health, 49 Beaucouzé, France

Background and Objectives

Swine-health-management programs aim to propose solutions to producers that improve the performance of their operations. The uncertainty linked to the implementation of new practices can be related to the lack of visibility of the impact of said practices on performance. We illustrate a prescriptive model developed by Cooperl and MSD data scientists that provides personalized health management recommendations for pig farmers.

Material and Methods

The data provided by Cooperl has a longitudinal structure with 579 farms and 11 consecutive semesters starting from 2015. Three indicators for pig farms were selected as Key Performance Indicators (KPI): annual average productivity of sows, global feed conversion rate and average age at 115 kg. The study estimated how dozens of various factors (vaccination, type of feed, mortality rate, etc.) affect these KPIs. Health status of the pig farm was assessed using a performance and health score, as well as quantification of the use of antibiotics and vaccine usage in sows or piglets. We built a continuous real-time sanitary score system. Analysis of direct and indirect relations, linear and non-linear relations between variables and the clustering of farms allows not only for an estimation of the impact of the implementation of new practices on the 3 key performance indicators, but it also provides us with a list of personalized recommendations on a per farm basis. In addition, this analysis provides us with an estimation of performance improvements.

Results

The model produces recommendations for each KPI: 18 for productivity, 25 on FCR and 13 on average age at 115 kg., for an average impact of respectively +1.33 pigs sold/sow/year, -0.02 kg/kg of global feed conversion rate and -2.6 days to reach 115 kg.

Discussion and Conclusion

Application of the model on a select number of pig farms would allow for confirmation of estimated gains under field conditions.

HHM-OP-04

DETECTION RATE OF PATHOGENS ASSOCIATED WITH THE PRDC IN DIFFERENT SPECIMENS (2016-2020)

R. Renzhammer [3], A. Entenfellner [3], A. Auer [1], I. Loncaric [2], J. Spergser [2], L. Schwarz [3], A. Ladinig [3]
[1]*Institute of Virology, University of Veterinary Medicine Vienna, Austria*
[2]*Institute of Microbiology, University of Veterinary Medicine Vienna, Austria*
[3]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

The Porcine Respiratory Disease Complex (PRDC) remains one of the major health concerns in swine stocks worldwide. PRDC results from interactions between several non-infectious and infectious causatives. Knowledge about appropriate specimens for the detection of each pathogen remains crucial for adequate diagnosis.

Material and Methods

From 2016 to 2020, a total of 932 tissue samples, 131 oral fluids (OF), 81 nasal swabs and 54 bronchoalveolar lavage fluids (BALF) from pigs with respiratory symptoms were investigated. 374 specimens were taken directly after euthanasia at the Vetmeduni Vienna, while 824 were field samples. PCR assays were performed to detect Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) (n=696), Influenza-A Virus (n=345), Porcine Circovirus 2 (PCV2) (n=339), Mycoplasma hyopneumoniae (n=590), Actinobacillus pleuropneumoniae (APP) (n=150), Glaesserella parasuis (GPS) (n=116) and Mycoplasma hyorhinis (n=155). Culture based microbiological examinations were performed on 430 lung samples. Results from all individual investigations of each sample were summarised. Pearson's Chi² tests were used to assess detection rates of each pathogen within different specimen and to evaluate the concomitant detection of pathogens within the same sample.

Results

The molecular detection rate of PRRSV, PCV2 and Mycoplasma hyopneumoniae was significantly higher in lung tissue compared to OFs or BALFs ($p<0.001$). GPS could be isolated more frequently from samples taken immediately after euthanasia at the Vetmeduni compared to field samples. The detection rate of Pasteurella multocida and APP were significantly higher in specimen that were also positive for PRRSV or Mycoplasma hyopneumoniae ($p<0,001$). Significant associations were not observed for other secondary pathogens like GPS.

Discussion and Conclusion

Tissue samples provide higher reliability for the detection of several pathogens compared to OFs or BALFs. In general, samples for the isolation of NAD-dependent bacteria like GPS should be taken and cultivated right after euthanasia.

HHM-OP-05

NOVEL RESILIENCE INDICATORS IN GROWING PIGS

H. Laghouaouta [1], R. Pena [1], R. Ros-Freixedes [1], J. Reixach [2], M. Diaz [2], J. Estany [1], R. Armengol [1], A. Bassols [3], L. Fraile [1]

[1]*University of Lleida, Lleida, Spain*

[2]*Selección Batalle SA, Riudarenes, Spain*

[3]*Universitat Autonoma de Barcelona, Barcelona, Spain*

Background and Objectives

The concept of resilience refers to the ability of animals to withstand stressors and rapidly recover their production. Resilience has been indirectly measured based on productivity-related traits and immunophenotypes in several livestock species. In this study, we aimed to elaborate resilience indicators in growing pigs using the deviation from the expected growth curve and the increment of the acute-phase protein haptoglobin after applying a vaccine.

Material and Methods

At 12 weeks of age, a total of 445 commercial Duroc pigs were vaccinated with an attenuated Aujeszky vaccine and 95 control pigs were inoculated with saline solution. Deviation from the expected growth curve of control pigs at 16 weeks of age (ÄBW) and the increment of haptoglobin at four days after challenge (ÄHP) were suggested as resilience indicators in growing pigs. Challenged pigs that maintained a steady production and had a minor activation of haptoglobin were deemed resilient. In contrast, pigs with a depressed production and a high activation of haptoglobin were deemed susceptible. Pigs were also classified based on ÄBW and ÄHP relative to the expected body weight at 16 weeks of age and the basal level of haptoglobin, respectively. The agreement between the different classifications was assessed using the Kappa statistic. The heritabilities of the resilience indicators were estimated.

Results

ÄBW and ÄHP allowed us to identify pigs with extreme responses to the challenge. The concordance was high (Kappa = 0.8) between the different classification methods, showing that ÄBW and ÄHP are not sensitive to the animal's body weight nor the basal level of haptoglobin. The heritability estimates for ÄBW and ÄHP were 0.33 and 0.16, respectively.

Discussion and Conclusion

The suggested resilience indicators are easy to measure, genetically controlled, and show substantial variability in the population. Thus, they may be improved through selective breeding.

HHM-OP-06

INVESTIGATION OF THE SPREAD OF PRRSV WITHIN LARGE-SCALE, FARROWING-FINISHING SWINE FARMS

I. Szabo [1], T. Molnar [1], L. Buza [2], I. Makkai [2], F. Polyák [3], M. Koczkás [4], I. Pogácsás [5], L. Savoia [4], K. Apáti [4], B. Bodnár [4], K. Lebhardt [6], K. Fornyos [6], A. Balint [7]

[1]National PRRS Eradication Committe, Budapest (Hungary)
[2]MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)
[3]TEDEJ Mg. Zrt.
[4]Triagró Ltd., Tunyogmatolcs
[5]Hajdúdorogi Bocskai Mg. Zrt., Hajdúdorog
[6]M.A.H. Food Control Ltd.
[7]National Foodchain Safety Authority, Budapest (Hungary)

Background and Objectives

For PRRS, stabilization of a certain breeding stock is defined as PRRSV seropositive sows to farrow PRRSV negative piglets. To reach this goal, the most frequently used method is that the breeding animals on the large-scale, farrow-to-finish farm are immunized with a live-attenuated vaccine virus. Laboratory monitoring was performed on weaned piglets with 30 piglets sampled per batch. The method was successful in 15 of the 23 herds. The failed cases were mainly explained by human related violations of disease control rules.

Material and Methods

We performed a laboratory monitoring study of post-vaccination pigs from a farrow-to-finish farm with 800 sows in two periods: testing one piglet per litter at weaning, then testing at least three weaned piglets per litter, using RT-PCR.

Results

PRRSV RT-PCR of 241 farrowing and 241 weaners (one pig / litter) did not reveal any positive individuals. Testing 2508 weaners (3 pigs / litter) from 836 farrowing of the same unit, gave twenty positive pools. Sequencing of RT-PCR-positive pools confirmed the presence of Porcilis vaccine virus in 14 pools and field virus in 3 pools (failed in the case of three pools).

Discussion and Conclusion

Our study revealed that the recommended number of tests may not detect the viral carriers that often infect their susceptible fellows during the fattening phase ("forward infection") with sufficient probability. This results in the appearance of clinical signs of PRRSV infection in the progeny population and a significant increase in viral excretion at herd level. The culling of such litters and sows may then facilitate producing PRRSV-free progeny in a farrow-to-finish swine herd.

RESIDENT SESSION

RES-OP-01

BRACHYSPIRA PILOSICOLI – NEWS ON ITS GENETIC HETEROGENEITY AND ANTIMICROBIAL SUSCEPTIBILITY

M. Arnold [1], S. Schmitt [2], A. Collaud [3], A. Rossano [3], E. Huebschke [2], F. Zeeh [1], H. Nathues [1], V. Perreten [3]
[1]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*
[2]*Section of Veterinary Bacteriology, Institute for Food Safety and Hygiene, Vetsuisse Faculty, University of Zurich, Switzerland*
[3]*Institute of Veterinary Bacteriology, Vetsuisse Faculty, University of Bern, Switzerland*

Background and Objectives

Diarrhoea and depressed growth rates in nursery and fattening pigs may be due to several causes, including Brachyspira (B.) pilosicoli the aetiological agent of porcine intestinal spirochaetosis. The scarce data on the genetic heterogeneity and antimicrobial susceptibility of B. pilosicoli prompted us to analyse the distribution, genetic heterogeneity, and antimicrobial susceptibility of B. pilosicoli field isolates from Swiss pig farms.

Material and Methods

Out of 156 herds, 693 faecal swabs were analysed by culture for the presence of Brachyspira spp.. B. pilosicoli were further identified by polymerase chain reaction and characterized by multilocus sequence typing and broth dilution antimicrobial susceptibility testing.

Results

B. pilosicoli was isolated in 52.6 % herds with animals suffering from diarrhoea. With only 10.5 %, the percentage of positive herds without clinical signs of diarrhoea, was significantly less frequent ($p<0.001$). Forty four different sequence types (ST) were identified among 80 B. pilosicoli isolates analysed. The ST often differed from herd to herd, and no ST was observed being predominant in the Swiss pig population. More than 73.0 % of the 41 B. pilosicoli isolates analysed for antimicrobial susceptibility, showed minimal inhibitory concentration values above the wild type cut-off values for lincomycin, tylvalosin and/ or tylosin. For tiamulin, valnemulin and doxycycline, this was the case in 48.8 %, 43.9 % and 36.6 % respectively.

Discussion and Conclusion

Overall, a diverse population of B. pilosicoli exhibiting a decreased susceptibility to antimicrobials was observed in pigs in Switzerland. Therefore, monitoring of resistance in B. pilosicoli is highly recommended to support targeted use of antimicrobials in pigs suffering from intestinal spirochaetosis.

RES-OP-02

BLEEDING SKIN LESIONS IN GESTATING SOWS – COULD THE STABLE FLY BE THE CAUSE?

L. Schwarz [1], T. Bernreiter-Hofer [2], I. Loncaric [3], M. Arnold [4], T. Voglmayr [5], A. Ladinig [2]
[1]*University Clinic for Swine, Department for Farm Animals and Veterinary Public Health, University of Veterinary Medicine Vienna, Vienna, Austria*
[2]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[3]*Institute of Microbiology, University of Veterinary Medicine Vienna, Austria*
[4]*University of Bern, Vetsuisse Faculty*
[5]*Traunkreis Vetclinic, Grossendorf, Austria*

Background and Objectives

Skin lesions of sows are not uncommon. Bleedings of the skin may have different causes. Usually, veterinarians count technopathic mechanisms as the most relevant ones.

Material and Methods

In a piglet producing farm with a three-week batch farrowing interval, the herd veterinarian contacted the University Clinic for Swine, because sows in the gestation unit showed moderate to severe skin lesions which in parts were bleeding. Additionally, he reported a massive fly population became a problem during the last two months. A herd visit was conducted by the University Clinic for Swine, Vetmeduni, to find out the reason for these skin lesions. Swabs of skin lesions were taken for bacteriological investigations.

Results

The problem of skin lesions could only be observed in the gestation unit, which was also the only unit with a massive fly infestation. Stomoxys calcitrans was the dominating fly species with an estimated percentage of 90% in relation to the total fly population. 66% of all sows in the gestation unit showed moderate to severe bleeding skin lesions. Subjectively affected sows seemed stressed and disturbed by stable fly bites. Bacteriological investigation of skin swabs resulted in a high grade of secondary infection with staphylococci.

Discussion and Conclusion

After treatment with an insecticide, skin lesions on farm disappeared after ten days. Stomoxys calcitrans is often underestimated by both, veterinarians and farmers in regards of its importance in swine production. It may not only be a possible vector transmitting pathogens, but has a direct influence on the well-being of hosts, which are bitten for blood sucking reasons. Massive infestations often occur in gestation units as conditions for stable fly reproduction are optimal there. The disturbance caused by fly bites together with skin lesions are important factors causing stress and consequently may result in decreased reproductive performance of the sows.

RES-OP-03

CHALLENGES OF A PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) OUTBREAK – A CASE REPORT

H. Kreutzmann [1], M. Bünger [1], R. Renzhammer [1], A. Temmel [2], R. Brunthaler [3], T. Rümenapf [4], A. Auer [4], A. Ladinig [1]

[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[2]*Veterinary Practice Gleinstätten, Styria, Austria*
[3]*Institute of Pathology, University of Veterinary Medicine Vienna, Austria*
[4]*Institute of Virology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

PRRSV is one of the most important viruses in swine industry. Naïve farms usually try to minimize the risk of introduction by external biosecurity measures. Increased internal biosecurity measures, intensified diagnostics and application of modified-live virus (MLV) vaccines are frequently used to mitigate clinical and economic consequences of a PRRSV outbreak.

Material and Methods

This case report describes a PRRSV outbreak in a PRRSV-naïve piglet-producing farm with 700 breeding sows, located in Styria. In 2020 an average of 14.6 weaned piglets per litter was recorded, while the number of stillborn accounted for 1.6 piglets per litter. In October 2020, processing fluids were examined and PRRSV RT-PCR negative. Since the number of weak and dead born piglets increased in January 2021, processing fluids were again submitted and tested positive for PRRSV-RNA.

Results

After the outbreak, the number of stillborn and weak piglets increased rapidly. In one group, only 3.5 piglets per litter were weaned. Immediately after the positive PCR result, all sows and piglets were immunised with a commercial MLV vaccine. After two vaccinations, production parameters increased for a short time, but never reached the level prior to the outbreak; after a few weeks they deteriorated again in a wave-like progression. Processing fluids were continuously examined, starting in May 2021 with a negative result, but in the consecutive weeks PRRSV-RNA was detected again. A reinforcement of internal biosecurity measures was initiated, in particular a limitation of cross-fostering. These measures in addition to vaccination led to the continuous achievement of production parameters as prior to the PRRS outbreak.

Discussion and Conclusion

This case report shows that continuous monitoring via processing fluids can be helpful to evaluate the PRRS status regarding intrauterine transmission. In addition, it demonstrates that the use of MLV vaccine alone without additional reinforcement of internal biosecurity might not be sufficient to stabilize the sow herd.

RES-OP-04

EFFECT OF FLOOR COOLING ON FLOOR TEMPERATURE AND PEN HYGIENE IN A SWEDISH FARM WITH SLAUGHTER PIGS

R. Westin [1], C. Ehlorsson [2], A. Reneby [3], A. Sannö [4]
[1]*Department of Animal Environment and Health, Swedish University of Agricultural Sciences, Skara, Sweden*
[2]*Farm & Animal Health, Ängelholm, Sweden*
[3]*Farm & Animal Health, Falkenberg, Sweden*
[4]*Department of Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden*

Background and Objectives

Solid flooring on the lying area is mandatory by Swedish law. This can cause problems with poor hygiene during hot summers. The objective of this study was to evaluate the effect of floor cooling on floor temperature and hygiene for slaughter pigs.

Material and Methods

The study was conducted in May-August 2021 on one batch of slaughter pigs (n=419). Pens were 10.0m^2 including a solid lying area of 7,6 m^2 (10-11 pigs/pen). Cold water (8-14°C) was circulated in three pipes normally used for floor heating in one row of pens (n=21). In a second row (n=20) no cooling was applied. Floor surface temperatures were measured for times. Pen hygiene was assessed weekly. Room temperature was logged hourly.

Results

Room temperature ranged 18-32°C. Mean floor surface temperatures ranged 23.4-25.8°C on cooled floors and 25.3-29.3°C on non-cooled floors resulting in a difference of 2.5–3.6°C. First 4 weeks there were no difference in pen hygiene with clean pens in general. The following 3 weeks, there was a clear difference with poor pen hygiene in non-cooled pens. During the hottest period in July (26-32°C in daytime), the hygiene was poor also in cooled pens but somewhat fewer pens had to be manually cleaned by the staff on a daily basis compared to non-cooled pens. The last three weeks, room temperatures dropped (18-26°C) and 1-2 pigs/pen were sent to slaughter, resulting in an improved hygiene in both cooled and non-cooled pens.

Discussion and Conclusion

Floor cooling lowered floor surface temperatures and initially had a positive effect on pen hygiene but was not sufficient to improve hygiene during the hottest period. Using existing floor heating pipes for cooling is possible but construction could be improved (more pipes, less distance, covering a larger area) to improve cooling properties.

RES-OP-05

CASE REPORT: AN OUTBREAK OF RESPIRATORY DISEASE AND SYSTEMIC INFECTION CAUSED BY ACTINOBACILLUS PLEUROPNEUMONIAE SEROVAR 8 IN A NORWEGIAN FARROW-TO-FINISH SPF FARM

M.G. Maaland [1], M. Oropeza-Moe [1]
[1]*Norwegian University of Life Sciences*

Background and Objectives

The Norwegian pig population is free from important respiratory pathogens such as M. hyponeumoniae and PRRSV, and SPF farms are also free from Actinobacillus pleuropneumoniae (App). App is normally considered to infect the respiratory tract, with pathological lesions confined to the thorax.

Material and Methods

In October 2021 an outbreak of disease occurred in a farrow-to-finish SPF farm (70 sows) in Rogaland county. Clinical respiratory signs were present in all age groups, mortalities occurred in all age groups except finishers. Eight animals (sows, suckling and weaning piglets) and lungs from slaughtered pigs were subject to diagnostic investigation including gross pathology, bacteriology, histopathology and PCR analysis (PRRSV, IAV, PCV2, PCMV, M. hyopneumoniae, M. hyorhinis, G. parasuis). One App isolate was analysed by PCR for serovar and toxin types.

Results

Acute to chronic fibrino-hemorrhagic and necrotizing pleuropneumonia was present in all age groups. Bacteriological investigation revealed pure growth of App serovar 8 (App8) from lungs and/or pleura of most pigs. The isolate produced apxII and apxIII toxins, predicting moderate virulence. App was also recovered from the peritoneum of two pigs with fibrinous peritonitis, and from liver, spleen, kidney, brain, pericardium and/or endometrium of several pigs. In the liver of some animals, multifocal acute inflammation with necrosis and bacteria was observed. Two lung samples were positive for porcine cytomegalovirus (PCMV), one sample was weakly positive for PCV2.

Discussion and Conclusion

This report describes an outbreak of App8, the dominating clinical serovar in Norway, in a naïve SPF herd. Pathological lesions and bacteriological findings were not exclusively confined to the respiratory tract in these animals. A few reports of systemic spread of App with or without concurrent respiratory disease exist, however to the best of our knowledge none describing peritonitis or hepatitis associated with App8. The significance of PCMV infection to the severity of respiratory tract lesions is uncertain.

RES-OP-06

A CASE OF SALMONELLA ENTERICA SUBSPECIES ENTERICA SEROVAR CHOLERAESUIS IN A SWEDISH GILTPRODUCING HERD

J. Fjelkner [1], C. Hultén [3], M. Jacobson [2], E. Nørregård [1], B. Young [3]
[1]*Farm and Animal Health, Sweden*
[2]*Department of Clinical Sciences, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden*
[3]*National Veterinary Institute, Uppsala, Sweden*

Background and Objectives

In September 2020, Salmonella Choleraesuis was detected in faecal samples from a gilt multiplier collected within the Swedish salmonella control program. This was the first time in 40 years that the serovar was detected in Swedish pigs. This report describes the subsequent investigation and measures undertaken to eliminate the pathogen from the herd.

Material and Methods

In accordance with Swedish regulations, pig movements to and from the farm were stopped and plans to eliminate S. Choleraesuis from the herd were made. Internal biosecurity measures were increased and regular testing was implemented, including repeated faecal sampling/culture, culturing tissues from all dead/euthanized pigs over 7 days old and serological sampling of replacement gilts. The epidemiological investigation included examination of production records, employee interviews, culturing feed and environmental samples, culturing tissue and faecal samples from wild boars and faecal sampling the herd's purebred gilt supplier. Testing in contact herds that received gilts (n=15) or 30kg pigs (males/excess gilts, n=7) from the multiplier included whole-herd faecal sampling and tissue cultures from pigs that died with signs of septicaemia.

Results

12/4200 faecal and 5/1350 tissue samples taken in the herd were positive, resulting in euthanasia of one group of lactating sows with piglets, half a group of pregnant sows and two groups of weaned pigs. All feed and environmental samples and samples from the nucleus herd were negative. In 1/22 contact herds, gilts in isolation tested positive. S. Choleraesuis was isolated in samples from wild boars shot in the region. Replacement gilts introduced into the herd January-May 2021 remained serologically negative in July 2021.

Discussion and Conclusion

Few clinical signs were observed, which is unusual based on previous descriptions of S. Choleraesuis-outbreaks. Although speculative, a possible source was indirect contamination from wild boars. All restrictions were removed in August 2021 and the herd was re-instated as a gilt multiplier.

VVD-OP-01

ASSESSMENT OF THE RELATIONSHIP BETWEEN BREEDING HERD PRRSV OCCURRENCE AND MANURE PUMPING EVENTS IN THE U.S.

C. Vilalta [1], J. Sanhueza [2], M. Kikuti [3], C. Picasso [3], C. Corzo [3]
[1]*Upnorth analytics, Lleida, Spain*
[2]*Veterinary Sciences and Public Health Department, Temuco Catholic University, Chile.*
[3]*Veterinary Population Medicine Department, College of Veterinary Medicine, University of Minnesota, St Paul, MN, USA*

Background and Objectives

A repetitive and seasonal epidemic pattern has been reported for the Porcine Reproductive and Respiratory Syndrome (PRRS) in the United States breeding herd. The onset of the epidemic occurs between mid-October and November. A noticeable event that occurs at the same time as the onset of the national epidemic involves manure agitating, pumping, and spread. The aim of this study was to describe the relationship between manure management and reporting a breeding herd PRRS outbreak.

Material and Methods

Outbreak data, manure pumping activities and farm characteristics were directly obtained from the Morrison Swine Health Monitoring Project (MSHMP) participants between July 2019 and June 2020. The incidence rate occurring within the hypothesized incubation period (15 or 30 days) and outside the 30-day period was calculated for the overall population and each variable of interest.

Results

A total of 150 out of 216 breaks in the period of study provided complete manure management information. The proportion of outbreaks occurring during the first 15 and 30 days after agitation and pumping was 25% (38/150) and 41% (61/150), respectively. The incidence rate during the first and second fortnight after manure pumping, and outside the 30-day window were 0.017, 0.011 and 0.001 outbreaks per farm per week. The months with higher number of pumping events were October (40), April (29), and November (24). The incidence rate during the first 15 days after pumping was similar during the fall (0.022), summer (0.023) and the spring (0.019).

Discussion and Conclusion

The two main periods in which manure pumping occurred were fall and spring. PRRS outbreak incidence rate within the following 15 days of manure pumping remained the same in farms that either pumped during fall, summer, or spring. These findings suggest that on-site manure pumping was temporally associated with reporting a PRRS outbreak between 15 and 30 days after.

VVD-OP-02

ECONOMIC IMPACT OF A PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS) STABILIZATION PROGRAM IN A FARROW-TO-FINISH FARM USING MASS VACCINATION WITH A MODIFIED LIVE VACCINE AND STRICT BIOSECURITY MEASURES

F. Bouchet [1], V. Normand [1], P. Berton [1], J. Jeusselin [1], C. Ardies [2], C. Teixeira-Costa [1], G. Boulbria [1], M. Brissonnier [1], C. Chevance [1], A. Lebret [1]

[1]PORC.SPECTIVE, Swine Vet practice, ZA de Gohélève, 56920 Noyal-Pontivy, France

[2]HIPRA, 7 rue Roland Garros, Bat H, 44700 ORVAULT, FRANCE

Background and Objectives

In the last two decades, in France, PRRSV stabilization protocols have been implemented using mass vaccination with modified live vaccines, herd closure and biosecurity measures. The aim of the study was to evaluate performances and economic improvements after implementation of such protocol in a farrow-to-finish farm using UNISTRAIN® PRRS.

Material and Methods

The stabilization protocol was conducted in a 195 sow-farrow-to-finish farm located in a high-density pig area, implementing a 5-week batch farrowing system. For many years, this herd has suffered from abortions, high return-to-estrus rate and high usage of antibiotics in all stages. In end 2019, an active circulation of PRRSV-1 was diagnosed in this farm. The stabilization protocol and its monitoring was implemented as described by Pauline Berton (Berton et al., 2017) and according to the recommendations of AASV (Holtkamp et al., 2011). Production performances, together with antibiotic consumption, were compared before and after implementation of the protocol using Student's t-test with R Studio.

Results

Results of the monitoring showed the absence of transmission of PRRSV-1 from sows to their piglets and the absence of circulation within the sow herd and in growers in four batches. We observed a significant increase in fertility rate, respectively 90.16 % (Q1 85-Q3 94.65) and 95.14 % (93.58-97.33), before and after the stabilization protocol (p=0.02). Weaning-to-estrus intervals were more gathered (4.88-6.37 days before and 5.03-5.16 days after the stabilization). Thus, both improvements in reproductive parameters reduced the sows' unproductive time. Feed conversion ratio decreased from 2.74 to 2.63 and veterinary costs were reduced from 9.15€ to 6.40€ per pig produced, linked to a huge reduction of antibiotics usage. Finally, we estimate the return on investment at 4,2 € per pig.

Discussion and Conclusion

This stabilisation protocol was successful and economical results were clearly improved.

VVD-OP-03

PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME SURVEILLANCE IN BREEDING HERDS AND NURSERIES USING TONGUE TIPS FROM DEAD ANIMALS.

J. Baliellas [1], E. Novell [1], V. Tarancón [1], C. Vilalta [2], L. Fraile [3]
[1]*Grup de Sanejament Porci, Lleida, Spain*
[2]*Upnorth analytics, Lleida, Spain*
[3]*University of Lleida, Lleida, Spain*

Background and Objectives

One of the main issues regarding PRRSV surveillance and monitoring of large populations of animals is how to sample them in a cost-effective way. Therefore, the main objective of this study was to evaluate the detection capacity of removed parts from dead animals (tongues) as an indicator of PRRSV in swine farms. Breeding herds and nursery farms were targeted to provide additional surveillance options for producers.

Material and Methods

The detection capacity of PRRSV in tongues from dead animals was evaluated in breeding herds (stillborns and piglets dying during the lactating period) and nursery farms (naturally dead animals). The samples were selected if pairs of serum and tongues were available from 2018 to 2020. Serum (six pools of five) and exudate from tongues (one bag) were analysed by PRRSV RT-PCR. The agreement between the serum sample procedure versus the tongue exudate was assessed using a concordance test (Kappa statistic) at batch level.

Results

A total of 32 submissions, corresponding to 14 farms, had PRRSV diagnostic information for serum and tongue exudate. Overall agreement of classifying a batch as positive or negative, based on RT-PCR PRRSV results, between serum and tongue exudate of the 32 pairs was 76.9%. Cohen´s Kappa was 0.55. The main discrepancy came from the presence of positive samples in tongue exudate and not in serum, suggesting that tongue exudate could be more sensitive than serum to monitor PRRSV.

Discussion and Conclusion

One of the reasons for the different detection by sampling carcasses versus serum could be based on targeting a subpopulation of animals (stillborns or dead piglets) that are more likely to harbour PRRSV. The use of tongue tips to monitor the presence of PRRSV is a suitable surveillance method for breeding herds and nurseries.

VVD-OP-04

SWINE INFLUENZA VACCINATION IMPAIRMENT IN PIGS WITH MATERNALLY DERIVED ANTIBODIES: FROM EXPERIMENTAL TO IN-SILICO MODELLING EVIDENCE

M. Andraud [1], S. Hervé [1], S. Gorin [1], N. Barbier [1], S. Queguiner [1], F. Paboeuf [1], G. Simon [1], N. Rose [1]
[1]*French Agency for Food, Environmental and Occupational Health & Safety (ANSES), Ploufragan-Plouzané-Niort, France*

Background and Objectives

Swine influenza A virus (swIAV) vaccination is commonly practiced in breeding herds but might be used also for active immunization of growing pigs at weaning. Interference between vaccine and maternally-derived antibodies (MDA) has been reported, but the impact on swIAV transmission was not quantified. This study aimed to set up and analyze an experimental trial to infer transmission parameters in vaccinated SPF piglets with or without MDA and to analyze the consequences at the herd-level.

Material and Methods

The experiment involved two groups of 22 pigs born either to vaccinated (Respiporc®Flu3) or unvaccinated SPF sows, determining so their MDA status. All piglets were vaccinated once at 3 weeks of age. In each group, two piglets were $H1_{av}N1$-inoculated 17 days post-vaccination and put in direct and indirect contact (separated pen) with 4 and 5 SPF piglets, respectively (2 replicates). The transmission parameters were estimated based on the follow-up of the infection chain during the experiment (swIAV-shedding by RT-qPCR). Estimated parameters were used in a simulation model, representing the swIAV dynamics in a farrow-to- finish pig herd.

Results

The direct transmission rate was 3.6-fold higher in MDA+ vaccinated piglets than in MDA- vaccinated ones (1.2 [0.7-1.9]). Vaccination nevertheless reduced significantly the contribution of airborne transmission, compared with estimates in unvaccinated animals. Simulations evidenced an extended persistence of viral spread when vaccinating sows and piglets. When extinction was quasi-systematic 5 years post-introduction in the absence of vaccination, the extinction probability fell down to 33% when batch-to-batch vaccination was implemented.

Discussion and Conclusion

The interference between swIAV vaccination and MDAs enhanced the transmission of an $H1_{av}N1$ swIAV strain amongst vaccinated pigs, favoring the persistence of the virus at farm level. Vaccination at later age, after MDAs fade out (between 8 and 12 weeks of age) could be more prone to limit swIAV transmission.

VVD-OP-05

VIRUCIDAL EFFECT OF VIROCID® DISINFECTANT AGAINST THE AFRICAN SWINE FEVER VIRUS (ASFV) - 3 VALIDATION TRIALS

L. Grab [1], L. Ledoux [1], E. Claeys [1], E. Rodriguez-Gonzalez [1]
[1]*CID LINES, An Ecolab Company*

Background and Objectives

ASF is one of the most important threats for the European pig industry due to its significant socioeconomic consequences. There are no effective vaccines and outbreaks can have devastating effects on swine production. Biosecurity measures, including cleaning and disinfection, are key to reducing the risk of disease introduction in the farms and to preventing the subsequent virus spread. Due to the critical role that proper farm hygiene can play in mitigating the ASFv risks, a series of independent studies have been conducted to validate the virucidal efficacy of Virocid® (broad-spectrum disinfectant based on quaternary ammonium compounds and glutaraldehyde) against ASFv.

Material and Methods

The 3 studies were carried out by 1) EU Reference Laboratory for ASF, CISA-INIA, Spain, 2) Plum Island Animal Disease Center, USA, and 3) Federal Research Center for Virology and Microbiology, Russian Federation. The studies utilized separate methods and procedures and included examining the effect of different testing surfaces on efficacy as well as the presence/absence of “organic matter”.

Results

Study 1 showed complete absence of ASFv activity after 0.25% Virocid treatment. The specific cytopathic effect induced on Vero cells was 100% reduced and avoided ASFv replication even at high virus concentration. Study 2 showed higher log reduction of infectious ASFv after 10 min Virocid exposure on stainless steel (4.8) and concrete (4.12) compared to 5 other disinfectants. Virocid was the only passing the EPA product efficacy cutoff for concrete in presence of 5% organic matter. Study 3 showed complete disinfection of surfaces simulating livestock facilities (rough concrete) contaminated with ASFv after a single irrigation with 0.5% Virocid (5 minutes exposure, 0,3 l/m2 rate).

Discussion and Conclusion

All the studies showed a high effectiveness of Virocid® versus ASFv under a variety of conditions used to mimic on-farm conditions and demonstrate the utility of Virocid® as effective program against ASFv.

VVD-OP-06

RESULTS OF AN EPIDEMIOLOGICAL SURVEILLANCE ON INFLUENZA A VIRUSES DETECTED IN FRENCH PIG FARMS FROM 2015 UNTIL 2021

A. Jardin [1], S. Brilland [2], P. Leneveu [2], K. Lillie-Jaschniski [3]
[1]*Ceva Santé Animale, 33 500 Libourne, France*
[2]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*
[3]*Ceva Santé Animale, Libourne, France*

Background and Objectives

Swine influenza A virus (swIAV) is one of the most important infectious diseases in pig farms for its financial and productive impact. The aim of this study is to share the results of a private hold epidemiological surveillance on swIAV made in France from 2015.

Material and Methods

From 2015 to late 2021, samples (nasal swabs, tracheal mucus, lungs or oral fluids) were taken in 1053 French farms by vet practitioners. Most of the sampled animals presented evocative clinical signs, mainly respiratory disorders and fever. Presence of IAV and subtyping were assessed by RT-qPCR (Real Time quantitative Polymerase Chain Reaction).

Results

In 50,7% of the investigated farms, swIAV was detected. Weaned piglets below 12 weeks of age represent the main investigated age category with 55% of the sampled animals. In 15,4% of the farms, samples were taken on breeders (gilts and sows). On sows, the swIAV detection rate is quite low (27,3%) compared to the others age categories. For 65,2% of the investigated groups with at least one sample in which swIAV was detected, virus subtyping was successful. Until 2019, H1avN1 was the most frequently detected virus (66.2% in average), followed depending on the year by either H1huN2 (maximal frequency in 2018 with 21.4%) or pandemic viruses (maximal frequency in 2016 with 18.9%). From 2020 the situation changed tremendously. H1avN2 became the most frequently detected virus (65% of farms being positive for swIAV). At the same time, the number of investigated farms doubled, showing an increased interest in diagnostic due to a growing number of flu syndrome cases.

Discussion and Conclusion

The data collected by this passive epidemiological surveillance allow to make an overview of the occurrence of different swIAV subtypes in French domestic swine through years. The changes over the years underline the importance of regular investigations of the herds either by active or passive surveillance.

VPH-OP-01

ULTRA-HIGH PERFORMANCE LIQUID CHROMATOGRAPHY TANDEM MASS SPECTROMETRY (UHPLC-MS/MS) ANALYSIS OF ANTIBIOTICS IN ORAL FLUID AS A FAST SURVEILLANCE SYSTEM

A. Gajda [1], E. Nowacka-Kozak [1], M. Gbylik-Sikorska [1], P. Cybulski [2]

[1]*Department of Pharmacology and Toxicology, National Veterinary Research Institute, Puławy, Poland*

[2]*Goodvalley Agro S.A., Przechlewo, Poland*

Background and Objectives

An exposure to antibiotic residues in animal products may cause harmful effects for consumers. Even though ante-mortem methods are being investigated, tissues collected from slaughtered pigs are still the main material for monitoring of possible contamination. The main objective of our study was to demonstrate usefulness of oral fluid samples as a material for ante-mortem detection of 7 injectable antibiotics commonly used in pig farming.

Material and Methods

For the purpose of the study, separated groups of 40-60 kg finishers (30 animals in each) were treated intramuscularly using sulfadoxine (SDX) with trimethoprim (TRMP) 2 times with 48h interval, lincomycin (LIN) 3 times with 24h interval , tiamulin (TIAM) 3 times with 24h interval, tylosin (TYL) 3 times with 24h interval, amoxicillin (AMX) 2 times with 48h interval, and penicillin G (PEN G) 3 times with 24h interval. First oral fluid sample was collected 24 h after administration. Next sampling took place at the same hour for 35 consecutive days. For the detection of substances in oral fluid, an UHPLC-MS/MS analytical method was developed and validated. The analysis was conducted by Shimadzu Nexera X2 (Shimadzu, Japan) connected to the QTRAP® 4500 triple quadrupole mass spectrometer (AB Sciex Framingham, USA).

Results

Most of the active substances were detectable for 30 consecutive days after administration, apart from TYL, which was detected for 27 days. AMX and PEN G were quantified only for 5 and 8 days post injection, respectively.

Discussion and Conclusion

In our study, transfer of 7 different antimicrobials into swine oral fluid after intramuscular injection was investigated for the first time. We proved that UHPLC-MS/MS analysis of antibiotics in oral fluid can be used as an effective tool in ante-mortem monitoring. Its application to other studies dealing with safety of food-producing animals is valuable. Moreover, broader spectrum of active compounds deserves further research.

VPH-OP-02

FIRST RESULTS OF A WIDE-RANGE MONITORING ON SALMONELLA SEROPREVALENCE IN FATTENERS IN HUNGARY 2021

T. Révész [1], K. Lillie-Jaschniski [2], I. Szigeti [1]
[1]*Ceva S.A./Hungary*
[2]*Ceva Santé Animale, Libourne, France*

Background and Objectives

Salmonella spp. are major food-born zoonotic agent and next to poultry, consumtion of pig meat plays a significant role as source of infection. Next to intense Salmonella control during meat processing, some European countries implemented Salmonella monitoring systems to reduce the risc of Salmonella-positive pigs entering the slaughterhouse as a potential risk for carcass contamination during slaughter. As there is no on-farm monitoring system implemented in Hungary, and 40% of Hungarian breeding herds were sampled positive during the Salmonella EU baseline survey (EFSA 2008), aim of this survey was to collect a first impression of the serological status of Hungarian fatteners just before slaughter.

Material and Methods

From a total of 28 farms 15 blood samples of fatteners just before slaughter were collected. For screening IDEXX HerdCheck® Swine Salmonella ELISA test was used. Farms were Categorized following the rules of the German Salmonella Monotoring (QS-System). Sample cut-off here is 40%-OD instead of the Test cut-off 10%-OD.Herds are categorised by positivity rate (Category (Cat)1:<20%, Cat2: 21-40%, Cat3: >40% positive samples)

Results

91% of the farms were seropositive, out of wich 37%, 11% and 52% belonged to Cat. 1-2-3 respectively. Almost half of the animals (45%) were seropositive (OD-40%).

Discussion and Conclusion

51% of the 28 investigated Hungarian pig farms were categorized in Cat 3, which is rather high compared to Germany, where the ammount of Cat 3 farms reduced from arround 4% in 2006 to 1,8% in 2021). Our investigation only gives a momentum as in contrary to the German system where 60 samples per farm/year (15 samples each quater) from almost 90% of all fattening farms are evalued, we only investigated 15 samples of 28 fattening farms (approx.14% of Hungarian fattening farms). Still it shows a potential risk and further investigations needed.

VPH-OP-03

SOUND BASED HEALTH MONITORING PERFORMED BY SOUNDTALKS SIGNIFICANTLY REDUCES THE OVERALL ANTIBIOTIC CONSUMPTION IN NURSERY FACILITIES

P.H. Rathkjen [1], M. Jensen [1], A. Kragh [1], C. Alonso [2]
[1]*Boehringer Ingelheim Animal Health Denmark*
[2]*Boehringer Ingelheim Vetmedica GmbH*

Background and Objectives

SoundTalks is a cloud-based sensor technology that processes the sound data collected at the farm and transforms it into a metric, respiratory health status (ReHS) shown as green, yellow (increased warning) and red status (immediate action). The objectives of this study were to describe respiratory disease impact in a nursery facility monitored by SoundTalks and to evaluate the overall treatment consumption compared to the period prior to SoundTalks.

Material and Methods

The study was performed in a nursery facility of a 1300 sow farm in Northern Denmark (8 weaning rooms/site, 900 head spaces/room filled weekly). All rooms were monitored for respiratory problems via sound by SoundTalks. Production variables such as batch number, mortality, as well as number and type of treatments (antibiotic vs antipiretic) were daily recorded and requested for the previous 12 months.

Results

During the 6-monthstudy period, between 2 and 3 batches per room were monitored by SoundTalks. Overall results showed thatin 15.4% of days the farm had respiratory alarms (yellow or red) warning signals. There was an evident room effect as the percentage of days with green, yellow or red ReHS differed significantly between rooms. Results from the 69 vs 20 batches before and after SoundTalks monitoring showed a 38% antibiotic reduction and a 395% antipyretic increase when respiratory pathogens, other than IAV, were identified (p-value < 2.2e-16 Pearson's Chi-squared).

Discussion and Conclusion

Results from this study demonstrated the importance of continuous monitoring of nursery population in order to ensure the early detection/intervention in the face of a respiratory outbreak. Under the conditions of this study, the implementation of SoundTalks lead to a 38% reduction in the use of antibiotics with the exception of cases involving IAV as the primary pathogen.

VPH-OP-04

UPDATE ON SLAUGHTER LUNG LESIONS FROM FINISHER PIGS IN GERMANY AND AUSTRIA

V. Cvjetković [1], B. Dobrokes [2], K. Golacz [1], M. Lisgara [3]
[1]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*
[2]*Geflügeltierärzte GmbH, Marktstraße 26/3, 2831 Warth – Austria*
[3]*Ceva Hellas LLC, 15, Ag. Nikolaou street, 174 55 Alimos (Attiki) Greece*

Background and Objectives

The evaluation of slaughter lungs in pigs offers the possibility to find possible causes of respiratory diseases. Management practices, housing conditions and climate, which can vary from country to country or across a specific country, could affect pigs' respiratory health. Present work creates slaughter lung lesion value benchmarks for farmers and practitioners.

Material and Methods

In total, 5867 lungs were submitted for evaluation using standardized methodology (Ceva Lung Program), all together belonging to 81 different farms and four regions: Austria (A) (n=1792), Eastern Germany (EG) (n=1155), North-Western Germany NWG) (n=1985) and Southern Germany (SG) (n=935). The data were collected from 2019 to 2021 and analysed on batch level, with a minimum number of 30 lungs per batch. They were most often assessed in necropsy rooms due to slaughterhouse restrictions (COVID-19).

Results

Median (range) prevalence of bronchopneumonia was significantly higher in SG (65%; 7-94%) compared to A (32%; 0-67%) and EG (40%; 3-79%) ($P<0.05$ for all comparisons), whereas it did not differ significantly from NWG.The percentage of affected lung surface in pneumonic lungs was higher in SG (6%; 1-25%) compared to EG (3%; 0.6-11%) and NWG (3.9%; 1-10%) ($P<0.05$ for all comparisons), whereas it did not differ significantly from A. In total, 18% of the lungs had dorsocaudal pleurisy (DP). EG had higher values (35%; 3-70%) than all other regions ($P<0.05$ for all comparisons): NWG (8%; 0-68%), A (16%; 0-59%) and SG (20%; 0-50%).

Discussion and Conclusion

Under the conditions of the present study, SG presented higher values of bronchopneumonic lesions and EG higher prevalence of DP. The present results are in contrast with those of previous works, in which bronchopneumonic lesions were most present in Austria and DP in NWG. These discrepancies can be due to a general shift in lung lesions due to adopted control measures or a lower number of lungs examined.

VPH-OP-05

OCCURRENCE OF QUINOLONE NON-SUSCEPTIBLE ESCHERICHIA COLI IN FAECAL SAMPLES FROM FLUOROQUINOLONE TREATED AND UNTREATED SOWS.

R. Stohler [1], K. Zurfluh [2], R. Stephan [2], X. Sidler [1], D. Kümmerlen [1]

[1]*Division of Swine Medicine, Department of Farm Animals, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland*

[2]*Institute for Food Safety and Hygiene, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland*

Background and Objectives

Fluoroquinolones (FQ) have been defined by the World Health Organization as highest priority critically important antimicrobials. In pigs, FQ are used for the treatment of the Postpartum Dysgalactia Syndrome (PPDS) in sows and diarrhea and respiratory disease in piglets. The present field study aimed to analyze the occurrence of quinolone non-susceptible Escherichia coli (QNSE) in faecal samples of FQ-treated and untreated sows.

Material and Methods

The study was carried out in four farrowing farms of a sow pool system with FQ usage. One study group consisted of in total 29 FQ-treated sows and the second group of 28 untreated sows. Faecal sampling of sows was performed shortly before farrowing (timepoint 1) as well as 14 (timepoint 2) and 28 days (timepoint 3) after farrowing. The percentages of QNSE-positive samples in total valid samples were calculated and statistically significant differences were investigated by comparing the confidence intervals (CI).

Results

After moving to the farrowing pens, QNSE could be detected in 41.7% of all samples. The percentages of QNSE-positive samples were significantly increased in all sows at timepoint 2 (29/34; 85.3%; CI 70.7%-94.2%) and 3 (24/29; 82.8%; CI 66.3%-93.1%) compared to timepoint 1 (20/48; 41.7%; CI 28.5%-55.8%). In the untreated sow group, the percentage of QNSE-positive samples at timepoint 2 (14/16; 87.5%; CI 65.6% - 97.3%) was also significantly higher than at timepoint 1 (10/25; 40.0%; CI 22.7%-59.4%).

Discussion and Conclusion

In the present study, QNSE occurred regularly in sows without FQ treatment and the proportion of QNSE-positive samples increased significantly after entry into the herd. Further research on FQ usage in pig farms and the subsequent occurrence of QNSE is needed to develope targeted recommendations for FQ treatment regimens in sows.

BBD-OP-01

A CROSS-SECTIONAL STUDY ON THE PREVALENCE OF MYCOPLASMA HYOPNEUMONIAE IN BREEDING ANIMALS

E. Biebaut [1], I. Chantziaras [1], F. Boyen [2], F. Haesebrouck [2], B. Devriendt [3], D. Maes [1]
[1]*Department of Internal Medicine, Reproduction and Population Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*
[2]*Department of Pathobiology, Pharmacology and Zoological Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*
[3]*Department of Translational Physiology, Infectiology and Public Health, Faculty of Veterinary Medicine, Ghent University, Belgium*

Background and Objectives

Mycoplasma hyopneumoniae infections in breeding animals are often subclinical but dam-to-piglet transmission plays an important role. This study investigated the prevalence of M. hyopneumoniae in breeding animals of different parities and at different time points in the reproductive cycle.

Material and Methods

On ten Belgian farrow-to-finish farms, 344 gilts and 456 sows (n=80/farm) were sampled. Farms were selected based on the willingness to collaborate and indications of M. hyopneumoniae presence. Gilts were vaccinated against M. hyopneumoniae on all farms, sow vaccination was never practiced. A tracheobronchial swab was collected from 20 animals at four different time points in the reproductive cycle; at 30-40 days (after moving to the group housing), at 75-85 days of gestation, at 3-5 days after farrowing and at 1-3 days after weaning. Swabs were analyzed for the presence of M. hyopneumoniae DNA with nested PCR. A generalized linear mixed model with farm as random factor was used to test the effect of time point in the reproductive cycle and parity on M. hyopneumoniae prevalence.

Results

M. hyopneumoniae prevalence ranged between 44% and 0% at farm level. In total, 11% of the sows and 27% of the gilts were M. hyopneumoniae positive. Both the factors time point and parity were statistically significant. Gilts (26%) were significantly more M. hyopneumoniae positive than 2-4th parity (16%; p=0.024) and >4th parity (4%; p=0.019) sows. At 30-40 days of gestation significantly more breeding animals (30%) were positive as compared to 75-85 days of gestation (18%; p=0.035), 3-5 days after farrowing (9%; p=0.016) and 1-3 days after weaning (14%; p=0.02).

Discussion and Conclusion

Gilts were more often M. hyopneumoniae positive than sows, emphasizing the importance of implementing M. hyopneumoniae vaccination and proper acclimation practices for the gilts. Breeding animals are more often M. hyopneumoniae positive at 30-40 days of gestation compared to other time points in the cycle.

BBD-OP-02

INDIVIDUAL IDENTIFICATION OF STREPTOCOCCUS SUIS SEROTYPES 1, 2, 1/2 AND 14 THROUGH NOVEL REALTIME PCR ASSAYS.

J.L. Arnal Bernal [1], S. Lacouture [2], A. Fernández [1], A.A. Benito [1], S. Lázaro [1], D. Martín [1], M. Gottschalk [2]
[1]*EXOPOL*
[2]*Université de Montréal*

Background and Objectives

Laboratorial diagnosis of Streptococcus suis determines the serotype and certain virulence marquers to try to foresee its virulent potential. Serotypes 1_14 and 2_1/2 represent the 30% of Spanish clinical cases. Nevertheless, the serological cross reactivity and the high homology at cps gene level hinder a complete differentiation. Thus, we decided to develop a qPCR assays to detect specifically the abovementioned serotypes and then updating the Spanish epidemiological situation.

Material and Methods

Novel qPCR assays targeting cpsK gene were validated using reference strains and clinical strains previously characterized by serological methods and mamaPCR described by Lacouture et al. Furthermore, other 98 clinical strains coming from 49 different Spanish farms already characterized either as serotypes 1_14 (n=45) or 2_1/2 (n=53) were analyzed by qPCR and mamaPCR. Inconsistent results were solved through Sanger sequencing. In addition, virulence marquers (VM: sly_epf_mrp) were studied.

Results

qPCR was capable to determine the serotype of every isolate and both techniques presen ted an almost perfect concordance (Kappa=0.94). Forty-four samples (98%) of the 1_14 isolates were confirmed as serotype 1 meanwhile 1 isolate (2%) was determined as serotype 14. Thirty-one strains (58%) of the 2-1/2 isolates were confirmed as serotype 2 whereas 22 isolates (42%) were characterized as 1/2. All the isolates belonging to serotypes 1, 2 and 14 presented the same VM pattern: sly+_epf+_mrp+. Serotype 1/2 isolates showed 3 different VM combinations: sly+_epf+_mrp+(68%); sly-_epf-_mrp+(13%); sly+_epf-_mrp+ (18%)

Discussion and Conclusion

This is the first research revealing that the vast majority of serotype 1_14 in Spain are indeed serotype 1 (98%). This new molecular tool would allow laboratories to offer an accurate characterization for some of the most relevant serotypes of S. suis. Moreover, these qPCR can be performed directly on clinical samples allowing a faster diagnosis.

BBD-OP-03

ANTIMICROBIAL SUSCEPTIBILITY PROFILES OF MYCOPLASMA HYORHINIS STRAINS ISOLATED FROM DISEASED SWINE ACROSS EUROPE BETWEEN 2019 AND 2021

U. Klein [1], D. Földi [2], N. Belecz [2], S. Catania [3], A. Dors [4], U. Siesenop [5], P. Vyt [6], Z. Kreizinger [2], M. Gyuranecz [2]

[1]*Huvepharma NV Antwerp, Belgium*
[2]*Veterinary Medical Research Institute Budapest Hungary*
[3]*Istituto Zooprofilattico Sperimentale della Venezie, Legnaro, Italy*
[4]*Department of Swine Diseases, National Veterinary Research Institute, Al. Partyzantów 57, 24-100 Puławy, Poland*
[5]*University of Veterinary Medicine Hannover, Institute for Microbiology, Bischofsholer Damm 15, 30173 Hanover, Germany*
[6]*Dialab, diagnostic laboratory, Belgium*

Background and Objectives

Mycoplasma hyorhinis is a facultative pathogenic bacterium prevalent world-wide. Clinical signs of the infection are mainly polyserositis and arthritis, which are present in three to ten weeks old weaners and finishers. M. hyorhinis infection can also induce more severe lung lesions in the presence of other pathogens. The economic losses due to the infection can be reduced by targeted antibiotic treatment. The aim of this study was to determine minimal inhibitory concentrations (MIC) of antibiotics potentially used in cases of M. hyorhinis infection treatment in swine production.

Material and Methods

Seventy-four M. hyorhinis isolates (20 Hungarian, 20 Italian, 19 Polish, 13 German and 2 Belgian) collected between 2019 and 2021 from various tissues and the type strain (NCTC10130) were examined by broth micro-dilution tests for ten antimicrobial agents. Clinical breakpoints for MIC result interpretation on Mycoplasma spp. are currently not available.

Results

Low concentrations of tiamulin (MIC_{90} 0.312 µg/ml), doxycycline (MIC_{90} 0.156 µg/ml), oxytetracycline (MIC_{90} ≤0.125 µg/ml), florfenicol (MIC_{90} 2 µg/ml) and enrofloxacin (MIC_{90} 0.625 µg/ml) inhibited the growth of most of the clinical isolates. A mono-modal MIC distribution was determined for these antibiotics. Numerous isolates showed decreased susceptibility to macrolides and lincomycin (MIC_{90} >64 µg/ml for lincomycin, tulathromycin and tilmicosin and MIC_{90} 5 µg/ml for tylvalosin) with bimodal MIC distribution.

Discussion and Conclusion

The study results show variable antimicrobial susceptibility among M. hyorhinis isolates against different antibiotics. The data underline the importance to continue susceptibility monitoring on pan-European level and to use antibiotics responsibly for treatment purposes. Based on our results, tetracyclines and tiamulin are the most effective compounds against European M. hyorhinis isolates in vitro.

BBD-OP-04

POST-WEANING DIARRHEA: SEROTYPES, VIROTYPES AND ANTIMICROBIAL SUSCEPTIBILITY OF ESCHERICHIA COLI STRAINS ISOLATED SINCE 2014 IN FRENCH PIG FARMS

S. Vigneron [1], B. Fily [1], F. Boutin [1], V. Burlot [1], N. Geffroy [1]
[1]*Elanco France SAS – Crisco Uno, Bâtiment C, 3-5 avenue de la Cristallerie, CS 80022 - 92317 Sèvres CEDEX*

Background and Objectives

Post-weaning diarrhea (PWD) due to Enterotoxigenic Escherichia coli (ETEC) is a major cause of mortality and reduces growth performance in pig farms. Since 2014, a diagnostic tool named Epidémiocoli™ using 5 rectal swabs can be used in France to detect ETEC from piglets with PWD. Bacteriological examination (serotyping), antimicrobial susceptibility testing and PCR for virulence genes (virotyping) from the Escherichia coli (E. coli) isolates are performed. The aim of this study was to describe serotypes, virotypes and resistance to antibiotics of E. coli strains isolated since 2014 from PWD cases in French pig farms.

Material and Methods

The database containing 4559 bacteriological results and 2091 PCR results was analyzed. Data between 1st January 2014 to 31th December 2020 from piglets between 3 to 12 weeks of age with suspected PWD were included in this study.

Results

Descriptive analysis of serotypes, virotypes and antimicrobial susceptibility testing shows that:
- 51% of E. coli strains were typable for serotyping and belong to serotypes O138:K81, O139:K82, O141:K85 or K88 (also called F4);
- most frequent virotypes associated with E. coli O138:K81 was F18:STa:STb:Stx2e, with E. coli O141:K85 was F18:STa:STb and with E. coli K88 was F4:LT1:STb;
- 50% of non-typable E. coli by serotyping were positive for F4 and/or F18 adhesin and enterotoxins;
- compared to non-ETEC strains, ETEC F4 and ETEC F18 were numerically more resistant for colistin and neomycin and significantly more resistant to apramycin ($p<0,05$).

Discussion and Conclusion

This study confirms a high prevalence of ETEC F4 and/or ETEC F18 in cases of diarrhea after weaning and highlights the importance of virotyping in the diagnostic of E. coli strains isolated during PWD. This also shows the value of preventive measures such as vaccination against ETEC F4 and F18 strains to fight against antibiotic resistance.

BBD-OP-05

EXPLORATIVE FIELD EXAMINATION ON THE USE OF ORAL FLUID SAMPLES (OFS) FOR THE DETECTION OF LAWSONIA INTRACELLULARIS AND BRACHYSPIRA HYODYSENERIAE BY PCR

M. Eddicks [2], G. Reiner [1], S. Junker [2], S. Becker [1], M. Ritzmann [2]

[1]*Department for Veterinary Clinical Sciences, Justus-Liebig-University Giessen, Frankfurter Strasse 112, Giessen, Germany*

[2]*Clinic for Swine at the Centre for Clinical Veterinary Medicine, LMU Munich, Oberschleißheim, Germany*

Background and Objectives

The ease in use of OFS increases the compliance of diagnostics in swine farms, which is a major concern regarding targeted measures to improve animal health and to reduce the use of antimicrobials. Oral fluids are an easy and cost effective way for surveillance of major respiratory swine-pathogens. Less is known about the suitability of OFS for the surveillance of enteric pathogens in the field. In the present examination, we compared pen-based- follow-up PCR-results of pooled feces samples (PFS) and OFS relating to L. intracellularis and B. hyodysenteriae.

Material and Methods

In total, we collected 66 OFS and 66 PFS from two farms. We conducted a follow-up pen-based sampling (farm 1: 12 pens, no L. intracellularis vaccination; farm 2: 10 pens, L. intracellularis vaccination) of OFS and PFS in two fattening farms at the 12th, 16th and 20th week of age of the animals. One rope was used for 20 animals. Three freshly dropped feces samples were pooled per pen. OFS and PFS were examined for L. intracellularis and B. hyodysenteriae by a quantitative multiplex PCR.

Results

Both farms were positive for L. intracellularis. In total, 45.5 % and 37.9 % of the OFS or PFS were positive by PCR (farm 1: 55.6 % / 36.1 %; farm 2: 33.3 % / 40.0 %) respectively. B. hyodysenteriae was present only on farm 2. On this farm 23.3 % of all OFS and PFS were PCR positive for B. hyodystenteriae. The PCR-results revealed no significant differences concerning the number of positives or the bacterial load in both sample types and for both pathogens.

Discussion and Conclusion

Our results indicate that L. intracellularis and B. hyodysenteriae can be added to an existing pen based OFS-surveillance program. To generalize our results large scale examinations should be conducted.

BBD-OP-06

EXPERIMENTAL CHALLENGE OF LEPTOSPIRA INTERROGANS SEROVAR ICTEROHAEMORRHAGIAE FAILS TO ESTABLISH INFECTION IN NAIVE GILTS

R. Steinparzer [1], S. Dürlinger [3], C. Knecht [3], R. Renzhammer [3], O. Al Salem [3], S. Takács [3], F. Schmoll [1], A. Steinrigl [1], Z. Bagó [1], D. Willixhofer [1], I. Schwendenwein [2], A. Ladinig [3], C. Unterweger [3]

[1]*Institute for Veterinary Disease Control Mödling, Austria*

[2]*Clinical Pathology Platform, University of Veterinary Medicine Vienna, Austria*

[3]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Antibodies against Leptospira interrogans serovar Icterohaemorrhagiae are a common finding in porcine serum samples, but there is no information available about prevalence based on direct detection, pathogenicity and infection dynamics in pigs. The objective was to determine serological, clinical, pathological and haematological responses and the detectability in different sample matrices from gilts after experimental infection with Icterohaemorrhagiae (RGA strain).

Material and Methods

Eight seronegative fertile gilts were divided into three groups: control (n=2), challenge (n=3; 10ml of 10^8 leptospires/ml i.v.) and contact (n=3, no infection, direct contact to challenge group). Until necropsy four weeks after infection, a daily clinical examination and periodic sampling of blood, urine and vaginal swab, starting 36 hours post infection, were done. Blood and urine chemistry analysis were performed and sera were tested by MAT. Sera, urine, vaginal swabs and tissue samples were tested by qPCR (targeting lipL32 gene) and bacterial culture was additionally performed from urine and tissue samples (EMJH-STAFF medium).

Results

Pyrexia was noted three hours after infection, but otherwise no clinical signs were obvious during the course of experiment. An L.Icerohaemorrhagiae seroconversion was seen in infected animals only, starting between four and seven days after infection and with maximal antibody titres of 1:1600. Surprisingly, Leptospira were undetectable by qPCR and bacterial culture in sera, urine samples, vaginal swabs or tissue samples. No significant differences were found in urine, but in blood chemical results (ALT) amongst groups.

Discussion and Conclusion

Despite the pyrexia and a clear seroconversion there was no indication of an experimental infection. It can be hypothesized that either the isolate has lost its pathogenicity or Icterohaemorrhagiae is not pathogenic for the pig at all. If bacteremia and excretion was completed within the first 36 hours, this could explain why we never found the pathogen. It is not comprehensible why contact animals never got infected.

BBD-OP-07

CORE GENOME MULTI LOCUS SEQUENCE TYPING REVEALS NEW INSIGHTS INTO THE EPIDEMIOLOGY OF MYCOPLASMA HYORHINIS

M. Bünger [1], A. Ladinig [1], J. Spergser [2]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[2]*Institute of Microbiology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

M. hyorhinis is an ubiquitous commensal of the upper airways in swine but is also associated with different forms of diseases and has a tropism for serous membranes. Although systemic spread after damaging of the respiratory epithelium is suspected, the pathogenesis of M. hyorhinis infection is not yet fully understood. Core genome multi locus sequence typing (cgMLST) allows for detailed genomic comparison of strains and therefore grants new insights into M. hyorhinis infections.

Material and Methods

CgMLST profiles of nine M. hyorhinis strains, originating from either one farm (farm C) or one individual animal (farms A, B), were chosen for comparison. Strains had previously been isolated from lungs (all farms), serosa (farms A, B), synovial fluid (farms B, C) and cerebrospinal fluid (farms A, C). Sampled pigs showed symptoms and also lesions known to be associated with M. hyorhinis infections including pneumonia (all farms), arthritis (farm C) and serositis (farms A, C) as well as central nervous symptoms (farms A, C).

Results

While there were no isolates sharing identical allele profiles, cgMLST profiles (453 target genes) of all respective strains from each farm formed so-called clonal clusters (≤ 8 allele differences), indicating clonal relationship at the core genome level. Between isolates from different farms, the number of allele differences was 250 or higher.

Discussion and Conclusion

The close relationship of M. hyorhinis strains within one epidemiological unit recommend cgMLST as the method of choice for future epidemiologic investigations of M. hyorhinis infection. While the factors responsible for invasion and systemic spread still remain unclear, core genome-based clonal relationship between isolates from lungs and serous membranes suggest that differences in invasiveness could possibly be associated with genes and their products of the more dynamic and variable accessory genome. Consequently, combining cgMLST with accessory gene typing might grant more detailed insights into the pathogenicity of M. hyorhinis.

IMM-OP-01

EVALUATION OF PRRS MLV VIREMIA AND TRANSMISSION FOR A BETTER PREVENTION OF RECOMBINATION BETWEEN VACCINE STRAINS

S. Mahe [1], P. Renson [1], M. Andraud [1], M. Le Dimna [1], N. Rose [1], F. Paboeuf [1], O. Bourry [1]
[1]*Anses-Ploufragan/Plouzané/Niort Laboratory, BP 53, 22440 Ploufragan, France*

Background and Objectives

Virulent vaccine-derived recombinant PRRSV-1 strains have been recently identified. Recombination between PRRSV-1 MLVs (MLV1) may occur when pigs, viremic for a first MLV1, are vaccinated or contaminated (through natural transmission) by a second MLV1 strain. To prevent recombination between MLV1s, it is thus essential to know the viremia duration and transmission abilities of the MLV1s. In the present study, we monitored in growing pigs the vaccine viremia and the transmission capacities of 4 MLV1s and 1 PRRSV-2 MLV (MLV2) approved in Europe.

Material and Methods

Groups of 6 specific-pathogen-free piglets were either vaccinated with Porcilis PRRS (Porci), Unistrain PRRS (Uni), Ingelvac PRRSFlex EU (Flex), Suvaxyn PRRS MLV (Suv) or with Ingelvac PRRS MLV (MLV2). Just after vaccination, contact pigs were added to evaluate the MLV direct transmission. Blood samples were collected twice a week during 8 weeks post-vaccination to monitor each MLV viremia by RT-qPCR. Transmission parameters were estimated by mathematical modeling.

Results

In vaccinated pigs, two profiles for the duration of MLV viremia were identified: a long lasting viremia for Porci, Uni and MLV2 (mean=50, 53, 50 days respectively), and a shorter viremia for Suv and Flex (mean=44 and 39 days respectively). Regarding the viral loads, MLV2 and Flex groups showed the highest and the lowest viremia, respectively, whereas Porci and Suv showed similar intermediate viremia. The Uni viremia level was between that of MLV2 and Porci/Suv groups. The transmission rate (â) of the vaccines was also strain dependent. While no transmission was observed with Flex (â=7.7E-07), Uni and MLV2 showed high â (4.5E-2 and 3.2E-2 respectively), whereas Porci and Suv showed lower â (6.1E-3 for both).

Discussion and Conclusion

This study demonstrates that the MLVs show different profiles of viremia and transmission that should be considered to prevent the recombination between PRRSV vaccine strains.

IMM-OP-02

IMPROVING COLOSTRUM, NEONATAL PIGLET IMMUNITY AND PERFORMANCE WITH ALGAL BETA GLUCANS

M. Costa [1], C. Abércio Da Silva [2], R. Neto [3], S. Kirwan [4]
[1]*Kemin South America, Brazil*
[2] *Londrina State University, Londrina, Brazil*
[3]*Kemin Europe NV*
[4]*Kemin Industries, USA*

Background and Objectives

A piglet has 24h to benefit from colostrum. Intake and quality are crucial for piglet health. Algal derived â1-3 glucans have been shown to benefit piglet immunity in scientific trials, this study aimed to investigate benefits in a commercial setting.

Material and Methods

On a commercial 2500 sow farm, 120 sows and litters were included in the study, (1st-6th parity). The study started on day 85 of pregnancy and lasted until weaning on day 21. The sows were split in control and â-glucan group, which received the basal diets with 200g/t dried algae beta-1.3-glucan on top. The measured parameters were piglets born (dead and alive) their weights, number of piglets weaned and their weights, as well as feed consumption of the sows. Within 6 hours of parturition, colostrum was manually collected from 20 randomly selected sows per treatment for immunological profiles. At 18h hours post-partum colostrum ingestion was evaluated and 4 days post-partum, blood was collected from 20 piglets, to evaluate immunological profiles.

Results

There was no effect on piglets born or live weights at birth. Treated sows showed higher colostrum production ($p<0.05$). Piglets ingested more colostrum ($p<0.05$) and showed an improved weight gain in the first day ($p<0.05$). Colostrum and blood immune parameters improved significantly; the largest changes were to colostrum IgG levels in the supplemented group, 40.89 mg/mL compared to 27.04 mg/mL for the control. The same could be observed for IgA and IgM, increasing 120% and 144%, respectively in relation to the control.

Discussion and Conclusion

With hyper prolific sows, more and better colostrum is crucial, as the source of energy and immunity for the piglet. Supplementation of algae 1.3-â-glucans, resulted in improved piglet weights at 18h after delivery and a higher concentration of IgG, IgA and IgM. These piglets consumed more colostrum and gained more weight.

IMM-OP-03

DIAGNOSTICS AND IMMUNOPROPHYLAXIS AGAINST PORCINE INFLUENZA VIRUS A, SUBTYPE H1PDMN2

J. Buch [1], C. Grosse-Kock [2], I. Spiekermeier [1], K. Teich [1], C. Helmer [1]
[1]*AniCon Labor GmbH, Hoeltinghausen, Germany*
[2]*proagrar Vet, Borken, Germany*

Background and Objectives

Influenza A virus (IAV) infections cause high economical loss in swine production systems around the world. RNA-virus specific point mutations as well as the segmented character of the virus lead to continuous development of antigenetically diverse subtypes that severely change the epidemiology and immunity of the infection. Immunoprophylaxis against IAV is challenging as there is only a limited cross protection between different subtypes. The presented case is about a piglet producer with 700 sows and a connected piglet rearing area that was confronted with recurring Influenza infections in the rearing area. Different vaccination protocols of sows and piglets with licensed vaccines against the subtypes H1N1, H1N2, H3N2 and H1pdmN1 could not decrease the incidence of clinically respiratory cases in the age group of week 5-10.

Material and Methods

A broad spectrum of real-time PCR set-ups (KyIt® Influenza A FLI-B 672; KyIt®H1pdm; LSI VetMAXTM SIV Subtyping) were used for identifying the responsible IAV subtype in nasal swabs of acute diseased piglets. Nasal UTM swabs were taken for virological cultivation in egg and cell culture.

Results

Molecular diagnostics as well as virus cultivation repeatedly identified the subtype H1pdmN2. The autogenous vaccine (AV) prepared from the obtained H1pdmN2-isolate finally brought the hoped-for success. Sows were vaccinated twice for primary immunisation and boostered at 90-day intervals. Piglets from AV vaccinated sows showed no signs of respiratory disease during the flatdeck period. Protection against IAV also significantly reduced secondary bacterial infections and the associated frequency of antibiotic therapy.

Discussion and Conclusion

The presented case study demonstrates impressively the complexity of IAV infections in pig farms and the resulting consequences for effective immunoprophylaxis. In certain cases, the use of an autogenous vaccine against IAV might be a promising option to reduce the infection pressure within the herd as well as to reduce clinical symptoms of an IAV infection.

IMM-OP-04

IMPACT OF EARLY-LIFE CHANGES ON PIGS' HEALTH, GROWTH AND WELFARE IN A COMMERCIAL FARM.

S. Gavaud [1], K. Haurogné [1], A. Buchet [2], I. Garcia-Vinado [3], M. Allard [1], M. Leblanc-Maridor [4], J. Bach [1], C. Belloc [4], B. Lieubeau [1], J. Hervé [1]

[1]*IECM, USC 1383, Oniris, INRAE*

[2]*COOPERL INNOVATION, Pôle innovation en Sciences Animales, 1 Rue de la Gare, 22640 Plestan, France*

[3]*HYOVET, 5 PA Penthièvre, 22640 Plestan, France*

[4]*BIOEPAR, INRAE, Oniris, 44307, Nantes, France*

Background and Objectives

In pig husbandry, weaning is a stressful period, critical for piglets that are abruptly separated from their mother and mixed with unfamiliar congeners in an unknown environment. This often leads to conflicts for the establishment of a novel hierarchy. Piglet growth is consequently slowed down at this period and the risk of gastrointestinal disease and associated mortality is increased. In this context, this project aimed at comparing, in a conventional commercial farm, the consequences of alternative rearing conditions, compared to standard ones, on pigs' health, performances and welfare, from day 10 to slaughter.

Material and Methods

We followed 155 pigs, raised under standard (n=75) and alternative (n=80) conditions. Alternative conditions included birth in free-farrowing pens, early-socialization from postnatal day 9 and maintenance of early-constituted social groups until slaughter. Also, piglets were not tail-docked in this group. Visits were made throughout pigs' life to evaluate individual growth and health. Body and tail lesions were scored as proxy measures of aggressiveness. Blood and bristle samples were periodically collected to evaluate stress, inflammation and immune competence.

Results

The overall performances of pigs were similar among groups. At weaning, piglets reared under alternative conditions exhibited fewer and less severe body lesions than standard pigs. Also, their numbers of circulating leukocytes were significantly higher. One week after, cannibalism occurred mainly in the alternative group and was associated with higher concentrations of serum CRP and hair cortisol at day 36 and haptoglobin at day 66. Vaccination against PCV2 at weaning was efficient in both groups.

Discussion and Conclusion

Early-socialization may have better prepared piglets for weaning. However, the whole-life maintenance of early-established social groups was not sufficient to prevent cannibalism in whole-tail pigs despite the enrichment provided into pens. This demonstrates the importance of field studies to assess the transposability of alternative rearing practices and their relevance to pigs' health and welfare.

AWN-OP-01

A MULTIDISCIPLINARY APPROCH TO INVESTIGATE DIGITAL LESIONS IN SWINE

S. Bariselli [1], N. Zappaterra [2], P. Riccaboni [2], E. Scanziani [2], D. Zani [2], A. Gazzola [1], C. Tansini [1], F. Scali [1], G.L. Alborali [1], F. Vezzoli [1], A.M. Maisano [1]

[1]*Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Brescia, Italy*

[2]*Department of Veterinary Medicine, University of Milan, Lodi, Italy*

Background and Objectives

Despite claw lesions represent a serious issue for pig welfare, they are usually not considered in scoring systems used to assess animal welfare (AW). Furthermore, dealing with those lesions is challenging due to their multifactorial nature. The aim of this study was to investigate those somewhat neglected lesions at the slaughterhouse using a multidisciplinary approach.

Material and Methods

Overall, digital swelling from eight limbs of seven pigs with claw lesions were sampled and macroscopically evaluated at the slaughterhouse. Computed Tomography (CT) and two X-ray projections (one dorsal-plantar and one latero-medial) were performed. Longitudinal sections of each limb were obtained, and macroscopical alterations were then described. Histological examination of Hematoxylin and Eosin-stained tissue sections from three limbs was performed as well.

Results

Only one toe per limb was affected by a lesion, mainly the lateral ones (six out of eight limbs). The most common lesion was horizontal wall crack (n=6). Radiography and CT localized the lesion in proximal and/or interphalangeal joints, severe arthritis was frequent (n=7). In all limbs a diagnosis of osteoarthritis, with some cases of osteomyelitis (n=2), was made. Both the anatomopathological examination and the medical imaging detected severe inflammatory and/or degenerative processes in all limbs. Histological analysis showed the presence of suppurative inflammation of soft tissue surrounding the bones, with granulocytic infiltration and partial disruption of cartilages.

Discussion and Conclusion

In our study claw lesions were associated with severe chronic inflammatory/degenerative processes involving the interphalangeal joints, likely the result of a previous septic arthritis. Repeated claw traumatisms can cause lesions from which septic processes begin. Moreover, these lesions are associated with intense pain and lameness in pigs and can be the outcome of management or structural problems. Considering their implication for AW, claw lesions could be included among the iceberg indicators used at slaughter to assess AW conditions at the farm.

AWN-OP-02

ANALGESIC EFFECT AND APPLICABILITY OF LOCAL ANESTHESIA FOR PIGLET CASTRATION

P. Deffner [1], S. Steffanie [1], N. Abendschön [1], M. Ritzmann [1], S. Zöls [1]
[1]*Clinic for Swine at the Centre of Clinical Veterinary Medicine, Ludwig-Maximilians University Munich*

Background and Objectives

Since 2021, pain elimination is obligatory for piglet castration in Germany. Currently, the efficacy of local anesthesia is still discussed controversially and is consequently not accepted as a legally compliant method for eliminating pain during piglet castration. To evaluate the analgesic effect and applicability of local anesthesia during piglet castration, lidocaine was administered intratesticulary and subscrotally with three different injection techniques.

Material and Methods

In total, 237 piglets (3-7 days of age) from 60 litters in 9 farrowing groups were included in the study and allocated to one control (castration without anesthesia) and three lidocaine injection groups: one-step injection with an 8mm/25G cannula with additional lateral openings allowing a simultaneous application without repositioning (F), two-step injection with a conventional 16mm/25G cannula (C), and two-step injection with a conventional but shortened 8mm/25G cannula (S). Per testicle, 0.6 ml lidocainehydrochloride 2% with epinephrine hydrogen tartrate 0.001 % were administered (F: 0.6 ml in once; C, S: 0.4 ml depot intratesticular, 0.2 ml during retraction of cannula). During injection and/or castration, defensive movements and side effects were assessed and evaluated.

Results

Using lidocaine, a significant reduction of defensive movements during castration was observed, independently of the injection technique used. Nonetheless, injection of lidocaine induced heightened defensive behavior in all three groups. However, significantly more defensive movements were observed using the one step injection method (F) than in groups C and S with two-step injection technique. Two piglets died 15 min after injection of lidocaine.

Discussion and Conclusion

The use of lidocaine reduced pain during castration. However, an increase of defensive movements during injection was observed which suggests that injection is painful. Although the one-step injection with the fenestrated needle is more user-friendly and faster, this advantage might not outweigh the fact that it provokes more defensive movements during injection than both other injection techniques.

AWN-OP-04

ANESTHETIC DEPTH AND NARCOTIC INCIDENTS OF AUTOMATED ISOFLURANE ANESTHESIA DURING PIGLET CASTRATION.

S. Gumbert [1], H. Haertel [1], M. Beisl [1], A. Wernecke [1], E. Winner [1], M. Ritzmann [1], S. Zoels [1]
[1]*Clinic for Swine at the Centre of Clinical Veterinary Medicine, Ludwig-Maximilians University Munich*

Background and Objectives

Since the beginning of 2021 the anesthetic-free castration of suckling piglets is prohibited by law in Germany. As one option, castration under automated isoflurane anesthesia can be performed by farmers without the attendance of a veterinarian. The devices for this anesthesia have been adapted and certified according to the legal specifications for the German market. In the present study the automated isoflurane anesthesia for suckling piglet castration was evaluated regarding anesthetic depth, narcotic incidents and recovery period.

Material and Methods

A total of 2764 under eight days old piglets on 2 farms were castrated under automated isoflurane anesthesia after the administration of a non-steroidal anti-inflammatory drug. Anesthesia was performed using either the PorcAnest® 3000 or the PigNap 4.0 anesthetic device. Defensive reactions during castration as well as possible influencing parameters such as weight, age, farm and housing type (conventional housing/outdoor climate housing) and the occurrence of anesthetic incidents were evaluated. Recovery periods of the piglets were recorded.

Results

Overall, 95.4% and 94.4% of the piglets castrated with the PorcAnest and PigNap, respectively, showed movement score 0 and 1 that correspond to no or only one short, not reproducible defensive movement of one leg. The parameters weight and farm influenced significantly the occurrence of defensive movements, in contrast to the parameters age and housing type. Anesthetic incidents, such as apnea or cardiovascular arrest, occurred in 0.7% of the piglets, no losses were recorded. Mean recovery period lasted 6.2 to 7.3 minutes depending on the location of the piglet crates.

Discussion and Conclusion

Piglet castration under automated isoflurane anesthesia can lead to a rate of over 95% of animals showing sufficient anesthesia. The low number of anesthetic incidents and the short recovery period underline the advantages of the method for animal welfare.

AWN-OP-05

PAIN MANAGEMENT DURING SURGICAL CASTRATION OF MALE PIGLETS : A COMPARATIVE STUDY

A. Waret-Szkuta [1], G. Poudevigne [3], C. Durand [2], E. Maze [3], M. Koralewski [3], O. Maniaval [4], C. Meymerit [5], R. Rossel [6], V. Simoes [7], D. Concordet [3]

[1]*Ecole Nationale Vétérinaire, Toulouse, France*

[2]*Interprofession porcine d'Occitanie, 2 Allées Brisebois, 31322 Castanet-Tolosan*

[3]*ENVT, 23 Chemin des Capelles, 31076 Toulouse Cedex 3*

[4]*SOCSA Elevage, 31240 l'Union*

[5]*Interface Elevage, 1219 route de Pau, 64410 Vignes*

[6]*AREPSA, ASPNA, Route de Samadet, 64410 Arzacq*

[7]*Les Bastides du Sud, 9 chemin Brousse, 64160 Morlaàs*

Background and Objectives

In 2022, surgical castration of piglets by farmers will be prohibited in France with exceptions for which a pain management protocol combining local anaesthesia and analgesia will be mandatory. We report a randomized double-blind study in a commercial farm that aimed at proposing an operational solution.

Material and Methods

One hundred and one male piglets aged 3 to 5 days from 18 litters were randomly assigned, either to a "treated" group (n= 48) castrated with a protocol combining sucrose 30% orally, Trisolfen® (lidocaine, bupivacaine, adrenaline, cetrimide) by local instillation and meloxicam intramuscularly; or a "control" group (n=53) receiving meloxicam intramuscularly. The piglets' expression of pain was assessed by studying their vocal responses and nociceptive motor responses during surgery using audio and video recordings. For the post-operative part, statistical analyses were performed on observations of 7 behaviours reported as relevant in the literature (huddled up, kyphosis, scratching, tail wagging, prostration, stiffness, trembling).

Results

Age and mean weight of piglets in each group was comparable (1.91 kg vs 1.88 kg, p=0.72). The maximum intensity of vocalizations and area-under-the-curve measurement at most observation times of the surgical procedure were significantly lower in the treated group than in the control group ($P < 0.05$). The number of nociceptive movements over the same period decreased in the treated group (ordinal regression coefficient: -0.72), which reflected the observed pain reduction. Post-operatively, pain intensity was lower in the treated group within 15 minutes of returning to the pen and with more piglets without signs of pain compared to the control group.

Discussion and Conclusion

The tested protocol appeared efficient in providing per and post operative pain relief when performing surgical castration on piglets less than 7 days old. After adaptation to the rearing conditions, it was selected to be proposed by french veterinarians in field when alternatives to surgical castration cannot be implemented.

AWN-OP-06

VITAMIN D3 SERUM LEVELS IN FINISHER PIGS AT SLAUGHTER

T. Geudeke [1], K. Eenink [2], M. Houben [2], M. Olde Monnikhof [3]
[1]*Royal GD, Deventer, The Netherlands*
[2]*GD Animal Health, Deventer, The Netherlands*
[3]*Ceva Santé Animale, Naaldwijk, the Netherlands*

Background and Objectives

An important task of Royal GD in Deventer is to monitor the health status of pigs in the Netherlands. As part of the monitoring system, we register all questions asked to our veterinary helpdesk. Since 2013, most questions regarding health conditions, involve lameness in finisher pigs and breeding gilts. In this context, it has been suggested that vitamin D3 supplementation in pigs is insufficient nowadays since D3 in pig feed is limited to 2000 IU/kg feed by EU regulation. In pigs, a serum level below 75 nmol/L is considered hypovitaminotic and below 50 nmol/L imposes an augmented risk for pathology (locomotive problems and infectious diseases).

Material and Methods

To investigate the current vitamin D3 status of finisher pigs, we conducted a pilot study in 2021 in slaughter pigs from 49 conventional and 7 organic farms. At slaughter, ten blood samples per farm were collected and tested for D3 by chemiluminescence.

Results

The mean serum vitamin D3 levels in pigs were 88 nmol/L (stdev 15.9) in conventional farms and 133 nmol/L (stdev. 56.6) in organic farms. In 18% of the conventional farms the mean concentration was below 75 nmol/L and in 18% above 100 nmol/L. In the latter group, mostly a specific vitamin premix was used ($P<0.01$). Furthermore, these farms reported a better daily growth rate and less health issues (n.s.).

Discussion and Conclusion

Apparently, it is possible to reach a sufficient level of serum vitamin D3 in finisher pigs despite the maximum level of 2000 IU/kg in feed. However, between farms large differences exist. The mean level in pigs from organic (outdoor) pigs is higher than in conventionally kept pigs, likely due to D3 synthesis in the skin. Further investigation should reveal the status in other age groups and whether serum levels of D3 are related to health parameters.

REPRODUCTION

REP-OP-01

EVALUATION OF AN ARTIFICIAL INTELLIGENCE SYSTEM FOR ESTRUS DETECTION IN SOWS

S. Verhoeven [1], I. Chantziaras [2], M. Loicq [3], L. Verhoeven [4], D. Maes [1]

[1]*Unit of Porcine Health Management, Department of Reproduction, Obstetrics and Herd Health, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium*

[2]*Department of Reproduction, Obstetrics and Herd Health, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium*

[3]*NoHow, Bredene, Belgium*

[4]*Eindhoven, The Netherlands*

Background and Objectives

Good estrus detection in sows is essential to predict the best moment of insemination. Technological innovations are currently available which can detect the estrus of the sow via connected sensors and cameras. The data are subsequently analyzed by an artificial intelligence system. The present study investigated whether an AI system (Smart Sow Breeding) could support the farmer to optimize breeding management.

Material and Methods

Three Belgian farms using this AI system were included. The reproductive data, before and after using the system, were evaluated by analyzing a total of 9,917 cycles. Next to that, data on onset and duration of estrus and number of inseminations per estrus were collected from two farms (n= 2,261 cycles).

Results

The following significant changes were found (P<0,05): percentage of repeat breeders in farm A decreased with 3.2% whereas this number increased in farm B with 3.7%; percentage of sows that farrowed after first insemination raised with 3.1% to 80.1% in farm A; Both, the number of total born piglets per litter in farm A and C increased with 1.86 and 0.45, respectively, whereas it decreased with 0.7 in farm B.

When using the system, weaning to estrus intervals in farm B (82-90h) and C (78-89h) were shorter than those determined by the worker (B: 95-108h, C: 92-112h). Estrous duration was determined by the system in farm B (58-60h) and farm C (48-57h) whereas the worker's determination in farm B was longer (62-108h) and varied in farm C (38-63h). The mean number of inseminations per estrus upon using the system decreased in farm B (2.40 versus 1.28), and farm C (2.36 to 1.01). Other variables were not statistically significant.

Discussion and Conclusion

The artificial intelligence system can help farmers to improve the reproductive performance of sows in pig herds, but the effects are variable between farms.

REP-OP-02

INFLUENCE OF THE PARTURITION AND DIFFERENT SOW AND PIGLET TRAITS ON UTERINE INVOLUTION IN A FREE FARROWING SYSTEM

P. Egli [1], G. Schüpbach [2], H. Nathues [4], S. Ulbrich [3], A. Grahofer [4]
[1]*ETH Zürich Animal Physiology, Institute of Agricultural Sciences, Zurich, Switzerland*
[2]*Veterinary Public Health Institute, University of Bern, Liebefeld*
[3]*ETH Zürich, Animal Physiology, Institute of Agricultural Science, Zurich, Switzerland*
[4]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

An inadequate uterine involution can lead to postpartal disorders in sows and thereby negatively affect the performance of the animals. The aim of this study was to evaluate the influence of the farrowing process and different sow and piglet traits on the uterine involution.

Material and Methods

During the first two weeks postpartum, the uterine diameter of three uterine horns from 48 sows was assessed daily by ultrasonography. The following sow and piglets traits were thereby assed: parity, body condition score (BCS), backfat thickness, gestation length, number of live born piglets, number of stillborn piglets, farrowing duration, duration of placenta expulsion, litter weight, placenta weight, number of placenta parts, faecal score, and birth induction. In addition, the body temperature, severity and amount of vaginal discharge, pathological colour of vaginal discharge, and lack of appetite were recorded daily for five days post-partum.

Results

The average diameter of the uteri decreased from 32.5 mm on day 2 post-partum to 11.4 mm on day 12 post-partum, which is a relative regression of 66%. In a linear multiple regression model, a significant influence of the BCS ($p = 0.046$) and the presence of high body temperature ($p = 0.022$) on uterine involution was detected. If the BCS increased by one unit, uterine involution decreased by approximately 8% ($\hat{a} = -8.66$) and if fever was present, uterine involution was almost 6% slower ($\hat{a} = -5.88$). Furthermore, a significant correlation was identified between the gestation length and the uterine involution ($r = 0.31$; $p = 0.035$). However, no significant correlations between the farrowing process and piglets' traits on the uterine involution were detected.

Discussion and Conclusion

BCS, gestation length and fever significantly affected uterine involution in sows. Therefore, these parameters should be routinely monitored in the farrowing management as they might reflect reproductive health post-partum and warrant early intervention.

REP-OP-03

EFFECT OF MODULATED ENERGY IN THE CONSERVATION OF PIG SEMEN DOSES WITH FORMULA 8, LONG TERM EXTENDER.

D.C. Angel [1], R. Bettini [2]
[1]*Research & Development department Medinova Italy , University of Parma*
[2]*University of Parma*

Background and Objectives

The challenge of semen extenders is to maintain sperm quality in this temperature range (16-17°C) where the metabolic rate of spermatozoa and the conditions for bacterial growth compared to storage at lower temperatures are favorable. The objective of the experiment was to evaluate the effect of the modulated energy of the long-term extender Formula 8 for preservation for 8 days on the sperm cells of 3 males of different breeds: Duroc, Landrance, Large white, determining the variation of motility during days 1, 3, 6, 8 of conservation.

Material and Methods

The Formula 8 extender was obtained in Medinova Italy. Semen was collected from 3 fertile males of the Duroc, Landrance, and Large white breeds during 3 months. Diluted semen doses were stored at 16-17°C. The sperm samples' motility was recorded using the motility and concentration module of the SCA® software, to evaluate sperm motility traits at 0, 72, 144, and 192 h.

Results

The results show how progressive motility increases as the days of conservation go on due to the modulation capacity of the extender, having the necessary energy to guarantee the life of the spermatozoon, unlike other commercial diluents in which, in the final period of conservation, progressive motility decreases.

Discussion and Conclusion

In the present study, differences between breeds and the percentage of progressive motility during the storage time were found, observing certain particularities of the Duroc breed in terms of vigor in movement and better progressive motility at the end of the long term storage period. The semen extender influenced the percentage of progressive motility in a significant way On the other hand, it is confirmed once again that the breed is a determining variable to take into account in the parametric analyses of the semen quality.

REP-OP-04

EFFECT OF A 1,25-DIHYDROXYVITAMIN D3 (PANBONIS®), BACK FAT AND FAECAL SORE ON THE FARROWING PROCESS AND PIGLET VITALITY IN A FREE FARROWING SYSTEM

L. Jahn [1], G. Schüpbach [2], H. Nathues [1], A. Grahofer [1]
[1]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*
[2]*Veterinary Public Health Institute, University of Bern, Liebefeld*

Background and Objectives

Vitamin D has been described improving the reproductive efficiency in animals and humans. The aim of this study was to examine the effects of a natural source of 1,25-dihydroxyvitamin D3 (1,25(OH)2D3-gly) (1,25VitD) on the farrowing process in sows and the vitality of their piglets.

Material and Methods

In total, 100 sows were allocated into two groups at insemination ('1.25VitD' and 'negative control'). The 1,25VitD group received 1,25VitD (0.26-0.30 mg/sow/day) in their feed during the gestation period. Backfat thickness and faeces score was evaluated before parturition. During the farrowing process, each expulsion of piglets and placenta parts was documented. Furthermore, the piglets were categorized into alive or stillborn, and vitality was evaluated by assessing the length and integrity of the umbilical cord as well as a meconium score. Retrospectively, the farrowing duration and the intervals between piglets were calculated.

Results

The number of total-born piglets in sows of '1,25VitD' was higher (16.0 vs. 15.1) and the farrowing duration was shorter (494 vs. 586 min) than in the negative control group without showing significance in the univariable analysis. In a multiple regression model including the variables 'farrowing duration', 'total born piglets' and '1,25VitD' significant differences became evident. 1,25VitD influenced the farrowing process by reducing the farrowing duration ($p = 0.05$) and increased the number of total born piglets ($p = 0.01$). Moreover, significantly more mummies were observed in the 1,25VitD group ($p < 0.01$). There was no significant difference in faeces score, backfat thickness or vitality of the piglets.

Discussion and Conclusion

This experimental field study shows a positive effect of a natural source of 1,25VitD on the farrowing process without affecting the piglet vitality. However, more research is needed to describe the mechanism of 1,25VitD in detail and to evaluate the cause for an increased number of mummified piglets.

REP-OP-05

ASSESSMENT OF FACTORS INFLUENCING ALTRENOGEST WITHDRAWAL-ESTRUS INTERVAL (AEI) IN DIFFERENT FARMS

M. Sebastian [1], M. Gomez [1], M. Marcos [2], M. Jiménez [2], R. Menjon [20]
[1]*CUARTE S.L.*
[2]*MSD Animal Health*

Background and Objectives

For farms it is very important to have enough cycling gilts to reach service targets. Proper estrus synchronization can be achieved using altrenogest, administered for 18 days and resulting in gilts coming into heat after a short period of time (approx. 4-8 days). The goal of this study was to understand the duration and variability of AEI considering different factors

Material and Methods

The study was carried out in 3 farms owned by the same company in Spain with DanBred genetics (2 with 800 sows and 1 with 2300 sows). For a year, we monitored gilt altrenogest (Regumate® Porcino, MSD) administration and AEI in a total of 695 gilts (G1 n= 243, G2 n=111, G3 n= 341). Parameters studied: AEI duration by farm, by season and by photoperiod (Increasing-21 December to 21 June, decreasing -22 June to 20 December)

Results

Average AEI differed between farms, G1= 7.37 (SD;1,533), G2=7.04 (SD; 1.095), G3= 6.85 (SD; 1,099), shortest AEI being that of G3 ($p<0,001$). With an AEI of 5-8 days, the % of gilts going into estrus was 85.12% in G1, 88.29% in G2 and 92.08% in G3. By seasons, winter had the shortest AEI (6.7; $p<0,05$) followed by spring (6.8),summer (7.34) and autumn (7,87). For increasing>decreasing photoperiod ($p<0,0001$), AEI in farms was G2>G3>G1for increasing, and G1>G3 ($p=0,011$) for decreasing (G2 no data)

Discussion and Conclusion

Altrenogest use is a practice to achieve service targets. Understanding the AEI helps to align estrus synchronization to weekly targets and to optimize batches. With the results of this field study, we have shown that the farm itself is a parameter affecting AEI, as is the season and the photoperiod, all must be considered to schedule farm activities. Additional studies would be required to understand the impact of individual farm parameters and management practices on AEI

REPRODUCTION

REP-OP-06

IMPACT OF A CIRCOVAC® MASS VACCINATION IN THE SOW HERD ON PRODUCTIVE PARAMETERS FOLLOWING A PCV-2 OUTBREAK IN A FARROW-TO-WEAN FARM

P. Berton [1], A. Lebret [2], V. Normand [2], F. Bouchet [2], M. Brissonnier [2], A. Jardin [3], S. Brilland [3], G. Boulbria [2], C. Teixeira-Costa [4]

[1]PORC. SPECTIVE, Swine Vet practice, Noyal-Pontivy, France

[2]PORC.SPECTIVE, Swine Vet practice, ZA de Gohélève, 56920 Noyal-Pontivy, France

[3]Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France

[4]Rezoolution Pig Consulting Services, Noyal-Pontivy, France

Background and Objectives

PCV-2 clinical outbreak in sows can occur when immune status is low and can lead to reproductive failure. Data are missing about chronological return to baseline (RTB) after implementation of a sow mass vaccination (SMV). This case report aims to investigate reproductive parameters evolution following SMV.

Material and Methods

A 1000-sow farrow-to-wean farm experienced a severe PCV-2 outbreak in 2021, leading to an increase of mummies rate and a drop in prolificacy. PCV-2 diagnosis included clinical signs, PCR results and evocative microscopic lesions in mummies. Two weeks after diagnosis, we implemented 2 SMV four weeks apart (Circovac®) and thereafter booster vaccination at each gestation. Reproductive performances have been compared between 4 groups: not vaccinated sows (G1), sows that didn't receive two vaccinations before mating (G2), sows that received two injections before mating (G3) and fully protected sows (two vaccinations before mating and one booster) (G4). In parallel, mummies were submitted for differential diagnosis in G2 and G4.Reproductive performances in each group were compared using analysis of variance. Then, differences between each pair of means was determined using a Tukey post-hoc comparison test.

Results

Mummies rate was significantly lower in G4 compared to G1 for all parities (7.1% versus 2.4% respectively). The rate of mummies was decreasing group after group. A significant improvement of piglets born alive (13.81 versus 14.84) and wean-to-estrus interval (9.6 days versus 7.2) was also observed in parities 1 to 3. The same was observed in older sows but without significance.PCV-2 has still been diagnosed on mummified in G2 but not in G4.

Discussion and Conclusion

This case higlights that full protective effect of PCV2 sow vaccination is obtained after a complete primary vaccination implemented prior to mating. One should consider this limitation to estimate time to reproductive parameters RTB.

FLASH TALKS

FLASH TALKS

FTP-OP-01

Bacterial diseases

DIFFERENCE IN LAWSONIA INTRACELLULARIS BETWEEN BATCHES AND DAYS POST ENTRY MUST BE CONSIDERED WHEN PERFORMING DIAGNOSTICS OF ILEITIS IN FINISHER HERDS.

S.L. Musse [1], G. Blach Nielsen [2], H. Stege [3], N. Rosager Weber [4], H. Houe [5]
[1]MSD Animal Health Nordic, Havneholmen 25, DK - 1561 København V and University of Copenhagen, Department of Veterinary and Animal Sciences, Section for Animal Welfare and Disease Control, Grønnegårdsvej 8, DK -1870 Frederiksberg C
[2]MSD Animal Health
[3]University of Copenhagen, Department of Veterinary and Animal Sciences, Section for Production, Nutrition and Health, Grønnegårdsvej 2, DK - 1870 Frederiksberg C
[4]SEGES Pig Research Centre, 1609 Copenhagen V, Denmark
[5]University of Copenhagen, Department of Veterinary and Animal Sciences, Section for Animal Welfare and Disease Control, Grønnegårdsvej 8, DK -1870 Frederiksberg C

Background and Objectives

In Denmark, bacterial counts of Lawsonia intracellularis (Li) in sock samples are used to support diagnostics of ileitis by assessing the severity of infection. Based on the assumption that only few differences exist between pens, batches, or time of sampling, generally few samples are collected per herd.
The objective of this study was to evaluate the consistency of Li counts in samples both within and between batches at different days post entry in the finishing unit.

Material and Methods

In one commercial herd with a history of outbreak of diarrhea, sock samples were collected in each of 26 pens in 5 batches at 3, 24 and 45 days post entry (Sample Day). Bacterial counts for Li were determined by qPCR at the National Veterinary Institute, Denmark. Lower detection limit being 3 log10 bacteria/gram faeces. Variation of bacterial counts were analyzed using ANOVA.

Results

A mean Li level of 4.6±2.1 log10 bacteria/gr faeces (range 0-6.3), 6.2±1.0 log10 bacteria/gr faeces (range 3.7-7.6) and 1.8±2.1 log10 bacteria/gr faeces (range 0-5.7) were found 3, 24 and 45 days, respectively, post entry. A significant effect on Li loads was found of Sample Day ($p<0,001$) as well as an interaction between Sample Day and Batch ($p<0,001$).

Discussion and Conclusion

The infection dynamics for Li changes between days post entry in the finishing unit along with the onset of infection in each batch with the variation between pens and batches being highest at onset and decline of the infection.
In conclusion, in order not to misinterpret the possible consequences of a Li infection, it is important to collect samples at several different ages post entry to match the time of sampling to the peak of infection and to include several batches to depict the fluctuations in infection dynamics of Li when evaluating the severity of ileitis by faecal sock sampling.

FTP-OP-02

Bacterial diseases

EVALUATION OF THE FAECAL MICROBIOTA OF HEALTHY POST-WEANING PIGS USING 16S RNA SEQUENCING

M. Klahr Fritz [1], P. Wallgren [2], M. Sjölund [1], M. Leijon [2]
[1]*National Veterinary Institute (SVA), Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden*
[2]*National Veterinary Institute (SVA), Uppsala, Sweden*

Background and Objectives

The upcoming ban of high-dose zinc oxide (ZnO) to prevent post-weaning diarrhoea (PWD) demands better understanding of the intestinal microbiota in pigs post-weaning, as a means for evaluating strategies aimed to prevent PWD. This study investigated healthy pigs post-weaning at a farm using neither ZnO nor antibiotics, to evaluate the effect of weaning on the intestinal microbiota.

Material and Methods

The faecal microbiota signature of 16 healthy pigs post-weaning was studied using 16S rRNA sequencing targeting V_3–V_4 hypervariable regions. Rectal swab-samples were collected in four batches of weaner pigs in the herd on days 0, 3, 7, 10, 14, and 21 post-weaning. Samples were analysed with Illumina MiSeq Sequencing and operational taxonomic units (OTUs) were created using a USEARCH (v.11.0.667) pipeline. OTU tables were used in USEARCH for determining alpha diversities. The OTUs were classified using a taxonomy database formatted for USEARCH based on the 16S sequence database of GenBank.

Results

The phylum Firmicutes dominated with up to 98% in relative abundance, followed by Bacteriodetes with up to 71% in relative abundance. The dominating family within Firmicutes was Clostridia, with a total average of 45% in relative abundance. During mainly days 3–7, Proteobacteria increased from low levels up to 10-30% in relative abundance in some individuals. The mean richness (number of different species represented) increased after weaning and remained on a plateau until day 21, when it decreased to roughly the same levels as at weaning. The average diversity was decreased on day 7 and 10.

Discussion and Conclusion

The faecal microbiota in pigs post-weaning was dominated by bacteria from the phyla Firmicutes and Bacteriodetes. The increased richness post-weaning in these healthy pigs could indicate that a healthy microbiota can adapt to new conditions. The decreased average diversity on day 7 and 10 indicated an increased risk for development of PWD at that time.

FTP-OP-03

Bacterial diseases

SALIVA VS. TONSILLAR SWABBING WITH A NYLON SWAB TO MEASURE ORAL STREPTOCOCCUS SUIS LOAD

L. Faba [1], K. Venrooij [1], P. Van Lith [1], R. Litjens [1]
[1]*Trouw Nutrition R&D, the Netherlands*

Background and Objectives

The gold standard sample to study individual Streptococcus suis prevalence and load by qPCR is the tonsil swab, however, saliva samples are less invasive and may be an alternative approach. This pilot study compared tonsil swabs and saliva samples to measure S. suis in oral cavity.

Material and Methods

Fifteen weaned piglets (6.8±0.41 BW) in 5 pens with 3 piglets, were sampled at days 6, 13, and 19 post-weaning. Individual saliva samples were collected with a cotton swab without handling the pigs. Then, a swab (Eswab®) was collected from tonsils while hand-restraining the pig and using a mouth opener to visualize the tonsils. Analysis of total bacteria, total S. suis, and S. suis serotypes (SS) 1/2 and 9 was conducted by qPCR. ANOVA, Pearson correlation and regression techniques were used to compare swab and saliva samples.

Results

Prevalence of SS1/2 and SS9 were 34% and 91% in saliva and 21% and 97% in tonsils, respectively. Total bacteria and SS1/2 and SS9 had lower log values in swab than saliva ($P<0.05$). A positive correlation between swab and saliva SS9 loads ($r=0.41$; $P<0.01$) were observed, but not for total bacteria, total S. suis, or SS1/2. SS9 showed higher correlation coefficients with total S. suis and total bacteria within saliva sample ($r=0.62$, $r=0.55$, respectively; $P<0.01$) than within swab sample ($r=0.32$, $r=0.31$, respectively; $P<0.05$). Saliva was more homogeneous than the swabs: SS9 means, and standard deviations were 4.17±0.77 log cells/swab and 4.81±0.65 log cells/mL saliva.

Discussion and Conclusion

Differences in sample nature and pressure applied during swab sampling, may explain the lack of some correlations and higher variance in swab samples. The linking of SS9 to saliva glycoproteins by AgI/II-encoding may contribute to SS9 correlating better. We conclude that saliva is a good method for SS9 but larger scale comparison is needed for other S. suis serotypes.

FTP-OP-04

Herd health management and economy

EFFECT OF THE COMBINATION OF AN IMMUNE MODULATOR AND A NUTRIENT ABSORPTION ENHANCER ON GROWTH PERFORMANCE AND HEALTH OF WEANED PIGLETS

A. Desbruslais [1], J. Aka [1], P. Bukowska [1], R. Neto [1], D. Gonzalez Sanchez [1], A. Hermes [2]
[1]*KEMIN EUROPA NV*
[2]*GS agri eG, Germany*

Background and Objectives

Nutrition and health are linked and failure to consider both factors has been widely shown to reduce animal performance. The objective of this study was to assess the impact of an algal derived immunomodulator when combined with a synergistic blend of lysolecithin, synthetic emulsifier and monoglycerides.

Material and Methods

1564 weaned piglets of 23 days of age of single origin and weighting on average 6.36 kg, were randomly assigned to two dietary treatments with 23 replicates of 34 piglets each: (i) a control group, fed a three-phase postweaning feeding program and (ii) a treated group that received the same postweaning feeding program supplemented with an algal Beta-1,3-Glucan (Aleta™, Kemin) in combination with a synergistic blend of lysolecithin, synthetic emulsifier and monoglycerides (LYSOFORTE® EXTEND, Kemin).The study had a duration of 49 days. Growth performance was measured and recorded throughout the study. Piglet mortality, removals and reasons were also recorded. Feed and water were provided ad libitum throughout the study.

Results

Over the course of the entire trial, piglets fed the treated diets grew faster (463 vs 456 g/day; $p>0.05$) and achieved a higher final BW (29.15 vs. 28.72 kg; $p>0.05$) while using feed more efficiently (1,42 to 1,44 kg feed/kg of BW gain; $p<0.05$) compared to control. Piglet losses were higher in the control group (2.5 %) compared to the treated group (1.95 %).

Discussion and Conclusion

The use of an algal Beta-1,3-Glucan in combination with a synergistic blend of lysolecithin, synthetic emulsifier and monoglycerides proved to be effective in improving feed efficiency and health status of weaned piglets.

FTP-OP-05

Herd health management and economy

IMPACT OF CONTROLLING COCCIDIOSIS AND IRON DEFICIENCY ANAEMIA ON PIGLET QUALITY AT WEANING.

E. Udvarhelyi [1], L. Villagrasa [2], T. Abizanda [2], O. Mitjana [1], M.V. Falceto [1], D. Espigares [3], L. Garza [3]
[1]*Departament of Animal Pathology, University of Zaragoza, Spain*
[2]*Mazana Group, Spain*
[3]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

Coccidiosis and iron deficiency anaemia are one of the main processes affecting piglet's parameters during first weeks of life. Prevention of such processes was based on the oral administration of Toltrazuril and the use of injectable iron around the 3rd day of life. Recently, injectable combination of Toltrazuril and iron has been used to reduce piglet's management. However, information of this practice on piglet quality, in terms of piglet body weight at weaning, is limited. Thus, the aim of this study is the evaluation of different treatments on the control of coccidiosis and iron deficiency anaemia on piglet quality at weaning.

Material and Methods

This study was performed in a farrow-to-wean farm with 3,300 sows and weekly batches. Three consecutive farrowing batches were randomly selected and its litters were divided into two groups (F and B) at processing age (2 days of life, doa). Group F was treated with 1.5 ml injectable Toltrazuril+gleptoferron (Forceris™, Ceva) and group B received the usual farm treatment (Oral toltrazuril and iron injected intramuscularly). Piglet weight was individually recorded at processing (PW) and weaning age (WW) to calculate average daily weight gain (ADWG).

Results

A total of 48 litters (662 piglets) were included: 338 piglets (group F) and 324 (group B). Average of WW and ADG was significantly higher in group F (WW 6.24±1.74; ADWG 0.22±0.08) compared to group B (WW 5.59±1.66; ADWG 0.19±0.07). No significant differences were detected for PW. At batch level, WW and ADWG in group F was significantly higher in batch 3 (WW 6.39±2.22; ADWG 0.22±0.09) compared to group B (WW 5.23±1.62; ADWG 0.17±0.07).

Discussion and Conclusion

Results indicated that the administration of Forceris™ for piglet's treatment against coccidiosis and iron deficiency anaemia led to an increased WW and ADWG in the lactation phase, representing an efficient strategy to improve piglet quality at weaning.

FTP-OP-06

Immunology and vaccinology

ASSESSMENT OF THE PRESENCE OF NON-RESPONDING, SERONEGATIVE SOWS AFTER VACCINATION AGAINST PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS) VIRUS

J. Fiers [1], D. Maes [2], M. Tignon [3], A. Cay [3]

[1]*Department Infectious diseases in animals, Unit Enzootic, vectorborne and bee diseases, Sciensano, Uccle, Belgium / Department of Internal Medicine, Reproduction and Population Medicine, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium*

[2]*Department of Internal Medicine, Reproduction and Population Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*

[3]*Department Infectious diseases in animals, Unit Enzootic, vectorborne and bee diseases, Sciensano, Uccle, Belgium*

Background and Objectives

Porcine Reproductive and Respiratory Syndrome (PRRS) causes major production losses in pig farms worldwide. Vaccination against PRRS virus is used to control the disease, but the effectiveness is variable. This cross-sectional study investigated the number of PRRS-seronegative sows, despite being routinely vaccinated, by measuring serum antibody (Ab) levels using different serological tests.

Material and Methods

In total, 1400 sow serum samples were collected in 70 PRRS-vaccinating herds in Belgium (20 samples/herd) between October 2020 and May 2021. IDEXX ELISA was used to detect Abs directed against the nucleocapsid protein, while CIVTEST ELISA was used to detect Abs against a glycoprotein extract. Negatives in either or both tests were further analyzed using INgezim 2.0 and IDScreen ELISA kits. Possible neutralizing Abs were assessed using SN assay on the PRRS DV strain.

Results

In total, 49/1400 (3.5%) sows, originating from 28/70 (40%) of the herds, were seronegative in IDEXX ELISA. In CIVTEST ELISA, 58/1400 (4.1%) sows, originating from 40% of the herds, were seronegative. Almost all IDEXX negatives were also negative in both INgezim (95.9%) and IDScreen ELISA (91.8%). CIVTEST negative but IDEXX positive samples showed a lower percentage of negatives in the additional ELISA tests (85.7% and 77.1%, respectively). A discrepancy between ELISA and SN results was shown: 43.21% of ELISA negatives (in either or both tests) were positive in SN.

Discussion and Conclusion

Although a low number of PRRS-seronegative sows was identified, there was at least one seronegative sow in 40% of the herds. The clinical importance of the non-responders as well as the underlying immunological mechanisms warrants further investigation, as it can be hypothesized that these sows are at elevated risk for PRRS. The observed discrepancy between ELISA and SN results suggests that ELISA alone might be insufficient to classify pigs as seronegative for PRRS.

FTP-OP-07

Immunology and vaccinology

COMPARISON OF MYCOPLASMA HYOPNEUMONIAE SHEDDING IN EXPERIMENTALLY CHALLENGED PIGLETS VACCINATED WITH A NOVEL ORAL VACCINE AND AN INJECTABLE COMMERCIAL VACCINE

G. Coelho Ferreira [1], M. Lopes Mechler-Dreibi [1], H. Meiroz De Souza Almeida [1], G.Y. Storino [1], K. Sonalio [1], F.A. Moreira Petri [1], T. Da Silva Martins [2], H.J. Montassier [1], O.A. Sant'Anna [3], L.C. Cides Da Silva [4], M. Carvalho De Abreu Fantini [4], L.G. De Oliveira [1]

[1]São Paulo State University (Unesp), School of Agricultural and Veterinarian Sciences, Jaboticabal, Brazil

[2]Department of Chemistry, Federal University of São Paulo (UNIFESP), Diadema, SP, Brazil

[3]Butantan Institute, São Paulo, Brazil.

[4]University of São Paulo (USP), Physics Institute, São Paulo, Brazil.

Background and Objectives

Mycoplasma hyopneumoniae is a microorganism widely spread in swine production worldwide Its prevention is of great interest for the productive system, since its colonization in the lung tissue leads to intense production losses. This study aimed to compare M. hyopneumoniae shedding in experimentally challenged pigs immunized with two different vaccines: a novel oral vaccine (OV) using a mesoporous silica (SBA-15) as adjuvant, coated by a polymer; and a commercial injectable vaccine (CV).

Material and Methods

Thirty piglets composed three equal groups (n=10), where Group 1: piglets received a single dose of CV at 24 days of age; Group 2: piglets received the oral vaccine (OV) at 24 days of age; and Group 3: non-immunized piglets (CONT). All animals were intratracheally challenged at 70 days of age with 5 mL of culture medium containing 10^6 CCU/mL of M. hyopneumoniae 232. Laryngeal and nasal swabs were weekly collected to monitor M. hyopneumoniae shedding by qPCR.

Results

The OV group showed less piglets shedding M. hyopneumoniae in nasal swabs compared to the control**.** The estimated bacterial load in laryngeal swab samples was also numerically lower in the vaccinated groups. OV piglets had a later peak of bacterial load in the laryngeal swabs (28 dpi) when compared to CV (21 dpi) and CONT (14 dpi).

Discussion and Conclusion

Detection and shedding of M. hyopneumoniae were influenced by the immunization, since lower bacterial loads were observed in the OV group. As this oral vaccine previously induced a specific mucosal immune response (Mechler-Dreibi et al., 2021), locally secreted IgA may play a protective role in M. hyopneumoniae dynamics due to the stimulation of mucosa-associated lymphoid tissue.

FTP-OP-08

Immunology and vaccinology

VACCINATION AGAINST ACTINOBACILLUS PLEUROPNEUMONIAE IN A SUBCLINICALLY AFFECTED FINISHING FARM EXPERIENCING PORCINE RESPIRATORY DISEASE COMPLEX

F. Reimus [1], C. Söckler [2], V. Cvjetković [3], M. Lisgara [4], P. Mortensen [5]
[1]*Tierärzte Team Tiefenbach GmbH, Steigäckerweg 10, 74564 Crailsheim-Tiefenbach, Germany*
[2]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*
[3]*Ceva Tiergesundheit GmbH, Kanzlerstr. 4, 40472 Düsseldorf - Deutschland*
[4]*Ceva Hellas LLC, 15, Ag. Nikolaou street, 174 55 Alimos (Attiki) Greece*
[5]*Ceva Corporate Swine Team*

Background and Objectives

A. pleuropneumoniae (Ap) is a primary pathogen in Porcine Respiratory Disease Complex (PRDC). The aim of this study was to evaluate the reduction Ap-like lung lesions following Ap-vaccination in a farm with a history of PRDC, but no previous awareness of clinical Ap, i.e. subclinical Ap.

Material and Methods

In April 2020 (T1) a 600-finishing farm reported severe respiratory distress and weight heterogeneity despite antibiotic treatment. At the time of slaughter 22 lungs were scored according to the Ceva Lung Program® (CLP) and three lungs were submitted for lab-analysis. Following ventilation check and change of antibiotics the situation did not improve; August 2020 piglets were vaccinated with a Porcine Reproductive and Respiratory Syndrome (PRRSV) modified-live vaccine. In October 2020 (T2) lungs of two dead pigs (of 56 and 65 kg) were submitted for lab-analysis due to increase in mortality leading to implementation of Ap vaccination (Coglapix®, Ceva Santé Animale) at end of nursery. Six months later, May 2021 (T3), a second CLP was performed on 23 lungs.

Results

CLP in April 2020 vs May 2021 revealed dorsocaudal pleurisy prevalence's of 50.00% vs 13.04% (-74%, p=0.051) and severity indexes of Ap-like lung lesions of 1.18 vs 0.39 (-67%, p>0.05). Lung pathogen findings were T1: PRRSV1 RNA, no Ap, T2: no PRRSV, Ap isolation, and T3: no PRRSV or Ap. An empiric improvement in respiratory distress, antibiotic use, and weight homogeneity was experienced following Ap vaccination.

Discussion and Conclusion

This case report shows the complexity of the PRDC and confirms presence Ap-like lesions in a farm with no awareness of this disease as an important part of the severe respiratory distress at the farm, i.e. subclinical Ap. Coglapix® was offering reduced lung pathology induced in subclinical Ap. Subacute Ap may play a role in perceived subclinical Ap.

FTP-OP-09

Miscellaneous

PREVALENCE OF UMBILICAL OUTPOUCHINGS IN PIGS – A CROSS SECTIONAL STUDY

M. Lillevang Hansen [2], T.B. Jensen [1], C.S. Kristensen [3], I. Larsen [2], K.S. Pedersen [2]
[1]SEGES Danish Pig Research Centre, Aarhus, Denmark
[2]Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark
[3]Ceva Animal Health, Ladegaardsvej 2, 7100 Vejle, Denmark

Background and Objectives

Umbilical outpouching (UO) is a clinical term for umbilical hernias, cysts, and abscesses in the umbilical region of pigs.
UO challenges pig welfare, both in the stable as well as during transport, because of ulceration risk and other complications. Transportation of UO pigs is further complicated by regulations which increases the overall cost.
The true prevalence of UO is unknown as no scientific reports with randomly sampled herds exist. This cross-sectional study estimates the prevalence of UO in Danish piglets and weaners.

Material and Methods

Thirty conventional herds, with at least 800 weaned pigs and 200 sows, were selected randomly from the danish husbandry register and visited from September 2020 to May 2021.
Piglets were examined the last week in the farrowing stable and weaners were examined between weeks three and eight after weaning; all sampling was random at pen level.
The abdominal area was palpated on all pigs and all irregularities were registered; the results presented here are outpouchings measuring at least 2x2 cm.

Results

The prevalence of piglets with UO was 4.7 % (n = 8 052 pigs) ranging from 0.8% to 13.6% between herds.
The prevalence of weaners with UO was 2.9% (n = 19684) ranging from 1.0% to 5.3% between herds.

Discussion and Conclusion

The observed prevalence of UO is probably underestimated as euthanasia of UO pigs is common, especially in some herds. This likely affects the prevalence for the weaners most, whereas the variations in the farrowing unit may be caused by different weaning ages and healing stages of the umbilicus.
In 2020 the Danish farmers produced 32.600.000 pigs (17.5 Mio. slaughtered in Denmark, 15.1 Mio. exported pigs), so according to this study, approximately one million Danish pigs are affected by UO yearly. Many of these pigs are wasted and this challenges sustainability as well as welfare and economy.

FTP-OP-10

Viral diseases

DETECTION OF RESPIRATORY VIRUSES IN OUTBREAKS OF PORCINE RESPIRATORY DISEASE COMPLEX IN NURSERIES.

G. Martín-Valls [1], Y. Li [1], I. Díaz [2], E. Cano [3], S. Sosa Portugal [4], E. Mateu [5]

[1]Departament de Sanitat i Anatomia Animals, Universitat Autònoma de Barcelona (UAB), 08193 Cerdanyola del Vallès, Spain

[2]IRTA, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la UAB, 08193 Bellaterra, Spain

[3]Centre de Recerca en Sanitat Animal, CReSA-IRTA-UAB, campus de la Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Spain

[4]Universitat Autònoma de Barcelona

[5]Department de Sanitat i Anatomia Animals, Facultat de Veterinària, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Spain

Background and Objectives

Respiratory disease in weaned pigs is a common problem in the field, with a complex aetiology of both viruses and bacteria. The purpose of the present work was to assess the presence of Influenza B (IBV) and D viruses (IDV), Porcine Parainfluenza virus type 1 (PPV1), Porcine Reproductive and Respiratory Syndrome Virus (PRRSV), Porcine Respiratory Coronavirus (PRCV), Swine Orthopnemovirus (SOV), Porcine Circovirus 2, 3 and 4 (PCV2-4), and Porcine Cytomegalovirus (PCMV) in outbreaks of respiratory disease that were previously evaluated for influenza A presence (swIAV).

Material and Methods

Twenty-nine swIAV-positive outbreaks and twenty-six swIAV-negative outbreaks (n=873 nasal swabs) were evaluated. Nasal swabs of each outbreak were pooled with sizes up to three individuals. Then, nucleic acid was isolated. The presence of different agents were evaluated by means of real-time RT-PCR. The prevalence and association were determined.

Results

PCV3, PRRSV and PCMV were the most frequently detected agents at herd level, while IBV, IBD, PCV4 and PPIV1 were not detected. At individual level, the prevalences were: swIAV 48.6%; PRCV 48.0%; PRRSV 31.6%; SOV 33.8%; PCMV 48.3%, PCV2 36.0%; and PCV3 33.0%. When correlated with the status of swIVA, PRCV, SOV, and PCMV were more likely to be found in the swIAV-positive outbreaks ($p<0.05$). PRCV was positively associated ($p < 0.05$) with swIAV and SOV but was negatively associated ($p < 0.05$) with PRRSV and PCVM. Besides these, swIAV and PRRSV were negatively associated ($p < 0.05$).

Discussion and Conclusion

As seen in the present work, there is a high diversity and prevalence of viruses in the respiratory outbreaks. Also, this is the first detection of SOV in Spanish pig herds. Overall, our data may contribute to a better understanding of the complex aetiology and the epidemiology of respiratory disease.

FTP-OP-11

Viral diseases

EFFECTIVE ASFV SURVEILLANCE BASED ON ANTIBODY AND NUCLEIC ACID DETECTION: THE EXPERIENCE OF VIETNAM

L. Gimenez-Lirola [1], W. Nelson [2], R. Rauh [2], N. Venkatswaran [2], K. Venkatswaran [2], A. Saunders [2], J. Walker [2]

[1]*Innoceleris LLC*

[2]*Tetracore Inc*

Background and Objectives

In the absence of effective African swine fever virus (ASFV) vaccines, early detection and differential diagnosis of ASFV infections increase the chances for successful control of this devastating disease. Optimal detection of ASFV relies on a basic understanding of the disease and the changes in diagnostic sensitivity occurring through ASF transition stages. Particularly, field investigations of ASFV outbreaks need to couple both antibody- and PCR-based testing, because the latter progressively loses diagnostic sensitivity over the course of the infection. The objective of this study was to evaluate the performance of ASFV serum/oral fluid (OF) indirect ELISA and qPCR for surveillance and monitoring of ASF outbreaks in commercial farms in Vietnam.

Material and Methods

Field team at Hanoi University collected a 398 OF and 398 serum paired samples from each animal, including 100 samples from 34 ASF-acute farms, 98 samples from 47 ASF-chronic farms, and 200 samples from 20 ASF-negative farms, and tested by both ASFV ELISA and qPCR.

Results

The detection rate by qPCR (74% serum; 69% OF) was higher than by ELISA (16% serum; 11% OF) in acute farms. Contrary, in chronically affected farms, the detection rate of the ELISA was higher (72% serum; 57% OF) than the qPCR (56% serum; 34% OF). However, when we combined both qPCR and ELISA, the detection rate of ASFV positive animal increased in acute (75% serum; 74% OF) and particularly in chronic farms (85% serum; 74% OF). All serum samples from negative farms were negative by both ELISA and qPCR (100% diagnostic specificity) while, for oral fluids, we obtained 100% and 99% diagnostic specificity for qPCR and ELISA, respectively.

Discussion and Conclusion

This study demonstrated that there is no single best diagnostic approach for ASFV, i.e., the combined use of ELISA and qPCR tests and serum/OF sampling increase the efficiency of ASFV surveillance.

FTP-OP-12

Viral diseases

SWINE INFLUENZA A TYPING RESULTS IN GERMANY FROM Q1-Q3 2018, 2019, 2020 AND 2021

K. Lillie-Jaschniski [1], K. Strutzberg-Minder [2], M. Koechling [3], S. Pesch [4], H. Smits [5]
[1]*Ceva Santé Animale, Libourne, France*
[2] *IVD GmbH, Innovative Veterinary Diagnostics, Seelze, Germany*
[3]*Ceva Tiergesundheit GmbH, Düsseldorf, Germany*
[4] *Ceva Innovation Center, Dessau, Germany*
[5]*Ceva S.A.*

Background and Objectives

Influenza A virus in swine (swIAV) impacts pig health in all stages of production. Whereas in piglets and fatteners it mainly plays a role in the PRDC complex, in sow herds its impact on reproductive performance reduces economic benefit. As the strains involved in disease can change and new strains can be introduced regularly, the aim of this study is to give an overview on passive Influenza surveillance in Germany over the past four years.

Material and Methods

This report summarizes Influenza subtyping results from January to September in the years 2018, 2019, 2020 and 2021 in Germany. Nasal swabs (pooled per 5), oral fluids, bronchoalveolar lavage or lung tissue were either taken in farms with acute Influenza like symptoms or in those showing unclear, persistent respiratory or reproductive symptoms. Samples were analyzed for Influenza A by real-time PCR. Subtyping of samples with a Ct-value ≤ 30 was done by multiplex real-time PCR.

Results

Overall, in 794 farms swIAV could be subtyped. In the investigated periods most farms were positive for H1avN1 (2018: 57,1%; 2019: 39,2%; 2020: 44,4%, 2021: 44,0%) followed by H1huN2 in 2018: 17,3%; 2019: 19,3% and 2020: 15,5%. In 2021 H1avN2 was second frequent subtype with 17,3% detection rate. In 2018 10% of the farms were positive for pandemic swIAV strains (H1pdmN1 and H1pdmN2), this increased to 20,3% in 2020. H3N2 was detected in 7,3% of the farms in 2018 and decreased to 2,4% in 2021. More than one subtype was found in 11,1% (2018), 8,2% (2019), 12,4% (2020) and 13,5% (2021) of farms.

Discussion and Conclusion

The frequencies of the subtypes have changed from 2018 to 2021. It is possible that several subtypes can be present on a farm at the same point of time. Knowing which strains are circulating on farms is important to be able to place the right vaccination regime.

FTP-OP-13

Welfare and nutrition

ELECTRONIC SOW FEEDING: CHARACTERIZING FEEDING PATTERNS OF GESTATING SOWS AND THEIR ASSOCIATIONS TO REPRODUCTIVE PERFORMANCE

M. Ornelas [1], E. Garcia Manzanilla [1], M. Rodrigues Da Costa [2]

[1]Pig Development Department, Teagasc Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland & School of Veterinary Medicine, University College Dublin, Belfield, Dublin, Ireland

[2]Epidemiology Research Unit, Department of Veterinary and Animal Science, Northern Faculty, Scotland's Rural College (SRUC), An Lòchran, 10 Inverness Campus, Inverness, Scotland, IV2 5NA, UK

Background and Objectives

Data recorded by electronic sow feeding (ESF) systems can be used to support decision-making on farm. There is evidence that the use of ESFs differs between healthy and diseased animals. However, for feeding records to be used as a monitoring tool, it is necessary to understand differences among parities, throughout gestation, or how they change in response to disease. This study aimed to identify feeding patterns of gestating sows using ESF and to study their associations with reproductive performance.

Material and Methods

We used data from 276 sows in a farm with a three-week batch system and one dynamic group of 120 gestating sows using 2 ESFs. These comprised 15 weeks of data for each sow and were collated to individual performance records.

Results

Visits made to ESF stations were mostly non-feeding visits (60.01 ± 19.8%), and daily rations were consumed predominantly in a single visit (98.3 ± 1.7% of all individual feeding cycles). The number of non-feeding visits was negatively related to gestation week and positively to parity ($p<0.001$). Despite the dynamic nature of the group, sows kept the feeding order relatively stable over time, especially among those feeding first. Moreover, the odds of a sow being among the first 15% to eat increased with every additional parity [OR: 2.16, $p<0.010$]. Concerning reproductive performance, top ranked sows in the feeding order had the highest pre-weaning mortality rates, almost 10% greater than those of bottom ranked group members (14.3% vs 4.5%, $p<0.05$).

Discussion and Conclusion

Several patterns were identified describing how sows with different parities and gestation stages used feeding stations. The contrasting performance figures, according to feeding patterns, may reflect the high competition over access to feeding stations that some animals are constantly exposed to. Further characterization of feeding patterns is necessary to support the implementation of ESF records as a monitoring tool for group-housed sows.

FTP-OP-14

Welfare and nutrition

BIOACTIVE FRACTIONS OF MILK AT DIFFERENT LACTATION TIMES IN LARGE-WHITE SOWS

A. Omede [1], H. Argüello [3], A. Carvajal Urueña [3], E.G. Manzanilla [2]

[1]Pig Development Department, Teagasc - Ireland

[2]Pig Development Department, Teagasc - Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland & School of Veterinary Medicine, University College Dublin, Belfield, Dublin 4, Ireland

[3]Departmento Sanidad Animal, Facultad de Veterinaria. Universidad de León, Campus de Vegazana s/n, 24071- León, Spain

Background and Objectives

Understanding milk bioactive fractions and how they change during lactation may be helpful in their targeted supplementation in piglet diets for improved gut development, post-weaning. With increasing interest in their use, our objective was to quantify milk bioactive fractions between day 1-21 post-partum in sow colostrum and milk.

Material and Methods

Porcine colostrum and milk samples collected from 10 Large White sows between 2-6 parities, at the University of Leon, Spain at days 1, 7, 14 and 21 were analysed for lactoferrin, oligosaccharides and fatty acids using ELISA, UPLC Acquity chromatograph, and a temperature gradient program respectively. Data were analysed using SAS software.

Results

The concentration of lactoferrin, a glycoprotein, ranged from 7.22 mg/mL in colostrum to 3.10 mg/mL in mature milk, ($p = 0.003$) observed in day 21. Also, 2´-Fucosillactose (2'-FL), a fucosylated neutral oligosaccharide, ranged between 43 to 60 % of the total relative abundance across lactation times. Its concentration was higher ($p<0.001$) in day 7 milk than in all other milk types. More so, 3´-Sialyllactose + 6´-Sialyllactose (3'+6'-SL), two sialyllated oligosaccharides eluted together were most ($p<0.001$) concentrated and abundant (31.8 %) in colostrum compared to milk from other days. Lacto-N-fucopentaose-I, a non-fucosylated neutral was present at 15 % in colostrum, rising to 38 % in mature milk on day 21. Saturated fatty acids (SFAs) were least (20.5 % of total fatty acids) concentrated in colostrum, while polyunsaturated fatty acids (PUFAs) were most (35.7 % of total fatty acids) concentrated (<0.001) in colostrum, compared to other milk types, respectively.

Discussion and Conclusion

Porcine colostrum and milk contain bioactive fractions of importance. The major bioactive fractions include lactoferrin, sialyllated and fucosylated oligosaccharides, and fatty acids. These bioactive fractions vary over lactation time. Considering the biological functions associated to these fractions, investigating their impact on gut development in piglets is necessitated.

POSTERS

HHM-PP-01

EFFICACY OF ON-FARM REPAIRS OF UMBILICAL AND SCROTAL HERNIAS IN WEANED PIGS

P. Cybulski [1], A. Jabłoński [2], E. Michalik [1]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Center of Translational Medicine, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*

Background and Objectives

Umbilical and scrotal hernias frequently occur in swine and cause complex welfare problems, legal ramifications, and considerable financial loss. The disease has genetic and environmental basis. The technique of repairing hernias in pigs is relatively simple; however, the vast majority of veterinary practitioners find a size of a pig as a main factor limiting its survivability. The aim of our study was to evaluate the success rate of the procedure performed in weaned pigs.

Material and Methods

The study was carried out during 12 consecutive weeks (January-March 2021) in a commercial, highly performing, 23000 weaners farm rearing animals in a weekly batch system. During the trial, 2060 pigs underwent an on-farm surgery. The total number of repaired umbilical and scrotal hernias was 1569 and 491, respectively. After the surgery, all the animals were ear-tagged and registered in an internal system.

Results

From a total number of 2060 surgeries, 96.5% (1987/2060) were successful, i.e. allowed owners to move full value animals into fattening units and eventually sell them to an abattoir. The mortality among weaners with repaired umbilical and scrotal hernias was 3.3% (52/73) and 4.3% (21/73), respectively. Among all the deceased animals, 24.7% (18/73) were found dead at the end of the surgery day, or at the following one. Nearly half of the pigs (46.6%; 34/73) died within a week.

Discussion and Conclusion

Our report indicates a relatively high effectiveness of a procedure completed after weaning. Depending on on-farm health status, obtained results might be considered typical or slightly higher than regular mortality noticed in animals which have never needed the surgery.

HHM-PP-02

DEVELOPMENT OF A NEW PRACTICAL AND SYNTHETICAL CRITERIA FOR COLOSTRUM INTAKE EVALUATION IN COMMERCIAL FARMS

T. Solignac [1], A. Durand [2], B. Lahuec [3], A. Gilet [4], E. Lewandowski [5], P. Leneveu [6]
[1]Eureden, 75 boulevard de Penthièvre, 22600 Loudéac, France
[2]Eureden, 7 rue de la Roberdière, CS 56547, 35 065 Rennes Cedex, France
[3]Eureden, ZI de Lanrinou, CS 20100, 29206 Landerneau Cedex, France
[4]Eureden, Z.A. de Lanjouan, BP 90251 - 22402 Lamballe Cedex, France
[5]Ceva Biovac, 4 rue O de Serres, 49 070 Beaucouzé, France
[6]Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France

Background and Objectives

Most of the methods described for Colostrum intake (CI) evaluation are not applicable in production farms (time-consuming and costly). The one from Leneveu et al. (2019) based on weight of piglets at birth and at 24h is easy but still demanding. Using data coming from a CI evaluation study on a large number of farms, the objectives of this work are to define a new and more feasible protocol and to test it in the field.

Material and Methods

We hypothesize that the rectal temperature of piglets at 24h (Temp24) of life could be an easy and interesting synthetical criteria to evaluate piglet homeothermy which could result from CI and piglet's environment.
To test the hypothesis, 1562 piglets from 25 French farms have been individually followed for CI evaluation (Leneveu method) and rectal temperature at birth and 24h. Farm management is taken into account.
If successful, distribution of data will be used to suggest a threshold.

Results

Average Temp24 is 38.56 +/- 0.66°C and linked to environment and farm practices such as piglet drying. Individual CI is linked to Temp24 ($P<0.001$). Average Temp24 of 38.5°C appears to be a clear threshold of CI (25g below 38.5°C vs 90g over 38.5°C) and this is the case for all classes of piglet's weight.
The percentage per litter of piglets below 38.5°C is also linked to the litter growth rate.
Based on this data, evaluating Temp24 of 100 piglets (10*10 litters) can be a feasible protocol with two criteria: global percentage of piglets over 38.5°C and the percentage of litters with more than 75% of piglets over 38.5°C.

Discussion and Conclusion

Temp24 appears to be an easy and promising criterion implemented in the field since this study. New field data will complete the results at congress.

HHM-PP-03

ASSESSMENT OF THE EFFECT OF INJECTABLE TOLTRAZURIL IN WEANING WEIGHT IN COCCIDIA POSITIVE FARMS IN PORTUGAL.

T.N. Nunes [1], F. Costa [1], D. Sperling [2]
[1]*Ceva Saúde Animal, Lda - Portugal*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Recent publications demonstrated the benefit of administering a combination of gleptoferron and injectable toltrazuril (Forceris®) to improve the control over the Cystoisospora suis and the piglets' weaning weight. The purpose of this field assessment was to evaluate the effect of this injectable toltrazuril on the piglets' weaning weight in commercial farms in comparison with piglets treated with oral toltrazuril.

Material and Methods

In six commercial farms (previously confirmed as C. suis positive), between 16 and 40 litters were randomly selected in each farm and assigned into one of two groups (937 piglets in IM group and 933 piglets in control group). All piglets were ear tagged and weighed in the first 48 hours of life and at the day prior to weaning. The piglets were balanced regarding the parity of the sow, birth date, litter size and initial weight. The IM groups in all farms were treated with 1,5mL of Forceris™ in the first 48 hours of life, whilst the control groups were treated with oral toltrazuril (20mg/kg) according to the usual farm practice.

Results

The initial average weight was balanced between groups in all farms, with numerical differences ranging between -32g and 45g but without statistical significance ($p>0,05$; Wilcox test). In all farms the average weaning weight was higher in the IM group, with differences ranging between 57g and 454g. The differences in the final weight were statistically significant in 4 of the 6 farms ($p<0,05$; Wilcox test).

Discussion and Conclusion

The results show a clear tendency for a better weaning weight in piglets treated with injectable toltrazuril on coccidia positive farms when compared with orally treated piglets. In future studies will be useful to compare the dynamic of oocyst excretion and diarrhea score between the groups, besides following the different groups from weaning to slaughter and compare their performances.

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HHM-PP-04

CASE STUDY: COMPARISON OF ROUTINE TREATMENTS WITH IRON-DEXTRAN INJECTION AND ORAL TOLTRAZURIL TO TREATMENT WITH A PRODUCT COMBINING GLEPTOFERRON AND TOLTRAZURIL FOR SINGLE INJECTION, FOR EFFECT ON NUMBER OF ANAEMIC PIGLETS AND BODYWEIGHT GAIN

P. Van Der Wolf [1], G. De Reus [1], H. Van Gisteren [1], M. Kanters [2], S. Van Colen [1]
[1]*Ceva Santé Animale, Naaldwijk, the Netherlands*
[2]*Veterinary practice Varkens GezondheidsTeam Zuid, Chaam, The Netherlands*

Background and Objectives

The pig owner wanted to improve the technical results and reduce the stress of the routine treatments to prevent iron deficiency anaemia and coccidiosis. To investigate this on request of the veterinarian and farmer in comparison to a product combining gleptoferron iron with toltrazuril for i.m injection, two groups of piglets were weighed and haemoglobin (Hb) levels were measured.

Material and Methods

Litters of new borne piglets were treated by the farmer with either Forceris 1.5 ml i.m. injection (group_F) or the routine treatments with an iron dextran (Uniferon 200, 1 ml, i.m.) product and toltrazuril (0.7 ml, oral) (group_RT). Piglets were weighed at treatment, at weaning and at the end of nursery. For the diagnosis of anaemia, haemoglobin levels were measured at 21 days of age (Hemocue201, <90 gr/L: anaemia, 90 – 110 gr/L: sub-clinical anaemia, >110 gr/L: optimal). Statistical analysis was done in R.

Results

Hb was measured in 2 week groups, in 15 and 12 litters in group_F (N=81 piglets) and in 13 and 12 litters in group_RT (N=75). 45 litters in group_F and 48 litters in group_RT were weighed. Piglets in group_F were significantly less often anaemic than piglets in group_RT (9/75 vs 2/81, Chi-square statistic = 5.3973, P=0.02), and had significantly more often optimal Hb-levels (44/81 vs 24/75, Chi-square statistic = 7.8905, P=0.005).Weight at weaning was 191 gram higher and at the end of nursery was 1176 gram higher (St. dev. F: 0.690 vs RT: 0.854, Welch Two Sample T-Test, P=0,014) and the growth in the nursery was 27 gr/day higher (P=0,013) in group_F than in group_RT.

Discussion and Conclusion

Based on these results, with significantly less piglets with anaemia and significantly more piglets with an optimal haemoglobin level and heavier more uniform piglets at the end of nursery, the farmer decided to continue using the combination product.

HHM-PP-05

EFFECT OF AN EXTENDED PHOTOPERIOD ON THE HEALTH, TECHNICAL AND BEHAVIOURAL PARAMETERS OF NEWLY-WEANED PIGLETS

F. Griffioen [1], M. Aluwé [2], D. Maes [3]
[1]*Faculty of veterinary medicine, Ghent University*
[2]*Institute for Agricultural, Fisheries and Food Research (ILVO), Melle, Belgium*
[3]*Unit of Porcine Health Management, Department of Reproduction, Obstetrics and Herd Health, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium*

Background and Objectives

Weaning represents a major stress period in the life of a piglet, resulting in increased susceptibility to disease and lower performance. Studies have shown that light might influence reproduction and performance of poultry, ruminants and pigs. However, the effect of light on newly weaned piglets is less clear and results are controversial. Some studies found a positive effect of extension of the photoperiod, whereas other studies did not. The present study investigated the effect of photoperiod on newly weaned piglets.

Material and Methods

The study was conducted in one farm and included 288 piglets (RA-SE x Belgian Piétrain) weaned at 28 days. There were two compartments with short photoperiod (8h light and 16h dark) and two with a long photoperiod (16h light and 8h dark). Each compartment contained eight pens, with 6 pigs per pen (piglets sorted based on gender and weight).Throughout the nursery period, the piglets were monitored for different parameters. Scores were given for fecal consistency (FCS 0-100), skin lesions (0-5), ear lesions (0-4), tail lesions (0-4) and behavior (ethogram based). Additionally, the following performance parameters were measured: piglet weight (PW), average daily feed intake (ADFI), water consumption (WC), feed conversion ratio (FCR), average daily growth (ADG).

Results

Fecal consistency score was significantly higher, on days 7, 11, 21 and 25 in piglets exposed to a long photoperiod. No significant differences were obtained for the other parameters.

Discussion and Conclusion

Piglets exposed to longer photoperiods were prone to worse fecal scores, possibly due to a higher water intake. Long photoperiods might lead to more active piglets that drink more. This in turn could affect the fecal score and the performance parameters. Alternatively, these piglets could be more susceptible for pathogens due to more stress.

Lengthening the photoperiod negatively affected fecal consistency score and did not improve performance parameters under the present conditions.

HHM-PP-06

IMPACT OF AN ACUTE PRRS OUTBREAK AND STABILISATION OF REPRODUCTIVE PERFORMANCE AFTER IMPLEMENTATION OF A PRRS CONTROL PROGRAMME IN A NUCLEUS FARM IN SERBIA

Z. Tomić [1], V. Miljković [1], S. Milić [2], R. Morgenstern [3]
[1]*Boehringer Ingelheim Serbia d.o.o.*
[2]*Veterinary Specialist Institute "Sombor"*
[3]*Boehringer Ingelheim RCV GmbH & Co KG*

Background and Objectives

PRRSV infection can significantly impact reproductive performance in a previously naïve farm. This study aimed to compare sow reproductive performance before, during and after a PRRS outbreak resulting in a PRRS control programme which should be followed by an eradication programme.

Material and Methods

The study was conducted in a nucleus farm with approximately 650 sows, in farrow-to-feeder production. A further gilt development unit (GDU) for own replacements is on site. Some gilts and sows were coughing and diagnostic testing for PRRSV confirmed PRRSV-1 infection in 10/2020. Previously the farm was PRRSV negative. Vaccination and supporting biosecurity measures started mid 12/2020 with double mass vaccination (four weeks apart) of the breeding herd, including all gilts in GDU with ReproCyc® PRRS EU. Later repeated every 4 months. Concurrently pigs were mass vaccinated with Ingelvac PRRSFLEX® EU from 14 days of age until weaning. Vaccination was continued batchwise. Reproductive performance data of sows and nursery mortality was analysed from 01/2020 to 09/2021, and split in 3 phases: before (A), during (B, 10/2020-03/2021) and after the PRRS outbreak (C). In parallel pigs were monitored for PRRSV via PCR from 07/2021 (30x serum of pigs due to weaning / batch; 8x oral fluids from nursery pigs / batch).

Results

Performance was significantly impacted by the PRRS outbreak. Results of key reproductive parameters were as following (different superscripts: $p \leq 0.05$): Live-born piglets / litter (n): A) 15.14^{a}, B) 13.52^{b}, C) 14.38^{c}; Pre-weaning mortality (%): A) 8.35^{a}, B) 13.21^{b}, C) 8.70^{a}; Nursery mortality: A) 1.32^{a}, B) 7.32^{b}, C) 1.76^{a}. Monitoring revealed only 1 of 5 serum pools positive once end of August 2021.

Discussion and Conclusion

The data shows a positive impact of the PRRS control programme on key performance parameters within 3-4 month after start of the programme (reproductive cycle). Beyond that, monitoring looks promising to prepare for final PRRSV eradication.

HHM-PP-07

USING SOUND-BASED MONITORING OF RESPIRATORY HEALTH STATUS TO IMPROVE GROW-FINISH PRODUCTION PERFORMANCE IN COMMERCIAL PIG FARMS

C. Alonso [1], A. Ghysen [2], S. Figueras Gourgues [3], F. Erusalimsky [2], T. Guiu [4], A. Alegre [4], S. Badia [4], A. Fernandez-Fontelo [5]

[1]*Boehringer Ingelheim Vetmedica GmbH, Germany*

[2]*SoundTalks, Leuven, Belgium*

[3]*Boehringer Ingelheim Animal Health España, S.A.*

[4]*Piensos Costa S.A, Fraga, Huesca, Spain*

[5]*Humboldt-Universität zu Berlin School of Business and Economics Ladislaus von Bortkiewicz Chair of Statistics Unter den Linden 6 10099 Berlin Germany*

Background and Objectives

The swine industry continues to experience substantial economic losses due to respiratory disease outbreaks. SoundTalks®, a 24/7 sensor-technology based on artificial intelligence, transforms respiratory pigs' sound into a metric (0 - 100) that represents the animals' respiratory health status (ReHS). From healthy green ReHS status, when ReHS drops below a threshold, yellow/red LED-alerts are emitted allowing producers to intervene earlier. Despite the early warning evidence, the impact of ReHS on growing populations performance (i.e. mortality, average daily gain (ADG), feed conversion (FC)) remains unknown. Therefore, this study aimed to describe the ReHS in the growing population of a commercial sound-monitored farm and its potential association with performance.

Material and Methods

The study was performed in 4 nursery rooms and 16 finishing barns of a large farrow-to-finish sow farm in Spain continuously sound-monitored. Close-out information (i.e. mortality%, finisher-ADG, finisher-FC) and environmental variables were consolidated to be analyzed. Linear regression models were used to understand the association between production variables and ReHS.

Results

A total of 50 (nursery and finishers) batches were analyzed (Nov20-Sept21). Overall, results demonstrated that the nursery respiratory health status/batch (i.e. average ReHS) was significantly associated with batch %mortality (R^2=0,3532, p value=0,0075). With regards to the finishing groups, significant positive association was found between ADG and %green ReHS-days (days without yellow/red alarms) (R^2=0,2585, p value=0,0065). There was an evident room-effect as the %green/yellow/red ReHS-days significantly differed among nursery and finisher air-spaces. Others significant variables in the model were "calendar-month" and "months-after-placement".

Discussion and Conclusion

This is the first study, to the author's knowledge, that shows the direct impact that the respiratory health status (ReHS), measured by this sound-based monitoring system, has on production performance parameters during the growth-finishing phase. Further studies are needed to understand the implications and comparison of different interventions following sound-monitoring alarms when different pathogens are involved.

HHM-PP-08

CLINICAL TRICHURIASIS IN A FARM WITH EXTENSIVE HUSBANDRY – A CASE REPORT

M. Bünger [1], R. Renzhammer [1], A. Joachim [2], B. Hinney [2], R. Brunthaler [3], J. Matt [3], N. Nedorost [3], C. Weissenbacher-Lang [3],
L. Schwarz [1]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[2]*Department of Pathobiology, Institute of Parasitology, University of Veterinary Medicine Vienna, Austria*
[3]*Institute of Pathology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Trichuris suis infections became rare within the last decades. However, animal welfare became more important to consumers and despite being a niche branch, extensive husbandry and consequently helminths regain importance. This is demonstrated by a recent case of clinical trichuriasis: On a conventional fattening farm with free-range husbandry, severe wasting and diarrhoea were observed. Four fattening pigs (Duroc) were sent to the Vetmeduni for pathological examination and further diagnostics. During necropsy, histological and parasitological examination, extremely high numbers of adult T.suis as well as corresponding eggs were found in the colon of all animals. The case was further investigated to evaluate possibilities for intervention.

Material and Methods

To confirm trichuriasis and to evaluate concomitant infections, soil samples and faeces from 20 pre-fattening pigs (not kept on pasture yet) plus 34 fattening pigs were taken. All samples were investigated with faecal flotation. In highly T.suis positive faecal samples the concentration of eggs per gram faeces (epg) was determined by McMaster counting. Additionally, triplex-PCR for detection of Brachyspira hyodysenteriae, Brachyspira pilosicoli and Lawsonia intracellularis was performed.

Results

Twelve fattening pigs had poor body condition. T.suis eggs were detected in faeces from 30 fattening pigs (mean: 37.577epg, maximum: 778.000epg) and all environmental samples. T.suis eggs were not detected in faeces from pre-fattening pigs. Lawsonia intracellularis was detected in two samples. Brachyspira spp. was not found in any sample. All animals on pasture were treated with fenbendazole (5 mg/kg BW, seven days) in-feed. Subsequently, the farmer reported improving body condition of the animals and no further losses.

Discussion and Conclusion

Due to the long-term pasture contamination with long-lived eggs of T.suis, eradication is hardly feasible and regular anthelmintic treatment remains crucial to reduce worm burdens and associated problems. Although whipworm infections are rarely observed, under management conditions which support parasite transmission, high worm burdens can severely impact animal health.

HHM-PP-09

UNDOCKED TAILS AT SLAUGHTER: EFFECTS ON LUNG AND STOMACH LESIONS

A. Scollo [1], B. Contiero [2], M.C. Galli [2], F. Gottardo [2]
[1]*Department of Veterinary Sciences, University of Torino*
[2]*Department of Animal Medicine, Production and Health, University of Padova, Viale dell'Università 16, 35020, Legnaro (PD) Italy*

Background and Objectives

The EU-legislation (2008/120/EC) states that tail-docking should not be a routine operation, and other environmental/managerial measures shall be taken to prevent tail-biting. Towards this request, in Italy a Governmental plan has been implemented in swine farms, leading to an increase of undocked-animals currently reared in the Country. The study aims to monitor tail-lesions at the slaughterhouse in docked and undocked-animals, exploring effects of tail-docking on tail, lung, pleura, and gastric lesions.

Material and Methods

Data were randomly collected from January to September 2020 in the biggest Italian abattoir. The study monitored and classified as docked/undocked 532 batches (around 135 pigs/batch; 170 kg b.w.) from 208 intensive farms. A score for each lesion was assigned to 100 pigs/batch: tails 0-2 (and acute/chronic classification); lungs 0-24; pleura 0-4; stomach 0-3. The percentage of affected subjects/batches was statistically analyzed by ANOVA.

Results

Frequency of undocked-batches was 15,8%. The presence of tail-lesions was recorded in undocked-animals only (44,0 vs 0% in docked-animals, P<0,001), with a prevalence of severe-chronic lesions of 27,3%. Severe lung-lesions were more frequent in undocked-animals (9,2 vs 6,6%, P=0,006), as well as gastric-ulcers (26,1 vs 20,3%, P=0,006). No difference was shown for pleura.

Discussion and Conclusion

The Italian Governmental plan led several farmers in 2020 to rear more undocked-animals compared to the past, increasing undocked-batches at slaughter from 0% to 15,8%. However, this study highlights complications that might arise from the transition phase. Additionally to a reasonably expected increase of tail-lesions, the simultaneous increase of lung and stomach lesions suggests, respectively, the risk of septicemic infection from an infected tail and a possible involvement of stressful conditions. Considering that successfully rearing undocked-pigs is one leading indicator of welfare on-farm, it seems imperative to increase efforts in supporting farmers in the transition to reduce mistakes, detrimental both for pigs' welfare and health.

HHM-PP-10

UPDATE ON THE SLAUGHTERHOUSE LUNG LESION EVALUATION DURING 2020 AND 2021 IN PORTUGAL.

T.N. Nunes [1], F. Costa [1], R. Krejci [2]
[1]*Ceva Saúde Animal, Lda - Portugal*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Lung lesions scoring systems are useful tools to evaluate farms' respiratory health status and to validate disease control programs, especially for enzootic pneumonia and swine pleuropneumonia. Ceva Lung Program (CLP) is collecting data at slaughter from Portuguese pigs since December 2015 and the obtained data were already published in 2019 and 2021. The purpose of this study was to update the Portuguese CLP results for the years 2020 and 2021 in comparison with the previous published results.

Material and Methods

Between January 2020 and December 2021, 208 batches of pigs from Portuguese farms (21.025 pigs) were scored at slaughter using the CLP methodology. Prevalence of lungs with bronchopneumonic lesions, EP index, % of cranial pleurisy, scars and dorsocaudal pleurisy and APP index were evaluated.

Results

In average, each batch had 21,4% of bronchopneumonic lungs (vs 27,5% in 2015/19) resulting in a 0,87 EP index (vs 1,19 in 2015/2019). The average prevalence of cranial pleurisy was 4,0% (vs 6,3% in 2015/2019) and the average prevalence of scarring was 2,0% (3,4% in 2015/2019). Regarding dorsocaudal pleurisy, the average prevalence was 12,0% (vs 16,5% in 2015/2019), resulting in a 0,35 APP Index (vs 0,45 in 2015/2019).

Discussion and Conclusion

These results show that, despite the reduction in all types of monitored lesions (probably due to improvements in their control) in comparison with the previously published results, pathogens like Mycoplasma hyopneumoniae and Actinobacillus pleuropneumoniae may remain important agents of respiratory disease in the Portuguese swine herds. For this reason, it seems relevant to maintain lung lesion scoring programs at slaughter to assess the effectiveness of the disease control programs established at farm level.

HHM-PP-11

CORRELATION BETWEEN MDA TRANSFER TEST AND DIFFERENT TECHNIQUES TO MEASURE COLOSTRUM INTAKE

P. Könighoff [1], H.J. Sake [1], J. Miguel [2], D. Llopart [2], D. Angelats [2], C. Meistermann [3], M. Ganter [4], H. Schuberth [5], K. Heenemann [7], I. Hennig-Pauka [6]

[1]*HIPRA Deutschland GmbH*

[2]*HIPRA HQ, Amer (Girona), Spain*

[3]*Tierarztpraxis am Brettberg GbR*

[4]*Clinic for Swine and Small Ruminants and forensic Medicine and ambulatory Service, University of Veterinary Medicine Hannover, Germany*

[5]*Institute of Immunology, University of Veterinary Medicine Hannover*

[6]*Field Station for Epidemiology, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany*

[7]*Center for Infectious Diseases, Institute of Virology, Faculty of Veterinary Medicine, University of Leipzig*

Background and Objectives

Different techniques have been used to evaluate the colostrum uptake, measuring parameters such as the immunocrit[2, 3] or non-specific serum immunoglobulin (IgG)[4, 5]. Recently a new method to evaluate the colostrum intake in piglets has been described and it is based on the correlation between sow's Swine Erysipelas (SE) titers and her respective piglets, measured at around 7 days of lactation[6]. The objective of this study is to correlate this method with other techniques: immunoglobulin (IgG) ELISA and immunocrit.

Material and Methods

The study was carried out in a 3000 sow farm using a Ery+Parvo vaccine, located in Lower Saxony, Germany. A total of 11 sows and 33 piglets (3 piglets/sow) were blood-sampled at day 7 after farrowing to evaluate SE titers, immunocrit and IgG concentration. Colostrum was collected at day 0 for SE titers and determination of IgG concentrations.

Results

Samples at day 7 showed a strong correlation between the sows' SE titers and piglet titers ($R=0.65$, p-value < 0.001). SE colostrum titers at day 0 and SE sow serum titers at day 7 had a correlation of $R=0.78$, p-value $= 0.004$, and with SE piglet serum titers at day 7, the correlation was $R=0.58$, p-value $= 0.012$. Correlation between immunocrit and the ratio of piglet/sow SE titers was $R=0.62$, p-value $= <0.001$. IgG measured by ELISA and SE titers in sows and piglets showed a correlation of $R = 0.5$, p-value $= 0.0024$.

Discussion and Conclusion

This study confirms a correlation between the MDA transfer test (MDA TT) and other techniques such as immunocrit and IgG concentrations. Based on these results, the MDA TT is an adequate method for this purpose. An advantage of the test is that it considers the relation between sow and piglet titers and is not solely based on a single piglet value (immunocrit or IgG).

HHM-PP-12

EFFECT OF AN INJECTABLE TOLTRAZURIL – GLEPTOFERRON (FORCERIS) IN COMPARISON WITH COMBINED ORAL TOLTRAZURIL – INJECTABLE GLEPTOFERRON ON PRODUCTION PERFORMANCE IN 21 DAYS OLD PIGLETS IN A HIGH-HEALTH STATUS FARM IN POLAND

E. Michalik [1], P. Cybulski [1], K. Janeczko [2], R. Lewko-Wojtowicz [3], R. Panek [3]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Ceva Animal Health Poland; Department of Reproduction and Clinic of Farm Animals, Faculty of Veterinary Medicine, Wroclaw University of Environmental and Life Sciences, Poland*
[3]*Ceva Animal Health Poland*

Background and Objectives

Cystoisospora suis and iron deficiency anemia (IDA) are the most prevalent parasitic and deficiency diseases in piglets, respectively. Recently, Forceris (CEVA) has been introduced, offering the possibility to control both issues with a single injection. The aim of our study was to assess the efficacy of the product under the condition of commercial sows farm located in Poland and to compare results with those obtained using standard control measures (i.e. injectable gleptoferron and oral toltrazuril).

Material and Methods

The study was performed in a commercial 3600 sow farm located in northern Poland. The study included 300 piglets from 60 randomly selected litters. A half of the animals (F) was treated with a single injection of Forceris (45 mg of toltrazuril and 200 mg of gleptoferron per piglet), whereas the rest (EP) received 35 mg of toltrazuril per os (Espacox, aniMedica, Poland) and a single injection of 200 mg of gleptoferron (Previron, HIPRA, Spain) per piglet. Both treatments were applied at the age of 3 days. Statistical analyses were performed using GraphPad Software (San Diego, USA) and included Kolmogorov- Smirnov test: Unpaired T- test and Mann–Whitney-U-test (for metric data).

Results

The initial weight of the piglets was the same in both groups (p= 0.937). The weight at 21st day was numerically higher in the group F (3.88 kg ± 1.13 vs. 3.78 kg ± 0.91; expressed as mean and SD), but not statistically different (p= 0.832). Moreover, fewer litters were positive for oocyst examined with autofluorescence in the group F (2/10 vs. 3/10) at 11st day of life.

Discussion and Conclusion

Our research indicates that an injectable treatment with Forcers in piglets is an effective tool in a control of coccidiosis and IDA, which may significantly simplify piglets processing.

HHM-PP-13

LITTER SIZE IS A WELL-MANAGEABLE (RISK) FACTOR FOR COLOSTRUM INTAKE ON DUTCH SOW FARMS

J. Beek [1], J. Miguel [2], C. Jurjens [3], M. Solé [2], D. Llopart [2], M. Wilhelm [1]
[1]*HIPRA Benelux*
[2]*HIPRA, Amer, Spain*
[3]*De Oosthof, The Netherlands*

Background and Objectives

As colostrum yield is not increasing with litter size, the number of born alive piglets is a risk factor for suboptimal colostrum intake. Intake may additionally be compromised in very large litters because of surplus piglets being moved to a foster sow soon after birth. This study evaluated maternal immunity transfer, in relation to litter size and whether or not piglets were fostered and in the case of fostering, were moved within or after 24 hours after birth.

Material and Methods

At farrowing day, 10-20 sows per farm (8) and 3-6 piglets/sow were selected and ear tagged. Born alive piglets, date, and time when piglets were fostered were recorded. At day 7 after birth, blood samples were taken from the selected animals and analyzed with CIVTEST® SUIS SE/MR. Maternal immunity transfer was calculated via MDA transfer test[1] and the possible correlation with litter size (<16(G1), 16-20(G2) and >20 piglets(G3)) and fostering (yes/no and within/after 24 hours) was assessed via regression analysis. [1] De Cleer et al. IPVS 2020

Results

536 samples, representing 106 litters, were analyzed. Maternal immunity transfer was not significantly different between the groups of litter size ($p = 0,60$). Piglets from G3 had a numerically higher MDA TT-score of 81.50 compared to 73.80 and 71.35 in G2 and G1. Piglets that stayed with their mother showed a higher score than fostered piglets ($p<0.01$). In cases of fostering, piglets moved within 24 hours had the lowest colostrum score.

Discussion and Conclusion

These Dutch field data show that litter size, as risk factor for suboptimal colostrum intake, can be overcome by good colostrum management. Farmers managed to have the highest MDA score in the largest litters, which may be explained by extra attention given. The data supports the practical rule to only start fostering piglets after 24 hours.

HHM-PP-14

NEONATAL DIARRHOEA - OCCURRENCE OF VIRAL AND BACTERIOLOGICAL PATHOGENS

A. Ullerich [1], K. Dohmann [1], K. Strutzberg-Minder [1], I. Zerbin [1], D. Sperling [2], F. Schmelz [3]
[1]IVD GmbH, Innovative Veterinary Diagnostics, Seelze, Germany
[2]Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France
[3]Ceva Santé Animale, Dessau-Rosslau, Germany

Background and Objectives

Neonatal diarrhoea causes high losses in piglet rearing. The most common pathogens known are Escherichia coli (E. coli) and Clostridium perfringens (C. perfringens) as well as rota- and coronaviruses. In this study we evaluated which diarrheal pathogens could be detected in one farm at the same time using samples from a monitoring program in different European countries in 2020.

Material and Methods

In 79 European farms fecal or ileum samples were tested for diarrheal pathogens by bacteriological culture and by PCR (Rotavirus group A and C, Porcine Epidemic Diarrhoea Virus (PEDV), Transmissible Gastroenteritis Virus (TGEV)). The isolated E. coli and C. perfringens strains were typed molecular biologically in order to determine the occurrence of virulence and toxin genes. Most of the farms were located in Germany (n=52), followed by Poland (n=12) and Denmark (n=9), The Netherlands (n=3), UK (n=2) and Austria (n=1).

Results

The most frequently found pathogens on the farms were E. coli (96.2%), C. perfringens type A (CPA) (87.3%), Rotavirus (74.7%) and Clostridioides difficile (46.8%). PEDV was detected in 2 farms only, TGEV in none. Based on the presence of virulence-associated factors and the toxin gene patterns the E. coli isolates were classified into virulent or potentially virulent strains. Virulent or potentially virulent E. coli isolates were found in 78.9% (n=60) of the farms, CPA with β2 toxin gene in 81.0% (n=64). C. perfringens isolates type C were not found at all. All 4 pathogens were found in 24.1% (n=19) of the farms simultaneously. The combination of 3 different pathogens occurred in 39.2% of the farms. E. coli as the most frequently found pathogen occurred mainly in combination with CPA with β2 toxin gene (64.6%) or rotaviruses (64.6%).

Discussion and Conclusion

This study shows that neonatal diarrhoea in pigs rarely has a monocausal etiology. This should be considered with regard to prophylactic and therapeutical measures.

HHM-PP-15

BELGIAN PIGS "RAISED WITHOUT ANTIBIOTICS"

E. Bernaerdt [1], D. Maes [1], T. Van Limbergen [2], M. Postma [3], J. Dewulf [3]
[1]*Unit of Porcine Health Management, Department of Internal medicine, Reproduction, and Population medicine, Faculty of Veterinary Medicine, Ghent University*
[2]*ANITOM bv*
[3]*Epidemiology Unit, Department of Internal medicine, Reproduction, and Population medicine, Faculty of Veterinary Medicine, Ghent University*

Background and Objectives

Reduction of antibiotic resistance in pigs can be obtained through prudent or restricted use of antibiotics. Raised Without Antibiotics (RWA) is a certification mark that is known in only a few countries, and it is unclear what the characteristics of RWA herds are. The objectives of this study were to define the criteria of a Belgian RWA programme; to coach herds and to assess if it was possible to obtain and maintain the RWA status; and to determine differences between RWA and conventional pig herds.

Material and Methods

Pig herds (n=28) were visited 3 times: 1) inventarisation, 2) (2 months later) herd-specific coaching, 3) (7 months later) evaluation. Antibiotic use was followed up from before the first herd visit up to one year after the last visit. Criteria for Belgian RWA production were defined, and the status of the herds ((non-)RWA) was verified. Antibiotic use, biosecurity (Biocheck.UGent), and herd characteristics of (non-)RWA herds were compared.

Results

RWA was defined as no antibiotics from birth until slaughter. Pigs requiring an individual treatment received a special ear-tag and were excluded from the programme. The status of the herds varied over time, and the distribution RWA vs. non-RWA was 10-18, 13-15, and 12-16, before intervention, after coaching, and after one year, respectively. The median (range) number of sows was 200 (85 – 300) for RWA, and 350 (180 – 1250) for non-RWA herds. The 4-week system was used significantly more in non-RWA herds, while the 3- and 5-week system were used most often in RWA herds. There were no statistically significant differences in biosecurity status, but biosecurity improved in all farms over the course of the study.

Discussion and Conclusion

This study showed that it was possible for farmers to achieve and maintain the RWA status through herd-specific coacing related to prudent ABU and biosecurity.

HHM-PP-16

COLOSTRUM INTAKE ON FARMS WITH HIGH LOSS RATES OF LIVE BORN PIGLETS. ANALYSIS OF THE INFLUENCE OF BREEDING PRACTICES, HOMEOTHERMY OF PIGLETS AND COLOSTRUM PRODUCTION OF SOWS

P. Leneveu [1], A. Durand [2], B. Lahuec [3], A. Gilet [4], E. Lewandowski [5], T. Solignac [6]
[1]Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France
[2]Eureden, 7 rue de la Roberdière, CS 56547, 35 065 Rennes Cedex, France
[3]Eureden, ZI de Lanrinou, CS 20100, 29206 Landerneau Cedex, France
[4]Eureden, Z.A. de Lanjouan, BP 90251 - 22402 Lamballe Cedex, France
[5]Ceva Biovac, 4 rue O de Serres, 49 070 Beaucouzé, France
[6]Eureden, 75 boulevard de Penthièvre, 22600 Loudéac, France

Background and Objectives

Due to very limited energy reserves, the management of piglets at birth and their good colostrum intake (CI) are vital for their survival and good performances.
The objectives of this study are (i) to evaluate homeothermy and CI of piglets in farms with questionable CI quality and (ii) to determine the colostrum production of sows.

Material and Methods

Twenty-five French farms have been selected for doubts about their CI quality (% losses, practices). A total of 2557 live born piglets from 195 litters have been included and individually identified.
This study evaluates piglet's CI by weighing piglets (Leneveu et al. 2019), and homeothermy by rectal temperature measurement (n = 1562), both taken at birth and 24h. The colostrum production of sows is evaluated by using litter growth rate (low if < 1kg).

Results

Piglets can suffer cold shock at birth, especially when birth weights and the temperature of the birthing area are low ($p<0.001$). The impact of this shock depends on husbandry practices such as drying, which limits calories waste and decrease losses at 24 h ($P<0.001$).
Homeothermy at 24h is significantly linked to CI, and the temperature of the nesting area has been shown to influence homeothermy when piglets weigh less than 1.2 kg ($P<0.001$). This study revealed differences in the care and thermal comfort offered to piglets.
Analysis of the growth of 118 complete litters revealed 49% of litters with low growth rates, which was observed on all farms, and none of the parameters studied can explain this observation.

Discussion and Conclusion

This study confirms how homeothermy, CI and piglet's management are crucial for piglet's survival and performances.
The high percentage of litters with low growth rates was unexpected at this level. Therefore, this is a major factor that limits CI and whose origin has yet to be identified.

HHM-PP-17

IMPACT OF ALGAL BETA-1,3-GLUCAN ON VIABILITY OF NEWBORN PIGLETS UNDER THE SEGOVIA SUCKLING PIGLET GUARANTEED BRAND

M. Hidalgo [1], M. Soto-Salanova [2], R. Neto [2], V. Van Hamme [2], B. Isabel [1]
[1]*Departamento de Nutrición Animal, UCM, Madrid, Spain*
[2]*KEMIN EUROPA NV*

Background and Objectives

Under the husbandry rules of the Segovia suckling piglet "Spanish Guaranteed Brand", producers are prohibited to administer intramuscular iron post farrowing, posing significant health and management challenges. The objective of this study was to assess the effect of an algal beta-1,3-glucan (BG) on the immune and haematological status of the piglets and sow farrowing performance.

Material and Methods

A 400 sow farrow to slaughter farm (piglet slaughter) following the Segovia Suckling Piglet Guaranteed Brand guidelines was used in this study. 68 sows were allotted to 2 groups, a Control (31 sows) and a group (BG) (37 sows) supplemented with an algal (Euglena gracilis) beta- (1,3) -glucan (Aleta™, Kemin) at 1g /sow/day during the last 4 weeks of gestation and lactation (28 days). Born alive and piglet birth weights were assessed. Piglets were blood sampled at 5 to 7 days of age to measure IgA, hematocrit and hemoglobin, (n=25 before study, n=30/treatment group).

Results

Concentration of haemoglobin and haematocrit increased in the BG versus the Control group 8,059 ± 1,060 g/dL and 31,567 ± 3,978 % vs. 7,194 ± 1,276 g/dL and 28,137 ± 4,565 respectively ($P<0.05$). Concentration of IgA significantly increased in the BG group 49,799 ± 8,173 mg/mL compared tp control 34,731 ± 16,639 ($P<0.05$). The number of piglets born alive increased from 13,464 ± 3,282 (Control) to 14,000 ± 2,850 (BG); birth weight significantly increased in the BG group 1,496 ± 0,344 kg versus the Control group 1,377 ± 0,349 kg ($P<0.05$).

Discussion and Conclusion

Supplementation of the sows pre-farrowing and during lactation with an algal beta-1.3- glucan resulted in significant improvements in hematocrit, hemoglobin, IgA and weight at birth. algal beta-1,3- glucan supplementation may be beneficial to support piglet health, viability and vitality.

HHM-PP-18

SATISFACTION AND MOTIVATION REGARDING ERADICATION OF SWINE DYSENTERY

B. Vidondo [1], R.S.S. Cadetg [2], H. Nathues [2], G. Schüpbach [1], F. Zeeh [2]
[1]*Veterinary Public Health Institute, University of Bern, Liebefeld*
[2]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

Eradication of swine dysentery (SD; Brachyspira hyodysenteriae infections) is an effective, but costly control measure. Knowledge about drivers of motivation and satisfaction regarding the eradication of SD would help to convince farmers to eradicate.

Material and Methods

Pig farmers (n=68) having conducted an SD eradication were interviewed using a questionnaire. We assessed their motivation as moderately or highly motivated. Based on the farmers' subjective evaluation of nine aspects of the eradication, satisfaction was coded as moderate (<7/9 aspects positively evaluated) and highly (≥7/9). Multivariable factor analysis for mixed data (FAMD) was performed. Associations between motivation and satisfaction and farm characteristics were analysed by logistic regression models. Farms with fattening pigs and farms with breeding stock were analysed separately.

Results

Of the 36 farmers with breeding pigs, 24 were highly motivated, and 20 highly satisfied. Of the 61 farmers with fattening pigs, 45 were highly motivated, and 42 highly satisfied. The FAMD revealed two main factors each that explained between 15 and 10% (breeding stock) and 11 and 10.6% (fattening pigs) of the total variation, respectively. For farmers with breeding stock no significant factors for motivation were detected, but they were more satisfied when they had a rhythm of 3 weeks (OR 25). Farmers with fattening pigs were more likely to be more motivated when providing access to outdoor areas (OR 3.3) and when it was their own initiative (OR 5.5). They were more likely to be satisfied when they had only fattening pigs (OR 5.7), when the eradication was their own initiative (OR 5.5) and when they did not disinfect the barns during the eradication (OR 15.6).

Discussion and Conclusion

In summary, the majority of the farmers were satisfied with the eradication. Education could promote self-motivation of farmers, and subsidies might support the implementation of SD eradications.

HHM-PP-19

EARLY DIAGNOSTIC CAPABILITY OF A SOUND-BASED MONITORING TECHNOLOGY COMPARED TO ORAL FLUIDS SURVEILLANCE IN GROWING PIGS

C. Goodell [1], K. Hogan [1], C. Alonso [2], A. Fernandez-Fontelo [3], D. Polson [1]
[1]Boehringer Ingelheim Animal Health USA Inc.
[2]Boehringer Ingelheim Vetmedica GmbH, Germany
[3]Humboldt-Universität zu Berlin School of Business and Economics Ladislaus von Bortkiewicz Chair of Statistics Unter den Linden 6 10099 Berlin Germany

Background and Objectives

Pen-based oral fluid (OF) sampling could be considered the gold-standard for respiratory pathogens surveillance in swine populations. SoundTalks®, a 24/7 cloud-based sensor technology uses artificial intelligence to generate early warnings (yellow/red alarms) for producers to early intervene. However, the advantages of this technology compared to an intensive OF surveillance program in the field remains unknown. Therefore, the objective of this study was to determine the timing of cough episodes´ diagnostics based on sound monitor alerts compared to an intensive of program.

Material and Methods

PRRS-positive 3-weeks old piglets were placed at two sites: East-West (4 rooms, 8,400 head capacity/site). Pigs were continously sound-monitored and OF-sampled, weekly and post-alarms, for PRRS, IAV and Mhyo. Cough-episodes were defined as ≤5 consecutive red-yellow alarms-days ending in ≥5 consecutive green days. OF were performed to determine lead-time between sound-monitoring alarm (yellow/red) and when the diagnostics identified a positive result.

Results

From 844 OF samples, 114, 91, and 450 were positive for Mhyo, IAV, and PRRSV respectively. A total of 25 cough episodes (mean=3.1, max=5, min=2) were identified.13/25 of cough episodes were identified during the nursery phase. Those outbreaks identified during the finishing period (12/25) were detected 4.8 days sooner, as an average, with this sound-surveillance system than with OF sampling. When considering each of the pathogens individually, this sound-surveillance was capable to detect IAV outbreaks 5.1 days earlier and, in the case of Mhyo, 1.5 days earlier than intensive OF surveillance program in the field.

Discussion and Conclusion

Results demonstrated the importance of continuous and real-time monitoring of the swine growing population due to the high incidence of cough episodes in commercial barns. This sound-surveillance system detected cough episodes 4.8 days earlier than intensive OF sampling monitoring programs for IAV and Mhyo agreeing with previous literature when compared on observations of clinical signs.

HHM-PP-20

FIELD SURVEY ON THE USE OF ORAL IRON IN FRANCE: PRACTICES AND EVALUATION OF HEMOGLOBIN (HB) LEVEL IN PIGLETS AROUND WEANING

S. Brilland [1], J. Collet [2], A. Maligorne [3], W. Stynen [4], C. Trombani [5], N. Capdevielle [1], A. Jardin [1]
[1]Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France
[2]SOCAVET, 75bis boulevard de Penthièvre, 22600 Loudéac, France
[3]HYOVET, 5 Parc d'Activités Carrefour de Penthièvre, 22640 Plestan, France
[4]CLINIQUE VETERINAIRE DE L'ELORN, 260 Rue de la Petite Palud, 29800 Landerneau, France
[5]BREIZHPIG, Z.A. du Vern 29400 Landivisiau, France

Background and Objectives

Iron deficiency anaemia (IDA) is a recognized clinical condition of fast-growing piglets and is considered as an emerging problem. IDA is controlled by routine application of iron-based products of different formulations and route of administration (oral-injection). In France, the use of oral iron is widespread (around 20% of farms). The most common parameter to indicate IDA is hemoglobin concentration (Hb). The aim of the study was to evaluate the Hb of piglets and % of anemic piglets at weaning in commercial French farms using oral iron.

Material and Methods

Thirty-nine farms, from the west part of France (from 4 different vet organizations) were randomly selected, based on their willingness to participate on survey. Within each farm, ten randomly selected litters from different parity sows have been assessed (3 piglets per litter/ 1203 piglets in total). Small, medium and large piglet were selected and sampled. Hb levels were measured immediately by previously described method using farm analyzer (HemoCue ® Hb 201+.). A questionnaire concerning farm practice was filled in at the same time for each participant.

Results

Farmers applied different oral iron products 3 times (75%) on carpet or plates (6 farmers use dedicated trough). In 82% of the investigated farms (32/39), IDA doesn't seem to be completely controlled. Indeed, the target of 85% piglets with Hb ≥ 10 g/dl, considered as the minimum recommended concentration for piglet's growth needs, has not been reached. In total 24,5% (287) piglets were anemic (< 9 g/dL) in this survey compared to only 15% for those receiving it in injectable form (Brilland et al.,2019;$p<0.001$).

Discussion and Conclusion

In more than 80% of the farms investigated, IDA wasn't under control. Different level of intake by piglets needs to be considered and might be the reason for high heterogenity of Hb levels of piglets at weaning observed within herds.

HHM-PP-21

MATERNALLY DERIVED IMMUNITY AGAINST SWINE ERYSIPELAS AND ITS APPLICATION AS A TOOL TO EVALUATE THE IMMUNE TRANSFER FROM SOW TO PIGLETS

M. Baratelli [1], D. Llopart [1], A. Puigredón [1], I. Ballarà [1], I. Galè [1], J. Miguel [1], J. Bosch [2], B. Gainza [2]
[1]*HIPRA HQ, Amer (Girona), Spain*
[2]*Clinobs, SL*

Background and Objectives

Maternal immunity plays a pivotal role in piglet health and development and just a few methods are available to assess the efficiency of its transmission from sows. This study intended to characterize the dynamics of the maternally derived antibodies (MDA) against swine erysipelas (SE).

Material and Methods

Sows at 2nd–4th parity (n=7) were recruited from a farm vaccinating with an Ery+Parvo vaccine. The antibody immunity against SE was investigated periodically in the sera of sows and their respective piglets (n=102). Samples were analyzed by the ELISA CIVTEST® SUIS SE/MR (Cut-off IRPC>40; IRPC, Relative Index x100). The efficiency of the MDA transference was calculated as the ratio between the ELISA results at different days of the study from piglets and their mothers.

Results

The SE MDA were rapidly decaying (-1.94±0.84 IRPC/day) and thus more than 50% of piglets were negative by the 3rd–4th week of life. The antibody response against SE of sows at 3 weeks before farrowing was about 99-125.5 IRPC. This dropped drastically during the latter weeks of gestation (58.32%) to then recover back after the farrow. The ratio between results from sows at 13 weeks of gestation and piglets at birth was 0.81±0.19 and using data from both at the 1st week of lactation 1.06±0.68.

Discussion and Conclusion

This is the first study showing the dynamic of SE MDA under field conditions and the physiological drop of SE antibodies during the peripartum period. The most useful way to calculate the MDA transfer efficacy was using the results collected from the sows at 13 weeks of gestation and piglets at birth or using the data collected from both at the 1st week of lactation. Moreover, this study suggested that the SE antibody immunity might be used as a marker to evaluate the efficiency of the transfer of maternal immunity.

HHM-PP-22

SLAUGHTERHOUSE VISUAL AND PALPATION METHOD FOR MONITORING ECONOMIC LOSSES OF PORCINE PROLIFERATIVE ENTEROPATHY (PPE) CAUSED BY LAWSONIA INTRACELLULARIS (LI)

I. Szabo [1], T. Molnar [1], I. Makkai [2], P. Mate [2], R. Jolie [3], H. Swam [4], D.J. Holtkamp [5], R. Glávits [6], L. Ozsvari [7], L. Buza [2]

[1]*National PRRS Eradication Committe, Budapest (Hungary)*
[2]*MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)*
[3]*Merck Animal Health, Madison, NJ 07940 USA*
[4]*Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands*
[5]*Iowa State University College of Veterinary Medicine*
[6]*Autopsy Path Ltd., Budapest*
[7]*University of Veterinary Medicine Budapest, Hungary*

Background and Objectives

LI causes PPE, a disease characterized by thickening in the small intestine due to the proliferation of enterocytes, typically in the ileum, but also in the colon's mucosa. Economic losses due to ileitis have been estimated at $4.65 per fattening pig, with US pig farmers losing $56.1 million annually. Currently there is no monitoring tool at the slaughterhouse for PPE evaluation and it has become necessary to develop an ileitis monitoring tool that is inexpensive, simple, fast, sensitive and provides immediate results.

Material and Methods

The ilea of slaughtered pigs were evaluated based on visual assessment and palpation. More than 1.500 fattening pigs from 27 LI seropositive pig farms in five Central European countries were checked at slaughterhouses. Losses due to PPE were evaluated by Holtkamp's 2019 ileitis economic losses study. Animals with an ileum scored for "0" corresponded to Holtkamp PPE-free, those with a value of "1" in lower, and those with a value of "2" in upper bound category. The percentage incidence of individuals with acute PPE lesions "2+" was used.

Results

Ileum examinations performed with this new tactile method scored "0" in 46%, "1" in 26.9%, "2" in 26.7% of the animals. "2+" rated ileums were scored in 0.5%. In a dedicated farm, animals' acute ileitis score (2+) projected significant losses for producing fatteners due to LI infection. In 2 cases, 20-42 % of the achievable profit; in 9 cases, 62-76% and in 1 case 82% of the achievable profit were obtained.

Discussion and Conclusion

The method developed is similar to lung lesion scoring tools and can be performed at slaughterhouses. The results of the procedure are correlated with the results of other laboratory diagnostic tests for ileitis (histology, immunohistochemistry, serology, fecal PCR). The results can provide immediate interpretation of the status of ileitis.

HHM-PP-23

A PRACTICAL TOOL TO ASSES TIME OF DEATH OF PIGLETS DURING GESTATION AND PARTURITION.

K. Eenink [1], M. Houben [1], K. Junker [2]
[1]*GD Animal Health, Deventer, The Netherlands*
[2]*Royal GD, Deventer, The Netherlands*

Background and Objectives

Piglet survival is an important welfare issue and can be improved by reducing the number of stillborn piglets. To prioritize possible interventions to improve piglet survival it is important to determine, at individual farm level, in which phases of gestation and/or parturition, piglets die. Royal GD developed a practical tool to help veterinarians to identify these phases.

Material and Methods

Twenty-four sow farms participated and submitted all stillborn piglets and mummified foetuses of a farrowing batch. In total of 1151, mean 48 (± 28) piglets per farm were included. At the laboratory every individual piglet or mummy was scored on mummification, size, weight and intrauterine growth retardation (IUGR). Via necropsy the organs were assessed on colour and development. Based on the assessment, estimated death of every piglet was classified into one of the following four phases during gestation and parturition: 1) before the last week of gestation; 2) last week of gestation; 3) during parturition; 4) born alive.

Results

Overall, 86% of piglets classified as stillborn piglets and 14% as mummified foetuses. Average weight of piglets was 1061 (±355) grams. 1.5% of the piglets showed signs of IUGR. Of all piglets 6% were classified in phase 1, 4% in phase 2, 85% in phase 3 and 5% in phase 4. The average percentage of piglets per farm weighing under 800 grams was 26% (min: 2% - max: 68%).

Discussion and Conclusion

The variation between results of individual farms is large; this can be explained by the different underlying causes of stillbirth. For example, disease, feed, genetics or management factors. Although veterinarians and farmers find the tool helpful in their daily practice, more research is needed to confirm the relation between the cause of stillborn piglets and the results in the tool.

HHM-PP-24

ASSESSMENT OF AN NSAID ADMINISTERED TO POSTPARTUM SOWS AND GILTS, TO EVALUATE PIGLET ZOO-TECHNICAL PERFORMANCE AND IGG TRANSFER.

L. Pérez Sala [1], A. Finestra Uriol [1], R. Reyero [2], E. Grandemange [3], O. Merdy [3], N. Seux [3], P. Renaud [4]
[1]*F.V.A. Spain*
[2]*Vetoquinol Especialidades Veterinarias S.A. Spain*
[3]*Vetoquinol S.A. France*
[4]*Vetoquinol N.-A. Inc. Canada*

Background and Objectives

Tolfenamic acid (TA) is a nonsteroidal anti-inflammatory drug with therapeutic indications in postpartum dams. The trial objective was to evaluate zoo-technical performances and IgG transfer in piglets, born from TA treated dams.

Material and Methods

Dams were randomly assigned to two groups: 1) TA; sows n=20 and gilts n=21, who recieved a single IM treatment of 2mg/kg within 12 hours postpartum, 2) CONTROL; sows n=20 and gilts n=20. The measured parameters in piglets (TA n=472, CONTROL n=458) were individual weights at D0-birth and weaning (WW), average daily gain (ADG), live-born, D2 mortality (D2M), weaned mortality (WM), and D1-D2-D20 individual plasma IgG. Statistical methodology involved Mann-Whitney Wilcoxon for D2M and WM parameters, while a linear mixed model for ADG, WW and IgG parameters was applied. For the ADG, WW and IgG levels, the litter was added as a random effect taking into account that piglets were not independent from the litter. Finally, the applied p-value was 0.05.

Results

The results for TA and CONTROL groups were for ADG 0.2281kg and 0.1906kg ($p<0.0001$), WW 6.318kg and 5.504kg ($p<0.0001$), D2M 2.54% and 6.11% ($p=0.0091\%$), and WM 6.6% and 11.8% ($p=0.0062$), respecitvely. Still considering the TA and CONTROL groups, the IgG levels in D1 piglets from gilts were 20.60µg/ml and 16.99µg/ml ($p=0.0488$), respectively.

Discussion and Conclusion

When compared to the CONTROL group, piglet zoo-technical performances in the TA group had a higher mean weaned weight (+0.8149kg), a significantly lower weaned mortality rate (almost half of CONTROL), and a higher D1 mean plasma IgG in piglets from gilts (3.61µg/ml). These results suggest that the potent effect of Tolfine® mitigates postpartum pain, improves dam well-being and maternal behaviour, which increases receptivity to suckling. Finally, the ≤12h postpartum treatment time frame is practical for commercial farms, when immediate attendance to dams is not always practical.

HHM-PP-25

BIOSECURITY MULTIDIMENSIONAL CHARACTERIZATION IN TWENTY FRENCH FARROW-TO-FINISH FARMS AND ASSOCIATION WITH HEALTH STATUS

P. Levallois [1], M. Leblanc Maridor [1], C. Fourichon [1], C. Belloc [2]
[1]BIOEPAR, INRAE, Oniris, 44307, Nantes
[2]BIOEPAR, INRAE, Oniris, 44307, Nantes, France

Background and Objectives

Although the link between biosecurity practices and the prevention of some diseases was demonstrated, the link between biosecurity scores and farm health is to our knowledge poorly described. The aim of this study is to describe biosecurity and health evolutions between two visits in 20 farrow-to-finish farms in which advices were provided by vets.

Material and Methods

The 20 farrow-to-finish farms were recruited since a health issue needed to be adressed and/or biosecurity practices needed to be improved. A biosecurity audit (internal and external) and a health description were systematically performed twice, 7 months apart. During the fist visit, farm veterinarians formulated tailor-made advices whose compliance was assessed. A principal component analysis followed by a hierarchical clustering characterized our 20 farms according to their biosecurity scores and healtyh statuses.

Results

We observed a high diversity of situations regarding both biosecurity practices and health statuses. Higher biosecurity scores are not always linked to higher health level and conversely in these 20 farrow-to-finish farms. These observations illustrate the complex relationship beatween management practices, among which biosecurity, and health. A thourough analysis of each individual herd is needed to identify tailor-made recomendations and levers to imporve compliance of advices.

Discussion and Conclusion

Through these 20 herd clinical cases with various health statuses and biosecurity levels we illustrate the need for an expert-performed biosecurity audit. This expertise includes a thorough knowledge of the herd health status (pathogen load, clinical observations, preventive and therapeutic practices) as well as the factors influencing the actual implementaion of biosecurity practices.

HHM-PP-26

GENOMIC REGIONS ASSOCIATED WITH RESILIENCE INDICATORS IN PIGS

H. Laghouaouta [1], L. Fraile [1], R. Suarez-Mesa [1], R. Ros-Freixedes [1], J. Estany [1], R. Pena [1]
[1]*University of Lleida, Lleida, Spain*

Background and Objectives

Selective breeding for improved resilience would reduce the economic losses and increase the profitability of the production systems. However, there is no direct measure of resilience and there is scarce information about its genetic background. This study aimed to detect genomic regions associated with two resilience indicators in growing pigs: deviation from the expected body weight at 16 weeks of age (ΔBW) and the increment of the acute phase protein haptoglobin (ΔHP) after applying a vaccine.

Material and Methods

DNA samples of challenged pigs were genotyped with the GeneSeek GGP Porcine HD array (~70K). After quality control, 445 individuals and 41,465 SNPs remained for the analyses. Genome-wide association studies for ΔBW, ΔHP and the observed body weight at 16 weeks of age were performed using a single-marker regression and a Bayesian multiple-marker regression approach.

Results

Genomic regions at SSC2 (10.7-12.7 Mb), SSC8 (12.8-14.8 Mb), SSC9 (135.8-138.7 Mb) and SSC11 (59.3-61.7 Mb) were identified as associated with ΔBW, explaining 6.4%, 4.45%, 13.75% and 2.35% of its genetic variance, respectively. There was no overlap between these regions and those obtained for the observed body weight at 16 weeks of age. The genomic regions at SSC8 (123.8-125.8 Mb), SSC9 (123.9-125.9 Mb), SSC13 (5.7-7.7 Mb and 21.0-23.0 Mb) were identified as associated with ΔHP, explaining 0.67%, 0.63%, 1.59% and 2.14% of its genetic variance.

Discussion and Conclusion

The associated genomic regions with the resilience indicators harbour several candidate genes related to the immune response pathway (CD6, PTGDR2, IKZF1, RNASEL and MYD88), corroborating the well-known relationship between resilience and the immune system. Our study identified also important genes involved in growth pathways such as GRB10 and LCORL. Further analyses are needed to validate the identified associations.

HHM-PP-27

IMPACT OF FECAL CONSISTENCY SCORE ON FEED CONVERSION AND DAILY WEIGHT GAIN IN NURSERY PIGS

J.P. Nielsen [1], P. Brandt [1], H. Sommer [2], A.ø. Pedersen [3]
[1]*Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark*
[2]*SEGES Pig Research Centre, Axeltorv 3, 1609 Copenhagen, Denmark*
[3]*Section for Production, Nutrition, and Health, Department of Veterinary and Animal Sciences, University of Copenhagen, 1870 Frederiksberg C, Denmark*

Background and Objectives

Fecal consistency scoring is used to assess gut health and diagnose enteritis in nursery pigs. The objective of the present study was to investigate the association between fecal consistency, feed conversion ratio and daily weight gain.

Material and Methods

A total of 108 pens with 1080 nursery pigs in the weight interval from 7 to 30 kg were included in the experiment. Consumption of feed was recorded pen wise and average feed conversion ratio (AFCR) per kg body weight gain (BWG) per pen was calculated.The consistency of feces was scored at pen level three times a week using a score where: 1 = normal, 2 = mushy, 3 = watery. Fecal floor samples were tested for intestinal pathogens by PCR.Statistical models included AFCS and batch as fixed and random effect, respectively. Response variables were AFCR and ADG.

Results

Very few pens had watery feces and L. intracellularis was detected in moderate levels. Fecal consistency (AFCS) was strongly associated with feed conversion ratio and average daily gain. The effect of 0.1 increase in AFCS was 0.043 FUgp/kg BWG and 18 g ADG, ($P<0.005$).

Discussion and Conclusion

This study was conducted in nursery pigs without severe diarrhea and with a low number of antibiotic treatments. In spite of this, a more fluid fecal consistency at pen level was clearly associated with reduced daily gain and increased feed consumption per kg weight gain. These findings support that fecal consistency is an important indicator of intestinal digestive function and gut health.

HHM-PP-28

IMPACT OF SPLIT SUCKLING ON COLOSTRUM INTAKE: A FARM CASE WITH HIGH PROLIFICACY

P. Leneveu [1], A. Bodard [2], M. Remond [3], E. Lewandowski [4], P. Bourguignon [3]
[1]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*
[2]*BTSA PA de Limoges et du Nord Haute Vienne, les Vaseix, 87 430 Verneuil sur Vienne, France*
[3]*Epidalis, Avenue de la Promenade, 79 140 Cerizay, France*
[4]*Ceva Biovac, 4 rue O de Serres, 49 070 Beaucouzé, France*

Background and Objectives

Colostrum intake (CI) is crucial fo health and performance of piglets, and many factors can influence its effectiveness. Among them, the split suckling (SS) technique (i.e., blocking heavier piglets under a heating lamp to facilitate udder access and CI of smaller) is questioning. Do small piglets suffer from a problem of access to the udder in large litters? Or do they need to be warmed up first? This study attempts to answer.

Material and Methods

The study took place in a high prolific farm using SS.

In a first part, SS was described during a CI evaluation using piglet Weight Gain at 24h (WG24; 304 Blocked Piglet, BP), and then evaluated among litters with 40-80% BP (245 of 304 piglets) by comparison of WG24 of 175 BP and 70 non-BP.

Next, rectal temperatures (RT) of 138 other BP were recorded every 30 min to describe their homeothermy.

Results

SS was implemented in large litters (69% of BP; 20.4 Live Born vs 15.9 in non-concerned litters). BP, most weighing > 1.2 kg, had a mean blocking time of 1 h 44 min.
Contrary to the assumptions, evaluation of SS shows that BP had higher WG24 ($P < 0,001$), especially piglets weighing < 1 kg (57g vs -21g).

In second part, due to a non-compliance with farm procedures, 85 of 138 BP were blocked without heating, which significantly decreased RT ($P = 0,002$). Variation of RT 1h30 after blocking was particularly demonstrative for “hypothermic” BP (RT < median at blocking, 38.4°C), presumably less vigorous: -0.29°C without heating vs +0.17°C with.
Those non-warmed BP experienced a situation similar to that of non-suckling non-blocked piglets.

Discussion and Conclusion

Improved homeothermy of hypothermic BP at blocking can explain better CI of BP.
Therefore, primary issue for piglets appears to be homeothermy rather than udder access.

HHM-PP-29

MONITORING OF LEVELS OF TOTAL IMMUNOGLOBULINS IN COLOSTRUM AND SERA SAMPLES OF NEWBORN PIGLETS

E. Vávrová [1], K. Hlavová [2], K. Nechvátalová [2], M. Faldyna [2]
[1]*University of Veterinary Sciences Brno, Czech Republic*
[2]*Veterinary Research Institute, Brno, Czech Republic*

Background and Objectives

Newborn piglets are fully dependent on colostrum intake to ensure total immunoglobulins (Igs) levels in their sera. Sufficient levels of Igs in piglets' serum could be also indicator of good farrowing management. Unfortunately, there are not many studies dealing with current Igs levels in colostrum and piglet sera samples, especially in hyper-prolific genetics. The aim of our study was to determine average levels of Igs in colostrum samples and sera of 3day old piglets and their (non)homogeneity within a litter, using cheap, rapid laboratory method.

Material and Methods

More than 500 piglets' sera and respective number of sera and colostrum from their dams were taken in farms with different genetics, but in comparable conditions - similar sows' vaccination and feed program without any specific supplements including drugs for farrowing induction. Zinc sulphate turbidity test, modified method of McEwan (1970) for measuring of Igs and Unistat Ltd. Software (UK) for statistical assessment were used.

Results

In contrast to previously published data, overall, lower mean (±SD) colostrum and piglet serum Igs levels were detected in our study, 26.05 ± 4.56 g/l and 12.14 ± 4.5 g/l, respectively. Differences among genetics were found – comparable size litters, for example serum Igs in Hypor piglets (14.43 ± 6.4 g/l) and PIC (14.42 ± 3.4 g/l) were higher than those of DanBred (11.08 ± 3.5 g/l) and Topigs (11.4 ± 3.4 g/l). Where differences were found between animals from same litter, they were related to postnatal care of piglets rather than size/birth weight of animals.

Discussion and Conclusion

Our study contributed to update of current common Igs levels in colostrum and sera of newborn piglets and confirmed that even a simple laboratory method can help to evaluate and improve good handling practice with newborns.
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HHM-PP-30

PIG HEALTH INFO SYSTEM: SYSTEMATIC RECORDING AND ANALYSIS OF HEALTH-RELATED DATA

C. Egle [1], G. Raposo [3], H. Michel [3], F. Romeo [3], X. Sidler [2], U. Fiedler [3], H. Nathues [1]
[1]Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland
[2]Division of Swine Medicine, Department of Farm Animals, Vetsuisse-Faculty, University of Zurich, Zurich, Switzerland
[3]Department of Engineering and Information Technology, Bern University of Applied Sciences, Biel-Bienne, Switzerland

Background and Objectives

Even if Swiss veterinarians are legally obliged to keep records of their examinations, data regarding the current health status of Swiss pig herds is hardly available and generally not suitable for any evaluation. As this data would be of great significance for an effective nationwide health monitoring, a system is to be built, consisting of an application that allows the veterinarians to document their findings in a homogenous and well-structured manner, a database for storing and analysing the recorded data, and a dashboard to visualise the results of these analyses.

Material and Methods

The veterinarians are equipped with a smartphone app that is developed to record all relevant information about a farm and possible health problems. This app includes several questionnaires covering different sections of a farm examination. Not only actual farm examination findings, but also other data on general management or lab results can be entered into the app. The veterinarians are able to decide case-related which questionnaires are filled in. Whenever a questionnaire has been completed, a report including all recorded information is generated and can be sent to the farmer and any other contacts by email.

Results

All data recorded using the app is stored in an appropriate database and is analysed continuously for any shift in pig health. Especially any local accumulation of certain symptoms should be revealed as early as possible, so that the veterinarians can be informed about potential threats in time. Moreover, the total number of recorded symptoms and diagnoses is displayed in a publicly available dashboard.

Discussion and Conclusion

This app is a terrific tool for veterinarians to improve their documentation. Additionally, it enables them to record health data in a way that makes it usable for further analyses. The entire system will simplify health monitoring and is therefore expected to have a positive impact on national animal health.

HHM-PP-31

SMART PIG PRODUCTION - IMPROVING ANIMAL HEALTH AND COMPETITIVENESS ON ORGANIC AND CONVENTIONAL FARMS THROUGH THE USE OF 4.0 SENSOR TECHNOLOGY

H. Nienhoff [1], J. Aundrup [1], C. Meckbach [3], D. Staack [2], S. Herbold [3], A. Reuter [3], J. Gerhardy [4], I. Traulsen [3], H. Gerhardy [4]

[1]Swine Health Service, Chamber of Agriculture Lower Saxony, Oldenburg, Germany

[2]VzF GmbH, Uelzen Germany

[3]Department for Animal Sciences, Georg August University, Goettingen, Germany

[4]MSG, Garbsen, Germany

Background and Objectives

The use of 4.0 sensor technology on pig farms allows farmers to continuously and precisely monitor the housing conditions of their livestock. Consequently, farmers can react in real time to changes (i.e. climate changes such as temperature or humidity) in order to maintain or even improve the pig's health status.

Material and Methods

4.0 sensor technology available on the market (temperature, humidity, CO2, NH3, water consumption, brightness) was installed in 10 pig units (piglet production, rearing and fattening, organic and conventional). The measuring period started in October 2019. Sensor data was regularly transferred to a data platform. Clinical examinations were carried out every 2 months. In addition laboratory diagnostic examinations and biological and economic performance data as well as information on the use of antibiotics and on slaughter performance were collected. All data collected on the farms were processed and merged to build SmartData. On the basis of the SmartData, the conditions of husbandry and animal health are described and prediction models will be developed for optimizing housing conditions and animal health.

Results

With respect to the clinical examinations and performance data, health and biological performance was improved in at least 6 units. The performances differ between organic and conventional production systems. Regarding the impact of climate conditions on animal health, first results reveal that the median NH3 value as well as changes in CO2 concentration influences the occurrence of respiratory track diseases.

Discussion and Conclusion

Sensor technology (4.0) on pig farms can support farmers improve production and management sustainably. The knowledge about the development of innovative concepts for the stable of the future (conventional and organic) will be developed. The societal challenges for fewer antibiotics as well as more transparency and better documentation can be met.

HHM-PP-32

EVALUATION OF ENTERIC DISEASE ON HEMOGLOBIN CONCENTRATIONS, COMPLETE BLOOD CELL COUNTS AND GROWTH IN PIGLETS

C. Bublitz [1], K. Castevens [2], B. Pecoraro [3], G. Almond [4]
[1]*College of Veterinary Medicine, North Carolina State University*
[2]*Country View Family Farms, Middletown, PA 17057*
[3]*North Carolina State University, Raleigh, NC USA 27606*
[4]*College of Veterinary Medicine, North Carolina State University, Raleigh, NC USA*

Background and Objectives

Hemoglobin (Hb) concentrations and complete blood cell counts (CBCs) in piglets with enteric disease remain an enigma. The objective of this study was to examine the effects of enteric disease on Hb concentrations, body weight, and CBCs in piglets.

Material and Methods

On a commercial 2000-sow farm, eight litters were selected as healthy and eight litters had enteric disease. Piglets were iron dextran (Uniferon®) injections on the first day of the study. From each litter, five piglets (4-5 days of age) were randomly selected and blood samples collected at the start of the study and weekly until weaning. Hb concentrations were determined for all blood samples and piglets weighed at each sampling day. One piglet per litter was chosen for CBCs. The ANOVA model included day and treatment and means compared with Tukey's test

Results

Healthy piglets gained more ($P<0.01$) weight (3.95+0.2 kg) than piglets with enteric disease (3.0+0.13 kg). In contrast, piglets with enteric disease had greater ($P<0.01$) Hb concentrations (120+2.6 g/L) than healthy piglets (113+3.0 g/L) on the day prior to weaning. CBC data showed differences in several parameters. Rotavirus was the pathogenic agent in the enteric disease.

Discussion and Conclusion

Body weight plays a negative role in Hb concentration. Heavy, rapidly growing piglets likely utilize more Hb or cannot produce sufficient Hb compared to slow growing piglets. Perhaps, dehydration of piglets with enteric disease contributes to higher Hb levels. The results raise questions about the physiological processes that cause sick piglets to utilize less or producing more hemoglobin.

HHM-PP-33

LOWER MATERNAL IMMUNITY TRANSFER IN PRIMIPAROUS VERSUS MULTIPAROUS LITTERS CAN BE EXPLAINED BY A COMBINATION OF SOW IMMUNITY STATUS AND SUBOPTIMAL COLOSTRUM INTAKE

J. Beek [1], J. Miguel [3], C. Jurjens [2], M. Solé [3], D. Llopart [3], M. Wilhelm [1]
[1]*HIPRA Benelux*
[2]*De Oosthof, The Netherlands*
[3]*HIPRA, Amer, Spain*

Background and Objectives

Colostrum intake is critical for the transfer of passive immunity from sow to piglet. Suboptimal intake results in piglets being more prone to infections early in life. The usefulness of an algorithm to score the quality of immune transfer (MDA TT) based on the sow and piglet Swine Erysipelas (SE) titers at 7 days after farrowing was previously shown[1]. This study aimed to evaluate maternal immunity transfer in primiparous versus multiparous litters on conventional Dutch sow farms. [1]De Cleer et al. IPVS 2020

Material and Methods

Eight farms participated in the study, all routinely vaccinated gilts and sows against SE. Depending on farm size, 10-20 sows of different parity and ≥3 piglets per sow were selected on the day of farrowing. On day 7 after birth, blood samples were taken and analyzed with CIVTEST® SUIS SE/MR. In total 536 samples were analyzed, originating from 24 primiparous and 91 multiparous litters. The MDA TT was calculated. Erysipelas titers in primiparous and multiparous sows and their piglets were compared using the T-test.

Results

Titers in primiparous and multiparous sows were 53,12±29,6 (mean±sd) and 78,54±28,0 ($p<0.001$). In their piglets, erysipelas titers were 53,35±31,7 and 82,76±30,5 ($p<0.001$), respectively. Maternal immunity transfer against SE increased significantly by 55% from first parity to multiparity litters. Whereas the erysipelas titer of second parity sows (58,83±21,0) was comparable to primiparous sows, second litter piglets showed a higher intake of maternal antibodies (69,52±21,5) compared to piglets from first parity litters ($p<0.05$).

Discussion and Conclusion

In this study on Dutch sow farms, piglets from primiparous sows had a lower quality of maternal immunity transfer than piglets from multiparous sows as shown by MDA TT. This finding can be explained by a combination of relatively low SE titers in young compared to older sows and a lower colostrum intake in primiparous versus multiparous litters.

HHM-PP-34

RESPIRATORY HEALTH STATUS MEASURED BY A SOUND-BASED MONITORING TECHNOLOGY IMPACTS GROWTH OF FINISHING PIGS IN THE NETHERLANDS

M. Steenaert [1], C. Alonso [2], A. Fernandez-Fontelo [3]
[1]*Boehringer Ingelheim Animal Health Netherlands bv*
[2]*Boehringer Ingelheim Vetmedica GmbH, Germany*
[3]*Humboldt-Universität zu Berlin School of Business and Economics Ladislaus von Bortkiewicz Chair of Statistics Unter den Linden 6 10099 Berlin Germany*

Background and Objectives

Respiratory disease in pigs impacts overall health, productivity and animal welfare. SoundTalks® is a cloud-based sensor technology that monitors sound emitted from pigs 24/7. The processed data is transformed into a respiratory health status metric (ReHS). From the ReHS value the system emits either a green signal (no respiratory disease) or early respiratory outbreak warnings (yellow/red signal) allowing producers to intervene prior to evident respiratory clinical signs. This study describes the use of this sound-monitoring system in a commercial finishing farm and the potential association of such data with pig's growth.

Material and Methods

In a Dutch finishing farm, the previousy mentioned sound-monitoring system was used in 11 rooms for approximately 1 year. In two rooms individual daily weight development was monitored using weight scale systems (MS Pigscale) and the calculated Average Daily weight Gain (ADG) was analyzed to study the association with daily respiratory health status (ReHS).

Results

Results showed alarms in 28% (yellow) and 14,5% (red) of the days of the study period. There was a significant room difference in the percentage of days with green, yellow or red signals. The ADG of 6 batches was monitored; during outbreaks ADG was lower compared to non-outbreak periods. In one room the estimated linear model showed that ADG was lower during outbreak periods compared to non-outbreak periods (statistically significant at 10%) as well as ADG difference when comparing the pigs at the beginning versus the end of the finishing period.

Discussion and Conclusion

This study showed the impact of ReHS on ADG in finishing pigs. Results from 6 monitored batches demonstrated that age at the time of the outbreak is a key variable since the observed ADG difference was higher in younger animals compared to older ones. Lower frequency of weighting events by sick animals compared to healthier animals may have underestimated the ADG differences.

HHM-PP-35

RISK OF ACUTE ILEITIS IN GILTS IN HUNGARY – A FIELD STUDY

P. Mate [1], I. Makkai [1], L. Buza [1], H. Swam [2], L. Ozsvari [3]
[1]MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)
[2]Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands
[3]University of Veterinary Medicine Budapest, Hungary

Background and Objectives

Ileitis is caused by Lawsonia intracellularis, and its acute, hemorrhagic form might cause death in the susceptible animals. If we want to decrease the mortality and early culling of gilts in swine farms, and we would like to reduce the use of antibiotics, especially when purchased gilts enter the farm after their quarantine period, the proper vaccination of gilts can control this disease. The aim of this study was trying to find relations between seroconversion around gilt selection, susceptibility, and acute ileitis cases.

Material and Methods

In 2019 we sampled the piglets from 3 weeks to 33 weeks of age with 3-week-intervals and the breeding gilts at 27, 30 and 33 weeks of age: 10 samples from 3-6-9-12-15-18-21-24-27-30-33 week-old animals (=cross-section method) in nine farrow-to-finish farms in Hungary were taken. The Ileitis SVANOVA laboratory tests were done in the CDS laboratory, Boxmeer.

Results

The results show that after the first seroconversion of the piglets (their age varied on different farms), the breeding gilts became seronegative again beyond 24 weeks of age in 100% of the tests.

Discussion and Conclusion

It is very important to know when the breeding gilts become seronegative for ileitis, because the disease often becomes fatal to the older animals, thus the acute hemorrhagic form of ileitis can result in serious production losses on the swine farms. If we want to achieve an effective vaccination protocol for breeding gilts, we must be aware of the seroprofile of the herd. Further data collection will be done, for example fecal ileitis qPCR in gilts.

HHM-PP-36

Herd health management and economy

THE SALIVARY ANALYTICAL MODEL PREDICTS DISEASE BETTER THAN THE SERUM MODEL.

J. Sánchez [1], M. Matas-Quintanilla [2], N. Fuentes [2], F.J. Ibañez-López [3], A.M. Gutiérrez [2]
[1]*CefuSA,30840, Alhama de Murcia, Murcia, Spain.*
[2]*BioVetMed Research Group, Department of Animal Medicine and Surgery, Veterinary School, University of Murcia, 30100, Espinardo, Murcia, Spain*
[3]*University of Murcia, Spain*

Background and Objectives

Saliva has been widely considered as a reflection of serum biomarkers; however, a higher diagnosis power has been defined for specific biomarkers such as acute phase proteins. This study compared the ability of several biomarkers to detect disease in saliva and serum specimens.

Material and Methods

Seven analytes were included in the biomarker panel and were quantified in a total of 93 commercial growing pigs from four different farms using previously validated assays. Specifically, the selected biomarkers were C-reactive protein (CRP), haptoglobin (Hp), adenosine deaminase (ADA), the total antioxidant capacity (TAC), the levels of copper (Cu) and zinc (Zn), and the total protein content (TP). Animals were divided in two groups, health, or disease, according to the observed signs of disease after veterinary clinical examination at farm. Afterwards, saliva and blood samples were collected. The distribution of biomarkers within each group and logistic regression models for each biological specimens were analyzed using R software.

Results

Greater differentiation between groups of animals were observed in the salivary distribution of biomarkers. Both models, saliva and serum models, produce acceptable predictions, according to the discrimination quantified using the AUC. The AUC were slightly higher for the serum model in comparison to the model generated in saliva (0.93 vs 0.87), however, the poor calibration of the serum model, in comparison to the saliva model, makes predicted risk unreliable and discards any possible use of the model.

Discussion and Conclusion

Considering the assays used for the quantifications of the biomarkers suggested in the statistical models (Hp, CRP, ADA and TAC in saliva and Hp, CRP, and Cu in serum), the similar diagnostic power of saliva vs serum for disease detection and the calibration analysis, it could be concluded that saliva-based biomarkers could contribute to more efficient detection of diseased animals than serum-based biomarkers.

HHM-PP-37

A FIRST APPROACH TO SALIVARY ANALYTICAL DIFFERENTIATION OF PATHOLOGICAL CONDITIONS IN THE PIG.

J. Sánchez [1], M. Matas-Quintanilla [2], N. Fuentes [2], F.J. Ibañez-López [3], A.M. Gutiérrez [2]
[1]*CefuSA,30840, Alhama de Murcia, Murcia, Spain.*
[2]*BioVetMed Research Group, Department of Animal Medicine and Surgery, Veterinary School, University of Murcia, 30100, Espinardo, Murcia, Spain*
[3]*University of Murcia, Spain*

Background and Objectives

The connection between stress and disease has been extensively documented. Moreover, a potential indication of decreased welfare in pigs is a greater prevalence of disease because of a compromised immunity. This study analyzed for the first-time stress and disease biomarkers in several porcine diseases to search for salivary analytical differentiations.

Material and Methods

A total of 40 healthy and 67 diseased pigs were included in the study. Six groups of animals were performed according to the clinical signs of disease: Healthy, prolapse, tail biting, diarrhea, lameness, and dyspnea. Saliva samples were obtained after veterinary clinical examination and eleven analytes were quantified including biomarkers of oxidative stress (antioxidant capacity & oxidative status), psychological stress (cortisol & alpha amylase), acute phase reaction (C-reactive protein and haptoglobin) and immune status (adenosine deaminase, copper, zinc and total protein). A principal component analysis (PCA) was used to analytically characterize each disease using R software.

Results

The analysis discriminates between all the studied diseases from the health condition. Moreover, the PCA showed that all the different physiological pathways monitored were important to differentiate between pathological conditions and show those variables that most contribute to the condition definition.

Discussion and Conclusion

A global salivary analytical analysis could be useful for porcine disease differentiation. The use of several unspecific biomarkers of different physiological pathways, that could be involve in disease condition, in an algorithm could make data interpretation specific of disease and should be further explored.

HHM-PP-38

BACTERIOLOGICAL DISEASES AND ANTIMICROBIAL PRACTICES IN LARGE HUNGARIAN SWINE FARMS

M. ágits [1], L. Buza [2], I. Makkai [2], P. Mate [2], L. Ozsvari [1]
[1]*University of Veterinary Medicine Budapest, Hungary*
[2]*MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)*

Background and Objectives

The treatment of bacterial diseases in livestock farming is becoming more limited due to increasing antibiotic resistance and stricter veterinary regulations. The aim of our research was to survey the incidence of bacterial diseases in different age groups in the Hungarian large swine farms and the practice of antibiotic therapy used for their treatment.

Material and Methods

Between November 2020 and March 2021, we surveyed 16 large-scale swine farms in Hungary (including 14 breeding, 14 farrowing, 16 weaner and 12 finisher production units/age groups) through personal interviews with veterinarians and farm managers.

Results

Our results showed that 73% of the surveyed age groups had some form of respiratory, digestive, articular or neurological disease of bacterial origin. Across all the age groups, articular and neurological diseases were the most prevalent, but respiratory and gastrointestinal disorders caused more severe symptoms. Urinary and genital diseases were the most common in sows. Group antibiotic therapy was decided immediately in 15% of the studied age groups, whereas in 25% of the age groups only above a certain incidence level. Samples are taken to determine antibiotic resistance in 49% of the age groups surveyed. The syringes are changed only after severe contamination in 71% of the groups, and in 21% a syringe is used for more than one preparation. For oral group treatments, medicated water is preferred by 61%, and solubility rules are considered in 50%, the change in water demand due to ambient temperature in 25% of the studied groups.

Discussion and Conclusion

In Hungary, it would be important to isolate animals with clinical symptoms, to measure antibiotic consumption more accurately, and to introduce treatments based on more frequent antibiotic susceptibility testing, thus effectively reducing antibiotic use while maintaining animal health status.

HHM-PP-39

CORRELATION BETWEEN COUGH ALARMS INDICATED BY A SOUND-BASED MONITORING TECHNOLOGY AND ORAL FLUIDS DIAGNOSTICS IN GROWING PIGS

C. Goodell [1], K. Hogan [1], C. Alonso [2], A. Fernandez-Fontelo [3], D. Polson [1]
[1]Boehringer Ingelheim Animal Health USA Inc.
[2]Boehringer Ingelheim Vetmedica GmbH, Germany
[3]Humboldt-Universität zu Berlin School of Business and Economics Ladislaus von Bortkiewicz Chair of Statistics Unter den Linden 6 10099 Berlin Germany

Background and Objectives

Respiratory diseases impact the overall health and wellbeing of pigs. SoundTalks®, a sound-based monitoring technology, uses artificial intelligence to provide early warnings (yellow-red alerts) for producers to react. However, further research is needed to compare these alarms to traditional diagnostics via oral fluids (OF). Therefore, the objective of this study was to correlate the sound-based monitoring alarms (yellow/red) with OF for pathogen detection in growing populations.

Material and Methods

PRRS-positive 3-weeks old piglets were placed at two sites: East-West (4 rooms, 8,400 head capacity/site). Pigs were monitored 24/7 by sound and by OF, weekly and post-alarms, for PRRS, IAV and Mhyo. A chi^2 test was used to examine the relation between SoundTalks alarms and PCR result. Secondly, ordinal logistic regression was used to predict the odds of having yellow-red alarms given the PCR result, considering weeks of age and site.

Results

The analysis of 844 OF demonstrated significant relationship between alarm-color and PCR-results for all 3 pathogens. For an IAV+ result, the odds of having a red/yellow alarm were 4.1 times higher than for a green alarm. For an increase of 1week of age, the odds of having red/yellow alarms were 10% higher compared to a green alarm. On the other hand, for a Mhyo+ result, the odds of having a red /yellow alarm were 3.1 times higher than for a green alarm, and for an increase of 1week age the odds of having a red/yellow alarm were 6% higher compared to a green alarm.

Discussion and Conclusion

Sound-based monitoring alarms are reliable diagnostic tools. The odds of having a red/yellow alarm with positive OF results were higher for IAV than for Mhyo and increased with piglet's age. Further studies are needed to evaluate the effect of PRRS positive OF results considering field vs vaccine strain.

HHM-PP-40

ECONOMIC ASSESSMENT OF A SOUND-BASED PRECISION LIVESTOCK FARMING TOOL (SOUNDTALKS) BASED ON TIMING OF INTERVENTION AFTER A DUAL MYCOPLASMA HYOPNEUMONIAE AND PRRS VIRUS SEEDER CHALLENGE IN PIGS

D. Polson [1], C. Alonso [2]
[1]*Boehringer Ingelheim Animal Health USA Inc.*
[2]*Boehringer Ingelheim*

Background and Objectives

The objective of this study was to evaluate the performance and economic differences resulting from earlier intervention following the onset of a clinical respiratory disease episode detected by a sound-based technology (SoundTalks).

Material and Methods

A total of 1655 11-week-old pigs were equally distributed throughout 72 pens and two rooms of a large research barn. In every pen, three randomly selected seeder pigs were challenged seven days apart with first Mycoplasma hyopneumoniae and then PRRS virus. To assess the impact of when an intervention is administered during a respiratory disease episode, the number of days to the onset of treatment after the first SoundTalks alerts was defined as follows for each group: day zero (G0), day 5 (G5) and day 10 (G10). Pigs in all three treatment groups received the same combination immunological + antimicrobial responsive intervention protocol. Economic effect differences between treatment groups were calculated using a "Standardized Economic Index" (SEI) based on a partial budget model and monthly input cost and market price data over a 10 year period. A 48 month rolling average was used to allow evaluation of the B:C ratio across the estimated lifespan of SoundTalks hardware.

Results

Production variable values were introduced into the SEI model. Throughout the 120 month period (January 2011 through December 2020), and using a CTO of USD $0.254/pig marketed the mean monthly B:C Ratio was 4.27, ranging from 2.52 to 7.90 and exceeding 2:1 for 120 of 120 (100%) months (G0:G5). For the same 120 month period, the 48 month rolling B:C Ratio ranged from 3.37 to 5.06, exceeded 2:1 for 120 of 120 (100%) intervals (G0:G5).

Discussion and Conclusion

This study suggests that a positive economic result is achievable when health interventions are administered earlier triggered by a technology capable of earlier clinical detection.

HHM-PP-41

EFFECT ON PRODUCTION PARAMETERS OF INTRAMUSCULAR VACCINATION AGAINST LAWSONIA INTRACELLULARIS IN A CHRONICALLY INFECTED FARM

M. Coma [1], T. Rodriguez [1], R. Menjon [2], M. Marcos [2], M. Jiménez [2]
[1]*Cooperativa Plana de Vic, Spain*
[2]*MSD Animal Health*

Background and Objectives

The objective of this trial was to evaluate the efficacy of an intramuscular vaccination against Lawsonia intracellularis to reduce clinical signs associated to the disease and to improve production data.

Material and Methods

The trial was conducted in a commercial 1400 sow farm in Spain. Recurrently, one month after entering the fattening unit, pigs were showing diarrhea, that was not inducing mortality, but needed antibiotic treatment. Serology and qPCR of feces confirmed L.intracellularis infection, but also the presence of Brachispira hyodisenteriae.It was decided to vaccinate 8000 piglets (10 consecutive weekly batches) with Porcilis® Lawsonia via im, at 21 days of age. To determine the efficacy of the strategy, clinical signs and production data at fattening phase of vaccinated batches were compared to previous ones (32.137 fatteners of 39 not vaccinated finishing units vs 7.447 vaccinated fatteners of 9 fattening units). ANOVA test was used as statistical analysis.

Results

No statistical differences were found at fattening entry weight between vaccinated (V) and not vaccinated (NV) batches. Vaccinated batches had higher weight to slaughter (V 112.45 kg vs NV 108.39 kg; $p<0,05$), higher ADWG (V 800 g/d vs NV 727 g/d; $p<0,001$) and less days to slaughter (V 113d vs NV 120d; $p<0,01$) than not vaccinated batches. Fewer antibiotic treatments were implemented in V vs NV batches (reduction of 45% of lincomycin via water). In V batches, when clinical signs appeared, laboratory analysis evidenced the presence of B.hyodysenteriae and S.typhimurium.In terms of profitability of the strategy, it was estimated an extra benefit in vaccinated pigs of 2,81€ and a ROI of 2,34.

Discussion and Conclusion

Under the field conditions described, piglet's im vaccination against Lawsonia has evidenced as an efficacious tool to reduce clinical signs induced by L.intracellularis infection, to reduce antibiotic use and to improve production data in a profitable way.

HHM-PP-42

IDENTIFICATION OF NEONATAL DIARRHEA CAUSING AGENTS IN PORTUGUESE SWINE FARMS BETWEEN 2020 AND 2021.

T.N. Nunes [1], F. Costa [1], D. Sperling [2]
[1]*Ceva Saúde Animal, Lda - Portugal*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Neonatal diarrhea (ND) remains a challenge for swine farms all around the world, being caused both by bacteria and viruses, sometimes in coinfection. Our goal was to identify the pathogenic agents present in ND clinical cases in Portuguese swine farms.

Material and Methods

Between January 1st of 2020 and November 1st of 2021, 35 farms with ND problems submitted 60 feces samples from diarrheic piglets to diagnostic labs. All samples were tested for Escherichia coli with detection of adhesin and toxin genes characteristic for ETEC causing ND during piglets' first days of life isolation plus PCR-testing), 56 samples were tested for Clostridium perfringens with detection of toxin genes (isolation plus PCR subtyping), 45 were PCR-tested for rotavirus A (RtVA) and 8 were PCR-tested for rotavirus C (RtVC).

Results

98% of the samples were positive for E. coli and 64% of the isolates contained at least one fimbria (gene). The most common fimbria gene was F5 (51% of the samples), followed by F4 (7%), F41 (7%) and F6 (5%). All F4 and F6-isolates codified toxins. C. perfringens was isolated from 47 samples (84%): 35 isolates (74%) carried genes for alpha and beta-2 being classified as type A, whilst the remaining 12 isolates of C. perfringens (26%) didn't contain toxins' genes. RtVA was present in 40% of the tested samples and RtVC was present in 25% (although, due to the low number of tested samples for RtVC, this only corresponds to 1 farm).

Discussion and Conclusion

These results show that neonatal diarrhea in Portuguese farms is mostly caused by coinfections of different pathogenic agents. Among these, F5 E. coli and C. perfringens type A seem to have a predominant presence, followed by RtVA. More studies must be conducted to better understand the real presence of RtVC.

HHM-PP-43

ILEITIS PREVALENCE AND SEROCONVERSION IN HUNGARY - A FIELD STUDY

P. Mate [1], I. Makkai [1], H. Swam [2], L. Buza [1], L. Ozsvari [3]
[1]MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)
[2]Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands
[3]University of Veterinary Medicine Budapest, Hungary

Background and Objectives

Lawsonia intracellularis is an intracellular bacterium, living mainly in the ileum. Ileitis is still one of the most important diseases in the swine sector, causing substantial deterioration in the average daily gain (ADG) and the feed conversion ratio (FCR). Generally, antibiotics were applied to control ileitis in a herd. The aim of this study was to gain knowledge of the prevalence and the age dependent seroconversion of ileitis in the Hungarian swine farms.

Material and Methods

We surveyed the prevalence of ileitis in 26 Hungarian farms in 2019 and 2020 with the support of the CDS laboratory, Boxmeer (MSD AH). We always used the same protocol for blood sampling: 3-6-9-12-15-18-21-24 weeks old pigs were sampled, and 10 blood samples were taken in every age group. We used the Ileitis SVANOVA test.

Results

We found that all farms were seropositive for Lawsonia intracellularis. The seroconversion was the following: at 7 weeks of age in 4% of farms, at 10 weeks in 4%, at 12 weeks in 16%, at 13 weeks in 20%, at 15 weeks of age in 12%, at 16 weeks in 12%, at 18 weeks in 16%, at 19 weeks in 8%, and at 21 weeks in 12%, respectively.

Discussion and Conclusion

The exposure to the L. intracellularis infection and the time of seroconversion greatly differs in the Hungarian swine farms. Since the piglets' age of exposure is defined, an efficient vaccination protocol can be set up, diminishing the overall use of antibiotics.

HHM-PP-44

IMPROVING PRODUCTIVE PARAMETERS IN SUCKLING PIGLETS AFTER USING A COMBO PRODUCT TO PREVENT ANAEMIA AND COCCIDIOSIS

T. Lopes [1], P. Maiquez [1], S. Cárceles [3], D. Espigares [2]
[1]*Piensos Galindo, Spain*
[2]*Ceva Salud Animal*
[3]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

Porcine neonatal coccidiosis caused by Cystoisospora suis is a frequent cause of neonatal diarrhea in sucking piglets worldwide and considered to be a responsible of lower post-weaning growth. Coccidiosis is prevented by application of toltrazuril. The aim of this study was to evaluate a combination of gleptoferron and injectable toltrazuril on weaning weight and Average Daily Gain (ADG) compared with piglets treated with gleptoferron and oral toltrazuril.

Material and Methods

A total of 374 piglets from 28 litters were included and randomised based on litter and parity. All piglets were individually weighed and ear tagged at 2nd day of age (doa) and re-weighed at 18 doa. 186 piglets were treated at 2nd doa with a combined injectable gleptoferron+toltrazuril (Forceris™) and 188 piglets were treated at 3rd doa according to the usual procedure with the usual farm products, an injectable gleptoferron and an oral toltrazuril (control group).

Results

There was no significant difference between initial weights of injectable and oral toltrazuril group (1.48±0.33kg and 1.44±0.32kg respectively, p=0.1524). There was a significant difference between 18 doa weights of the injectable and oral group (4.99kg ±1.12 and 4.57kg ±1.18 respectively, p=0.001). Statistically significant differences were observed in ADG, with injectable and oral treatment, piglets growing on average 193 and 173g/d ±0.06, respectively (p= 0.0014). An average of 360g extra growth was shown in piglets treated with injectable troltrazuril.

Discussion and Conclusion

The results of this study show that treatment with a combo product (Forceris™) provides heavier piglets at weaning, showing a higher ADG during the trial period compared with orally treated piglets.

HHM-PP-45

INVESTIGATION OF THE LUNG HEALTH AT THE SLAUGHTERHOUSE LEVEL FOR A BELGIAN PORCINE QUALITY LABEL

E. Libbrecht [1], P. De Backer [1], E. De Jonghe [1]
[1]*Ceva Santé Animale, Brussels, Belgium*

Background and Objectives

Respiratory problems have a strong impact on the production cost of fatteners. Because of this fact, a Belgian quality label wanted to map the lung health of their slaughter pigs as part of the health status of the farms. The aim of this investigation is to analyse and benchmark the lung health for a quality label in relation to the Belgian average.

Material and Methods

Lung scores were performed using the Ceva Lung Program app as described previously and focuses on 2 main parameters: bronchopneumonic lesions and dorsocaudal pleurisy.The data used for this analysis were collected in Belgium from June 2021 until November 2021 and will act as a baseline measurement for future reference of the quality label. 9896 lungs from 52 different batches, 38 unique farms and 9 veterinary practices were examined, with an average of 190 lungs per batch. The data for the benchmark is calculated from 501 batches and 74802 lungs.

Results

Bronchopneumonic lesions ranged from 0%-71.57% with an average of 14.99%. The enzootic pneumonia index (EP-index) varied from 0-4.81 and an average of 0.49, which is much lower than the median Belgian EP-index of 0.61. The dorsocaudal pleurisy ranged from 0%-86.8% with an average of 27.11%. The Actinobacillus pleuropneumoniae index (APP-index) ranged from 0-3.04 with an average of 0.92 and is higher than the median Belgian APP-index of 0.83.

Discussion and Conclusion

The EP-index is lower than the median in Belgium, which suggests that there are less severe bronchopneumonic lesions within this quality label in comparison with the farm average in Belgium. Meanwhile the APP-index is worse than the Belgian average, so the control of dorsocaudal pleurisy should be the main focus for improving lung health in this quality label. Screening of the lung health for this quality label will be continued in the future.

HHM-PP-46

REAL TIME AUDITORY MONITORING USING SOUNDTALKS SUPPORTS OBJECTIVE DECISION ON POSSIBLE INTERVENTIONS IN FINISHING FACILITIES BASED ON ACCURATE DIAGNOSTIC DETECTION OF RESPIRATORY PATHOGENS

P.H. Rathkjen [1], P. Toft [2], A. Fernandez-Fontelo [3], C. Alonso [4]
[1]*Boehringer Ingelheim Animal Health Denmark*
[2]*PORCUS Oerbaekvej 276, DK-5220 Odense*
[3]*Humboldt-Universität zu Berlin School of Business and Economics Ladislaus von Bortkiewicz Chair of Statistics Unter den Linden 6 10099 Berlin Germany*
[4]*Boehringer Ingelheim Vetmedica GmbH*

Background and Objectives

Coughing in itself (although easily recognized) does not provide any objective information regarding causality. Therefore, accurate diagnostics are needed to guide optimal interventions. The objective of this study was to improve the quality of diagnostic information to optimize intervention efficacy. This objective was achieved by using 24-hour real time sound monitoring provided by SoundTalks (ST) to determine a change in respiratory health status (ReHS)and trigger an Oral Fluid (OF) sampling at the time of the coughing event (ReHS+).

Material and Methods

From March 2020 – July 2021, 4 rooms from a 1200 finisher site were monitored by SoundTalks. Blood (20 samples) and 4 OF per room were taken from the first 4 batches at placement to determine health status. In the case of ReHS+ signal, 4 OF were obtained from the pens below the ST monitor and PCR tested to determine the pathogens involved.

Results

Results from this study demonstrated that all batches were serological positive to App 12 and Mhyo and negative to PRRS. First short ReHS+ event was in July in 2 rooms followed by severe ReHS+ from August - April 2021 mostly in 2 – 3 rooms at the same time. IAV and GSP were involved in every event. Mhyo was detected only once. Only the first severe ReHS affected batch in August were treated 3 days with penicillin injection. Based on diagnostics and ST pattern no later batches were treated.

Discussion and Conclusion

With ST it was possible to target the diagnostics to the actual time of cough, determine the pathogens involved in ReHS+ and decide on intervention. ST information, in combination to the provided diagnostic result, is helping the producer to intervene, or in this case even more important, not to intervene, based on objective information and thereby saving unnecessary antibiotics.

HHM-PP-47

ASSOCIATING SWINE WEIGHT AND AGE AT WEANING WITH WEAN-TO-FINISH PIG DEATH

T. Cheng [1], W. Lopez [2], J. Angulo [3], A. Arruda [1]
[1]*The Ohio State University*
[2]*Pig Improvement Company (PIC)*
[3]*Zoetis Inc, Parsippany, NJ, USA*

Background and Objectives

This exploratory study aimed to determine the optimal quality of weaned pigs by investigating the association between piglets' weight and age at weaning and wean-to-finish mortality.

Material and Methods

Production data were collected from 224 swine batches (4,852,489 pigs) in 52 North American wean-to-finish (WTF) farms between December 2016 and October 2020. Average weight (kg), age (day), and PRRSV and PEDV detections (yes/no) were collected at weaning at the batch level. Weaning weight and age were highly correlated and separately fitted into two generalized linear mixed models (M-weight and M-age). M-weight and M-age contained total WTF death count (outcome), start inventory size (offset), weaning weight/age (fixed effect 1), the detection of PEDV and PRRSV (fixed effect 2), interactions between fixed effects 1 and 2, and both pig source and WTF farm IDs as random effects.

Results

Among 224 swine batches, WTF mortality ranged 4.3%-73.4%. Swine weight and age (median±IQR) at weaning were 6.3±1.3 kg and 22.7±4.1 days. Higher WTF mortality (median±IQR) was identified in PEDV positive batches (18.9±12.2%; n=92) compared to negative batches (14.0±10.0%; n=132) whereas mortalities were similar for PRRSV status (16.5±11.9% vs 16.2±12.9%). WTF death counts increased as weaning weight (M-weight) and age (M-age) decreased. Because of interactions ($p<0.001$) between weaning weight/age and PEDV detection, the WTF mortality in PEDV-positive batches were estimated to increase at higher rates than negative batches by decreasing one kg weaning weight (M-weight; 47.7% vs 21.0%) or one day weaning age (M-age; 4.8% vs 1.7%). In contrast, increases were similar for PRRSV status (M-weight; 16.0% vs 21.0%; M-age; 1.6% vs 1.7%).

Discussion and Conclusion

The WTF pig death was found to increase as weaning weight and age decreased, and the increments were higher for PEDV-positive batches. These associations may be used to determine the quality of weaned piglets and anticipate WTF mortality.

HHM-PP-48

DETECTION OF DIFFERENT PATHOGENS IN TRACHEO-BRONCHIAL SWABS OF COUGHING SOWS ON 13 BELGIAN FARMS.

E. De Jonghe [1], E. Libbrecht [1], P. De Backer [1], S. Theuns [2]
[1]*Ceva Santé Animale, Brussels, Belgium*
[2]*PathoSense, Ghent University, Faculty of Veterinary Medicine, Laboratory of Virology, Salisburylaan 133, 9820 Merelbeke*

Background and Objectives

There are different infectious pathogens associated with coughing in pigs such as Mycoplasma hyopneumoniae (M.hyo), PRRSv, influenza A virus (IAV) and also novel and less characterized pathogens can be of potential importance. When a sow herd is coughing, it is important to identify the causative pathogen because the infection pressure of the latter can increase massively and can cause respiratory problems in piglets and fattening pigs.

Material and Methods

As part of Ceva Santé Animale's diagnostic service for swine vets, tracheo-bronchial swabs (=TBS) were taken on 13 farms from coughing sows of different parities. 5 to 10 sows per farm were sampled in the acute phase of the disease. Third generation viral and bacterial metagenomic nanopore sequencing (Oxford Nanopore Technologies) was performed on pooled samples by PathoSense, a diagnostic company. PathoSense focuses on the detection of intact, actively replicating clinically relevant pathogens.

Results

The results are shown as a semi-quantitative overview of all pathogens in the sample. 12 different respiratory pathogens were detected. On most farms multiple pathogens were identified. M.hyo, Pasteurella sp. and Picobirnaviridae sp. were found on respectivily 9/13, 6/13 and 5/13 farms. PRRSv was found on 1 farm.

Discussion and Conclusion

M.hyo, the primary pathogen of enzootic pneumonia, is a key pathogen of the porcine respiratory disease complex and was found in TBS of coughing sows the most frequent. Picobirnaviridae sp. are frequently detected in respiratory and faecal samples but the clinical importance can be questioned. Pasteurella sp. are usually the cause of pneumonia as a secondary infection to another respiratory pathogen. Possibly M.hyo was the major cause of the coughing in sows. Therefore, it remains important to have a good M.hyo acclimatisation programme for the incoming gilts

HHM-PP-49

EFFICACY OF PRRS VACCINATION IN PIGLETS TO REDUCE PRRSV CLINICAL SIGNS AND TO IMPROVE PRODUCTION PARAMETERS

L. Martí [1], A. Martínez [1], R. Menjon [2], M. Marcos [2], M. Jiménez [2]
[1]*Vall Companys S.A., Spain*
[2]*MSD Animal Health*

Background and Objectives

The aim of this study was to determine if using a PRRS MLV vaccine in piglets is an effective tool to reduce clinical signs and improve production parameters in a profitable way in growing pigs.

Material and Methods

The trial was conducted at a nursery farm, receiving piglets from a PRRS positive 1200 sow's farm. Piglets showed respiratory clinical signs at the end of the nursery phase and beginning of fattening, which resulted in increased mortality. Serology and rt-PCR confirmed PRRSv infection at 8–9 weeks of age. A total of 22000 piglets (36 weekly batches) were vaccinated at 3 weeks of age with Porcilis® PRRS, MSD Animal Health. Vaccination took place from August 2019 to May 2020. Efficacy of vaccination was determined by comparing mortality rates pre- and post-vaccination , and by measuring the presence of PRRSv at the end of nursery and beginning of fattening (Statistical analysis: Chi Square Pearson's test, based on monthly mortality as the nursery observational unit and fattening-unit mortality as the finishing one)

Results

Mortality in the nursery was significantly reduced, from 13,08% in non-vaccinated to 4,41% in vaccinated ($p<0,005$).
In fattening, mortality was significantly reduced, from 5,5% to 2,8% ($p<0,001$).
Respiratory clinical signs were improved, leading to a reduction in antibiotic use.
Six months after implementation of vaccination, no field virus was detected in pigs sampled at 11w of age.
Regarding profitability, calculated based only on the reduction of mortality, in the nursery phase an extra benefit of 2,65€ per piglet was obtained. In fattening, an extra benefit of 2,36€ per piglet was achieved, with 2,4 as ROI.

Discussion and Conclusion

In this trial piglet vaccination was an efficacious and profitable strategy to reduce PRRSv presence, clinical signs and to improve production parameters.

HHM-PP-50

FIELD EVALUATION OF PIGLET'S HEMOGLOBIN CONCENTRATION AT WEANING AFTER USING DIFFERENT DOSES OF AN INJECTABLE GLEPTOFERRON-TOLTRAZURIL PRODUCT FOR THE CONTROL OF ANEMIA

M. Remond [1], L. Werner [1], D. Ferreira [2], C. Meymerit [3]
[1]*Epidalis, Avenue de la Promenade, 79 140 Cerizay, France*
[2]*SOCSA ELEVAGE,1219 Route de Pau, 64410 Vignes*
[3]*Interface Elevage, 1291 route de Pau, 64410 Vignes*

Background and Objectives

In the field, 200 mg injectable iron dose per piglet is considered the gold standard to prevent Iron Deficiency Anemia (IDA). An injectable product (Baycox® Iron, Elanco) combines gleptoferron and toltrazuril to prevent IDA and the clinical signs of coccidiosis. The dosage of the product depends on piglet's weight, however very few farmers weigh their piglets. Usually, for convenience, fixed doses are applied to piglets. The aim of the study was to compare Hemoglobin (Hb) concentration at weaning of piglets receiving three different doses of iron to verify if field practices prevent IDA.

Material and Methods

The trial was conducted in two French farrow-to-finish farms. 633 piglets from 40 litters were weighed individually at approximately 48 hours of age. Randomization was performed at a litter scale based on individual piglet's weight. Each piglet received, according to its group, 182.0 mg, 200.2 mg or 218.4 mg of iron corresponding to an intramuscular injection of 1 mL, 1.1 mL or 1.2 mL of Baycox® Iron (Elanco). The day before weaning, piglets were weighed individually and Hb concentrations were measured on 275 piglets with HemoCue® Hb 201⁺ System. When Hb was below 8 g/dL, the piglet was considered anemic. ANOVA tests were performed to compare Hb values.

Results

The results showed no significant differences between average Hb concentrations of the three groups. There were no group effect and no effect of the weight at injection time on the Hb concentrations of piglets at weaning. Average Hb concentration measured at weaning was 11.5 ± 1.2 g/dL [7.8-14.1] and average weight at injection was 1.50 ± 0.35 kg [0.60-2.7] (n= 275).

Discussion and Conclusion

This study demonstrates the efficacy of the three iron doses and confirm that practices encountered in the field do prevent IDA in piglets.

HHM-PP-51

GLAESSERELLA (HAEMOPHILUS) PARASUIS PREVALENCE AND SEROCONVERSION ON THE HUNGARIAN SWINE FARMS - A FIELD STUDY

I. Makkai [1], P. Mate [1], L. Buza [1], L. Ozsvari [2]
[1]*MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)*
[2]*University of Veterinary Medicine Budapest, Hungary*

Background and Objectives

Glaesserella parasuis (GPS) is a commensal pathogen with 15 identified serovars and with many non-typable strains. The virulence of strains differs. The most virulent serovars are 4 and 5. Economic losses of Glässer's disease depend not just on the strains but also on environmental conditions and primary viral diseases like SIV, PRRS or PCV2 and many other co-infections. Aim of the study was to collect data about GPS frequencies in Hungary.

Material and Methods

With the support of the CDS laboratory, Boxmeer (MSD AH), we were able to survey GPS of 25 Hungarian non-vaccinated swine farms in 2019 and 2020. We always used the same protocol for blood sampling: gilts and sows (7 samples/parity) and 3-6-9-12-15-18-21-24 weeks old pigs (10 samples in every age group). We used the HPS BioChek ELISA test which measures the OppA antibodies (present in clinically infected animals).

Results

Regarding the breeding phase, 84% of the farms were positive and 16% negative.Considering the offspring, 76% were positive and 24% negative for GPS, respectively. On one farm (5.5%) we found seropositivity only in the farrowing unit, on two farms (11%) in the nursery and the fattening unit, and on 16 farms (84%) only in the fattening unit. Distribution of the seropositivity was the following: in one age group 21%, in two age groups 42%, 3 or more age groups 37%.

Discussion and Conclusion

The increasing antimicrobials (AM) resistance and the need for prudent use of AM in the diseases control highlighted the effective herd management and vaccination. In this study we confirmed the presence of GPS and determined the seroprofiles of the surveyed farms.

HHM-PP-52

PROPHYLAXIS THROUGH INTRAMUSCULAR LAWSONIA VACCINATION IN CASE OF ACUTE LAWSONIA CLINIC FROM THE MIDDLE TO THE END OF THE FINISHING PERIOD - DEVELOPMENT OF PERFORMANCE PARAMETERS IN A FIELD CASE

K. Busen [1], R. Tabeling [2], J. Vogels [3]
[1]*Veterinarian, veterinary practice Becker, Heek*
[2]*Intervet Deutschland GmbH; MSD Animal Health, Unterschleißheim, Germany*
[3]*Intervet Deutschland GmbH, MSD Animal Health, Unterschleißheim, Germany*

Background and Objectives

Lawsonia intracellularis (LI) is widespread in pig herds. The clinic of a Lawsonia infection is strongly dependent on the immune status of the animals, the pathogen dose and the age of the animals. The acute form of porcine haemorrhagic enteropathy usually occurs in older fattening pigs or gilts; mortality can reach up to 50%. Aim of this study was to investigate the impact of a vaccination against LI on the acute disease.

Material and Methods

In a field observation, a finishing farm with 1988 fatteners presented, acute LI infections occurred repeatedly in the middle fattening during the last five years. The pigs showed bloody diarrhea and showed very poor growth performance. Due to the experiences over years, antibiotic treatments were used to control clinics and economic losses by LI infection. The farm started in 2020 with the Porcilis® Lawsonia vaccination, vaccinating pigs one day after entering the fattening unit at a weight of 27kg.

Results

There was a clear improvement in the acute LI clinic and fattening performance. Feed conversion decreased by 2.69% and the daily weight gain increased by 40g. Only individual animals had to be treated with antibiotics in the vaccinated groups so that the treatment days were reduced by 98.6%. In relation to the veterinary costs (except for vaccination), a benefit of 2.03€ per animal is documented. The duration of the fattening was shorted by around 2,67 days.

Discussion and Conclusion

The results in this study showed that the intramuscular Lawsonia vaccination at the beginning of fattening reduced and controlled an acute LI infection in the middle up to the end of finishing period. Additionally, the vaccination improved performance and considerably minimized the use of antibiotics.

HHM-PP-53

RELATIONSHIP BETWEEN ANEMIA AND VIT D STATUS IN SOWS AND PIGLETS

S. Bhattarai [1], S.S. Jacobsen [1], J.P. Nielsen [1]
[1]*Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark*

Background and Objectives

Iron and Vitamin D (Vit D) are two essential nutrients. Human studies have shown associations between the two nutrients in subjects with these deficiencies. The objective of this study was to investigate the association between hemoglobin concentration (Hb) and Vit D status (both serum Vit D_3 and serum 25-hydroxyvitamin D_3 ($25(OH)D_3$)) in sows and their offspring.

Material and Methods

This study was carried out at a commercial indoor herd in Denmark and consisted of two groups of sows (31 in each group). Treatment group (LED) was exposed daily for 3 minutes and 15 seconds to Ultraviolet B (UVB) light from week 1 to 16 through gestation in the electronic feeder. The control group received no UVB light. Blood samples were collected in sows prior to farrowing and in piglets (one piglet per sow) at birth. Anemia in sows was defined as Hb < 103 g/L based on literature.

Results

No difference in Hb was found between the groups (Control: 109.4 ± 7 g/L; LED: 111.6 ± 7.3 g/L) ($p = 0.24$). There were four anemic sows in each group with similar average Hb (98.6 g/L). Hb in sows was neither associated to Vit D3 ($p = 0.34$) nor $25(OH)D_3$ levels ($p = 0.73$). In piglets, the mean Hb in Control group was 75.2 ± 5.5 g/L while in LED group, it was 75.6 ± 10.6 g/L ($p = 0.9$). All piglets had Vit D_3 < 0.5 ng/mL and 12 piglets in Control group had $25(OH)D_3$ < 1 ng/mL.

Discussion and Conclusion

On an average, sows had optimal Hb around farrowing irrespective of the groups. No relationship existed between Hb and Vit D status in sows. The concentrations of Vit D_3 and $25(OH)D_3$ in piglets were too low for further analysis.

HHM-PP-54

PREVALENCE AND SEVERITY OF ENZOOTIC PNEUMONIA AND PLEUROPNEUMONIA IN CZECH PIG FARMS BASED ON LUNG LESION SCORING IN 2021

R. Krejci [1], D. Sperling [2]
[1]*Ceva Sante Animale, France*
[2]*Ceva Animal Health, France*

Background and Objectives

Monitoring of respiratory disease by lung scoring is beneficial to assess the farm health status. Ceva Lung Program (CLP) was confirmed as a valuable tool to establish the prevalence and severity of Enzootic Pneumonia (EP) and pleuropneumonia. The aim of this study is to evaluate the level of EP and Actinobacillus pleuropneumoniae (A.p)-like lesions on Czech pig farms in 2021 compared to the previous year.

Material and Methods

The survey was conducted on conventional pig farms belonging to 12 swine producers. A total of 1190 lungs in 20 batches (30-100 lungs/batch) of slaughtered pigs were scored using the CLP method. Percentage of lungs with Bronchopneumonia lesions (BP), the extension of the lesions out of sick lungs were recorded and scored. Dorsocaudal pleurisy (DP) suggestive for previous pleuropneumonia was scored to describe A.p-like lesions. Data were compared to the year 2019.

Results

The prevalence of 28% of BP was found (Q1=9.67; Q3=62), compared to 16.67% in 2019. The area of affected surface of lung parenchyma in pneumonic lungs reached 3.85% (Q1=2.53; Q3=6.23). As for pleuropneumonia – 12% (Q1=6; Q3=17) of lungs were affected by A.p-like lesions, compared to 25.69% previously in 2019). The APPI index was 0.3 (Q1=0.2; Q3=0.37) in comparison to 0.59 in 2019. All values are expressed as median and quartiles 1 and 3.

Discussion and Conclusion

EP-like lesions have an increasing tendency compared to previous period. That indicates that Enzootic pneumonia probably affected again previously well controlled or repopulated farms. Lesions characteristic for A.p infections were less prevalent than previous years. This may be due to improved control of the infection or due to lower N° of scorings because of Covid restrictions. Both types of respiratory diseases however deserve high attention to be controlled. Efficient preventive measures shall be implemented and maintained in the Czech farms.

HHM-PP-55

SAVING TIME OF LABOUR TO PREVENT ANAEMIA AND COCCIDIOSIS IN SUCKING PIGLETS USING AN INJECTABLE COMBINATION OF IRON AND TOLTRAZURIL

P. Maiquez [1], T. Lopes [1], S. Cárceles [2], D. Espigares [2]
[1]*Piensos Galindo, Spain*
[2]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

Several management procedures on piglets are performed during their first days of life (doa), including treatments such as injectable iron to prevent iron-deficiency anaemia and oral administration of toltrazuril to prevent coccidiosis caused by Cystoisospora suis. An injectable combination of toltrazuril and gleptoferron improves management for farmers. The objetive of this study was to assess the impact of combined toltrazuril+gleptoferron (Forceris™, Ceva) and an injectable iron and an oral toltrazuril on the time of labour.

Material and Methods

This trial was performed in a farrow farm with piglets of 2nd–3rd weeks of aged presented coccidial diarrhea. A farrowing batch was selected and its litters were randomly divided into two treatment groups. Group 1 was treated with 1.5mL of the injectable toltrazuril+gleptoferron at 2 doa and group 2 using the usual farm products (oral toltrazuril and injectable iron) at 3 doa. Time of management per litter was recorded and time of management per piglet (seconds±SD) was calculated and analyzed by Student's T-test.

Results

A total of 266 piglets from 20 sows were included, 186 piglets from 14 litters in group 1 and 80 piglets from 6 litters in group 2. Time of management per piglet in each litter was significantly reduced ($p<0.01$) in group 1 (4.86sc±0.43) compared to 2 (10.71sc±0.74).

Discussion and Conclusion

Results between groups show that time for piglet's management is significantly lower using an injectable combination of gleptoferron+toltrazuril (Forceris™). A combo product to prevent anaemia and coccidiosis provides a labour-saving and improves animal welfare, less management time and consequently less stress for piglets.

HHM-PP-56

THE PREVALENCE OF ILEITIS IN HUNGARIAN SWINE FARMS ACCORDING TO SLAUGHTERHOUSE ILEUM (ENTERIPIG) EXAMINATIONS

R. Kondor [1], I. Makkai [2], P. Mate [2], L. Buza [2], H. Swam [3], L. Ozsvari [1]
[1]*University of Veterinary Medicine Budapest, Hungary*
[2]*MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)*
[3]*Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands*

Background and Objectives

Proliferative enteropathy damages the digestive tract, resulting in a significant deteroration in average daily gain (ADG) and feed convertion ratio (FCR). That is why, it would be important in the swine practice to have a quick and simple tool to measure the degree of damage what Lawsonia intracellularis infestation could cause. The aim of this study was to survey the Lawsonia intracellularis prevalence and its damage in randomly selected Hungarian farrow-to-finish swine farms.

Material and Methods

In 2021 we collected 20 cm long pieces of the terminal ileum of slaughtered animals in the slaughterhouses. We made visual examination and palpation before and after cutting the ileum. The categories of the ileum mucosa examinations were:0: No mucosal lesions observed.1: Slight thickening of wrinkles of the mucosa observed. Serious changes in the mucosa observed with several wrinkles with higher rigidity.3: Severe lesions with blood in the lumen.

Results

We examined altogether 625 pieces of terminal ileums from 25 Hungarian farms. Every farm had ileitis problems with different degree. The results show Score 0 in 29.77%, Score 1 in 44.73%, Score 2 in 25.17% and Score 3 in 0.30%.

Discussion and Conclusion

The EnteriPig tool is simple and easy. We validated the method before, using histopathology and qPCR. We could change the mindset of farm owners about ileitis thanks to this tool, and since we made the illness visible, farmers started to vaccinate, furthermore, smaller amount of antibiotics will be used in the swine industry.

HHM-PP-57

FIELD STUDY TO COMPARE THREE TWO-SHOTS VACCINE SOLUTIONS TO IMMUNISE PIGLETS AGAINST M.HYO AND PCV2

A. Gonçalves [1], C. Colimard [2], F. Mace [3]
[1]*BREIZHPIG SCOP SAS, rue Edgar Brandt, 56500 Locminé, France (a.goncalves@breizhpig.com)*
[2]*BREIZHPIG SCOP SAS, rue Edgar Brandt, 56500 Locminé, France*
[3]*Coopérative Evel'Up, rue Edgar Brandt, 56500 Locminé, France*

Background and Objectives

Vaccinating piglets against M.hyo with a 2-dose vaccine 2-4 weeks apart is common practice. This study aims to compare three different 2-dose M.hyo+PCV2 vaccines, in terms of performances, convenience and compliance.

Material and Methods

Three piglet-batches (855 total) were randomized into 3 groups in a commercial farm. At 6 days of age, the MF+CF, PCVM and SMH+CIF groups were administered 1 mL of MycoFlex (MF), 1 mL of Porcilis PCV-Mhyo (PCVM), and 2 mL of Suvaxyn Mhyo (SMH), respectively. At 25 days of age, the same groups were given 1mL of MF mixed with 1mL of Circoflex (CIF), 1 mL of PCVM only and 2mL of SMH combined with 1 mL of CIF, respectively. Pigs were weighed at 6, 25 and 137 days of age. 30 pigs per group were randomly sampled at 4, 10, 16 and 21 weeks of age for serological and PCR tests. Slaughterhouse data were used to compare weight, quality, and income from the carcasses. Farm staff (workers and veterinarian) gave their opinion on the practical and compliance aspects of each of the three vaccine options.

Results

PCRs on tracheal swabs confirmed that the animals had indeed undergone a natural M.hyo challenge. Mortality was 4, 3.8 and 5.3 % for the MF+CF, PCVM and SMH+CIF groups respectively (p=0.63). Wean-to-market ADGs were 817, 825 and 826 g/day respectively (p=0.27). For a price assumption of 1.495€/Kg, the average outcome was 143.9, 145.2 and 145.5€ per carcass (p=0.07) respectively. Staff emphasized the convenience of the PCVM-Group schedule and its full compliance with its official market authorization.

Discussion and Conclusion

The PCVM-Group protocol, used as a two-shot vaccine, is at least as effective against M.hyo as the other options tested. It was also reported to be more convenient and more compliant.

HHM-PP-58

LUNG LESION SURVEY USING CEVA LUNG PROGRAM IN RUSSIA: RESULTS 2020 - 2021

V. Pruglo [1], E. Stolbov [1], R. Krejci [2], P. Mazerolles [3], D. Sperling [4]
[1]*Ceva Sante Animale, Russia*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*
[3]*Ceva Sante Animale, Libourne, France*
[4]*Swine and Ruminant Clinic, University of Veterinary and Pharmaceutical Sciences Brno, Brno, Czech Republic*

Background and Objectives

Slaughterhouse lung scoring is important part of comprehensive approach to control respiratory swine diseases. Ceva Lung Program (CLP) is standardized tool for rapid scoring of M.hyo and A.p like lesions on farms with possibility to assess impact on production results. This tool was successfully used at regional and national level since 2013. The aim of our study is provision of regular update on prevalence and severity M.hyo and A.p lesions in Russia (RU) and compare data with results 2019-2020.

Material and Methods

We compared the data from the equal period of years:
November 2019-2020: a total number of examined batches – 290 included 23 520 lungs (median: 80 scored lungs/batch).
November 2020-2021: a total number of examined batches - 441 included 40 301 lungs (median: 90 scored lungs/batch).
Examinations were performed on different farms in various regions of Russia. We used EP and APP Indexes for impartial assessment of M.hyo and A.p lesions. EP and APP Indexes characterize the prevalence, type/extension of Bronchopneumonia (M.hyo-like lesions) and Dorsocaudal Pleurisy (A.p-like lesions), respectively.

Results

The increase in lung examinations during 2020-2021 year was recorded in compare with equal period 2019-2020.
The significant increase EP Index (M.hyo-like lesions) was observed on Russian farms from 0,76 to 1,44.
Slight increasing trend was observed for APP Index (A.p-like lesions) from 0,46 to 0,49.
All values expressed as median at the country level

Discussion and Conclusion

For both (M.hyo-like, A.p.-like) lesions increasing tendency was observed and this trend is opposite to the data obtained in 2017-2019. There could be a few explanations of the results:
Improving of the data objectivity due to the use EP and APP Indexes in combination with increased number of scoring.
Real aggravation of M.hyo and A.p. situation in the country: due to decreased vaccination rate (25-15%) against these pathogens and increasing associated viral diseases prevalence (PRRS, ...).

HHM-PP-59

SURVEY ON FARROWING MANAGEMENT AND REPRODUCTIVE PERFORMANCE IN SOWS IN A FREE FARROWING SYSTEM

L. Junker [1], S. Ulbrich [1], A. Grahofer [2]
[1]*ETH Zürich, Animal Physiology, Institute of Agricultural Science, Zurich, Switzerland*
[2]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

Representative data of farrowing management in sows in free farrowing systems is still scare, although free farrowing is already mandatory in several countries. The aim of this study was to describe different management habits, which are implemented during the peripartal period by means of an online survey across Switzerland. Furthermore, association between management and performance characteristics were assessed.

Material and Methods

The online survey included a total of 40 questions covering general information about the herd, reproductive performance and farrowing management, and was submitted to 140 farms across Switzerland. The statistical processing of all data was performed in R, considering the level of statistical significance being $p< 0.05$.

Results

In total, 43 farms (response rate 31%) answered the survey. Overall, a mean of 86 sows (SD ± 50.5) were housed per farm. On average, sows were moved on day 5 (SD ± 1.5) before farrowing into the free farrowing pen, which had a mean size of 7.1 m^2 (SD ± 1.1 m^2).Nest-building material was provided on all farms and a minimum of 1 kg per day significantly increased the number of liveborn piglets ($p < 0.01$), decreased the number of stillborn piglets ($p = 0.03$) and reduced the farrowing ($p = 0.01$) and placenta expulsion ($p = 0.01$) duration. In 89% of the farms, management procedures for newborn piglets were implemented. The estimated duration of birth (first to the last piglet) was 260 minutes (SD ± 78 min). In 5% of the herds, painkillers were routinely administered, which negatively correlated with the number of stillborn piglets ($p = 0.004$).

Discussion and Conclusion

This survey evaluated the farrowing management on swiss farms with free farrowing systems. The amount of nest-building material and the use of painkillers significantly improved the performance in sows in a free farrowing system and thereby increased animal welfare and productivity.

HHM-PP-60

YEARLY EVALUATION OF LUNG LESIONS IN SLAUGHTER PIGS IN EUROPE

R. Krejci [1], P. Mazerolles [2], N. Haboub [3], O. Ninet [2]
[1]*Ceva Sante Animale, France*
[2]*Ceva Sante Animale, Libourne, France*
[3]*Ceva Santé Animale, 33 500 Libourne, France*

Background and Objectives

Scoring of lung lesions in the slaughter pigs belongs to major diagnostic methods to evaluate the presence, incidence and severity of respiratory diseases in commercial pigs. Lesions suggestive for previous Mycoplasma hyopneumoniae or Actinobacillus pleuropneumoniae infections and their scoring were described before. The aim of this survey was to collect the results of lung scoring performed in most of swine producing European countries in 2021.

Material and Methods

Ceva Lung Program (CLP) scoring methodology was implemented to score lung lesions at the slaughterhouse. The results were collected from 20 European countries in the 12 months period from December 2020 till the end of November 2021 and compared with the same period in 2019/2020. The median values were calculated for % of lungs with bronchopneumonia (%BP), % of affected lung parenchyma out of sick lungs (% parenchyma), % of dorso-caudal pleurisy (%DP) and APP index (APPI). Data in the database were analyzed with respect to the origin of the scorings (farms) and local vet teams were consulted to understand factors influencing potential trends.

Results

The total number of scored lungs was 381748 from 4470 reports with the average of 85 lungs per batch. The median value of %BP was 24.% (30.6% in 2020). The median of affected parenchyma was 1.75% (2.07% in 2020). For % DP the median was 3% (4.1% in 2020) and for APPI the corresponding value was 0.07 (0.11 in 2020).

Discussion and Conclusion

The results of this survey conducted in European countries in 2021 revealed lower values compared to previous years. Three factors are apparently behind this reduction: 1) the general continuous improvements in the control of those two infections (reported from several countries); 2) a significant amount of CLP results from high health status Dutch farms came into the database; 3) farms with better control of respiratory disease began to perform CLP more frequently.

HHM-PP-61

CONTACTS POSING RISKS OF DISEASE INTRODUCTION IN SWINE BREEDING HERDS IN QUEBEC, CANADA: IS FREQUENCY OF CONTACTS ASSOCIATED WITH BIOSECURITY MEASURES IMPLEMENTED?

M. Lambert [1], J. Arsenault [1], S. D'Allaire [1]
[1]*Laboratoire d'épidémiologie et de médecine porcine, Centre de recherche en infectiologie porcine et avicole (CRIPA)-FRQNT, Faculty of Veterinary Medicine, Université de Montréal, St. Hyacinthe, Quebec, Canada*

Background and Objectives

Numerous viral and bacterial diseases are threatening the swine industry and biosecurity measures must be adapted to prevent the introduction of pathogens occurring through different transmission pathways. The objectives of the current study were to describe the types and frequency of contacts in swine breeding sites over a one-month period and to evaluate if the level of contacts was associated with the implementation of specific biosecurity measures.

Material and Methods

As part of a larger project, breeding sites having a porcine reproductive and respiratory syndrome virus (PRRSV) introduction between August 1, 2014 and July 31, 2017 were selected. A questionnaire, logbooks and pig traceability data were used to investigate several types of contacts: persons entering the site, vehicle circulation on the site, material entering the pig unit, live pig movements and breeding site environment. Biosecurity related to each type of contact was described.

Results

On the 84 sites investigated, the mean (max) number of staff and visitors entering the principal unit was 8 (24). Most sites (87%) had at least one visitor over the one-month period. Visitors involved in maintenance and technical services accounted for the highest number of different persons and visits. For sites with visitors (n=73), biosecurity at the entrance was the following: main entrance door locked (66%), signature of a logbook (38%), shower-in (42%), delimited entrance with changing of coveralls, boots and washing hands (27%). The mean (max) number of pig transports per site over a one-month period was 6 (16). On 15% of sites, ≥4 vehicles were involved. For sites that received gilts during the study period (n=52), quarantine was either located off-site (6%), on-site in a separated unit (10%), in a separated room within the principal unit (21%) or absent (63%).

Discussion and Conclusion

Contacts and biosecurity measures as well as their association will be further discussed.

HHM-PP-62

COMPARISON AT FARM LEVEL OF LUNGS LESIONS SCORING DEPENDING OF MYCOPLASMA HYOPNEUMONIAE VACCINE USED

C. Spindler [1], A. Lefebvre [1], J.C. Lorgere [2], B. Maynard [3], M. Charles [3], P. Leneveu [4]
[1]*Hyovet, 5 P.A., Carrefour du Penthièvre, 22640 Plestan, France*
[2]*Farmapro, 6 P.A. carrefour du Penthièvre, 22640 Plestan*
[3]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne, France*
[4]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*

Background and Objectives

Many vaccines against Mycoplasma hyopneumoniae (Mh) are available. The goal of this study is to compare at farm level, slaughter lung lesions of pigs from farms using the same Mh vaccine on a long term.

Material and Methods

Lung scorings (original Madec grid on 6 lobes; 0 to 4 per lobe; Ceva Lung Program) from 01/07/2020 to 30/06/2021 of farms from a French cooperative are considered (minimum of 30 scored pigs per session).
Selected farms used the same Mh vaccine for 1.5 year, from 01/01/2020 to 30/06/2021. All Mh vaccine groups include at least 30 farms.

The unit is the farm (average of scorings). The following parameter are calculated and compared among vaccines groups:
Average Enzootic Pneumia score (EP; out of 24)
Prevalence of Pneumonia Free lungs (PPF)
Prevalence of farms with EP ≥ 3/24 (PEPO3)
Prevalence of farms with 20% or more lungs scored ≥7 (PO20LS7)

Localization of farms in Brittany (high Pig density area) is taken in account.
Depending on criteria, statistical analysis was performed using Kruskall-Wallis or Chi-square test.

Results

399 farms using five Mh vaccines are included (1.8 scoring and 150 pigs per farm): vaccine A (n=41 farms), B (n=195), C (n=37), D (n=56) and H (Hyogen®, n=70).
Results are as follow (only two differences statistically significant *):
% of farm in Brittany: 51.2% (A), 65.1%(B), 64.9% (C), 48.2% (D)*, 77.1% (H)*
EP: 1.20 (A), 1.36(B), 1.05 (C), 1.62 (D), 1.17 (H)
PPF: 69.2% (A), 66.9%(B), 73.9% (C), 64.7% (D), 69.3% (H)
PEPO3: 4.9% (A), 8.2% (B), 5.4% (C), 19.6% (D)*, 4.3% (H)*
PO20LS7: 4.9% (A), 5.1% (B), 5.4% (C), 10.7% (D), 2.9% (H)

Discussion and Conclusion

Numerically, group H show the lowest prevalence of severe farm cases (PEPO3 and PO20LS7) despite higher use in Brittany. Those H results fits with powerful studies from Spain (Lasierra 2021) or Germany (Cvjetkovic 2021).

HHM-PP-63

EVALUATION OF DIFFERENT TREATMENTS FOR COCCIDIOSIS AND IRON DEFICIENCY ANAEMIA ON PIGLET BODY WEIGHT AT WEANING

C. Molina [1], D. Espigares [2], L. Garza [2]
[1]*UVESA, Málaga, Spain*
[2]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

One of the main processes affecting piglet's parameters and profitability during first weeks of life are coccidiosis and iron-deficiency anaemia. Most used practices to prevent those processes are the oral administration of toltrazuril and the injectable iron. Recently, a combination of Toltrazuril and iron has been developed for parenteral application, minimizing piglet handling. However, information of this practice on piglet body weight at weaning is limited. Therefore, this study aimed to compare different treatments for controlling coccidiosis and iron-deficiency anaemia on piglet body weight (BW) at weaning.

Material and Methods

This trial was performed in a farrow-to-nursery farm with 1,000 sows and weekly batches. Four consecutive farrowing batches were randomly selected, and its litters were divided into two groups (F and B) at processing age (3 days of life, doa). Group F was treated with 1.5 ml injectable Toltrazuril+gleptoferron (Forceris™, Ceva) and group B received the usual farm treatment (Oral Toltrazuril and iron injected intramuscularly). All treatment administration was performed under blinded conditions. BW was individually recorded at processing and weaning age to calculate total weight gain (TW) and average daily gain (ADG). Results were compared using Mann-Whitney test.

Results

A total of 71 litters (n=933) were included: 473 piglets in group F and 460 in group B. BW were not significantly different at processing age between groups. Average of TW and ADG was significantly higher in group F (TW 4.16±1.18; ADG 0.18±0.05) compared to group B (TW 4.06±1.40; ADG 0.18±0.06). At batch level, TW and ADG in group F was also significantly higher in batch 4 (TW 4.60±1.16; ADG 0.187±0.4) compared to group B (TW 4.04±1.53; ADG 0.16±0.06).

Discussion and Conclusion

These results showed that administration of Forceris™ for controlling coccidiosis and iron deficiency anaemia increased TW and ADG during lactation phase, representing an efficient practice.

HHM-PP-64

PIGLETS COCCIDIOSIS IN FRENCH FARMS- EVALUATION OF FARM POSITIVITY BY NEWLY DEVELOPED QPCR

S. Brilland [1], M. Retureau [2], C. Giacottino [2], D. Descamps [2], J. Houlbert [2], L. Lecarpentier [2], L. Cohonner [3], J. Le Guennec [4], P. Moalic [4], M. Hillion [4], Z. Homonnay [5], I. Kiss [5], D. Sperling [1]

[1]Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France

[2]Réseau Cristal Services, 85500 Les Herbiers, France

[3]Résalab, ZA du Douarin, 56150 Guénin, France

[4]LABOFARM, 4 Rue T Botrel, 22600, Loudéac, France

[5]Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary

Background and Objectives

Coccidiosis caused by Cystoisospora suis is one of the most important causes of pre-weaning diarrhea in pig production worldwide. Diagnostic is usually based on clinical signs and detection of oocysts in the feces by flotation. Recently, a new real-time PCR assay for rapid detection of C. suis has been developed.[1] With this study we aimed to investigate the occurrence of C. suis on selected conventional pig farms with real-time PCR using two sampling strategies.

Material and Methods

A total of 100 fecal samples were gathered from 100 litters, representing 10 farms (150-1250 sows) not applying toltrazuril and other control programs against coccidia. From each farm, 10 pooled litter samples (min. 5 piglets/litter) were obtained in the 3rd week of life of the piglets. In parallel, 10 cotton gloves samples from floor area which corresponding to location of sampled litters were collected. Samples were stored at 4°C until DNA extraction. A farm was considered coccidia-positive when it was positive at least in one sample out of the two sampling protocols.

Results

In total 7/10 (70%) farms were positive for C. suis in at least one sample, independently to sampling protocol used. A total 14% fecal samples (14 samples from each sampling protocol) were positive by PCR. Results from the fecal samples and from the environment matched in 64.3 % of cases; 5 litters were positive by qPCR with negative result of qPCR from floor area samples and the other way around.Once the farm was examined as positive for C. suis, pathogen was confirmed in both types of samples at the same time at least once.

Discussion and Conclusion

C.suis is highly prevalent in selected French farms, which are not using toltrazuril (70%). qPCR (providing a sensitive assay for detection) on environmental samples might offer easy to perform alternative to standard sampling protocol in the future.

HHM-PP-65

USING DEFINED DAILY DOSES (DDDVET) TO MONITOR THE USE OF INJECTABLE ANTIBIOTICS AMONG FATTENING PIGS IN FINLAND

V. Talvitie [1], I. Toppari [1]
[1]*Animal Health ETT*

Background and Objectives

ESVAC DDDvet system[1] was established in 2015 to provide a standardized method to report the usage of antibiotics and to allow comparison between different countries. Sikava[2] is a health and welfare register for swine in Finland and it covers over 95 % of commercial pig production. The usage of injectable antibiotics was calculated according to the methods described by EMA[1].

Material and Methods

Injectable antibiotic usage of fattening pigs from swine herds in Sikava in 2020 was collected from the register. Tulatromycin was excluded as it does not have a DDDvet value. The usage of peroral antibiotics in feed or water is not common in Finland.From this data the No. DDD/WA was calculated in a following manner. The amount of medicine (mg) was calculated by multiplying the amount of medicine used by the concentration of the medicine. This was divided by the appropriate DDDvet value and the standardized weight used (w=50 kg). DDDvet/W of all medication was then added together and then divided by the amount of slaughtered fattening pigs (A) in Finland in 2020.

Results

There were 1 873 282 fattening pigs slaughtered in Finland in 2020. No DDDvet / W of injectable antibiotics used for fattening pigs in the Sikava register was 1 059 082. No. DDDvet / W divided by the number of animals was 0,565. So, with the amount of injectable antibiotics used in 2020 in Finland, 565 out of 1000 fattening pigs with a standardized weight could be treated one day during that year.

Discussion and Conclusion

Using DDDvet values to determine the usage of antibiotics seems to be a promising tool to compare the usage between farms. The data is heavily based on the correct dosages entered into the register.

[1]Principles on assignment of defined daily dose for animals (DDDvet) and defined course dose for animals (DCDvet). https://www.ema.europa.eu/en/documents/scientific-guideline/principles-assignment-defined-daily-dose-animals-dddvet-defined-course-dose-animals-dcdvet_en.pdf

[2]Sikava register: www.sikava.fi

HHM-PP-66

EFFICACY OF A COMBINED INJECTABLE GLEPTOFERRON AND TOLTRAZURIL IN SUCKLING PIGLET DIARRHOEA CONTROL AND ITS GROWING PERFORMANCE

C. Casanovas [1], S. Oliver [1], S. Cárceles [1], L. Garza [1], D. Espigares [1]
[1]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

The objective was to evaluate the effect of a combined intramuscular gleptoferron and toltrazuril against a classical treatment with intramuscular iron dextran and oral toltrazuril.

Material and Methods

The study was performed in a Spanish 3600 sow farm with contrasted diarrhoea incidence caused by Cystoisospora suis. 280 litters were randomly distributed in 2 treatments: 140 were treated at 2 days life with 1,5 ml IM FORCERIS® (45 mg toltrazuril + 200 mg gleptoferron) per piglet (FO group). 140 litters were treated with 1 ml oral toltrazuril (50 mg) and 1 ml IM gleptoferron (200 mg) per piglet (CT group). Diarrhoea incidence was determined weakly all on all litters using a faecal score method considering the consistency and degree of involvement within the litter. Diarrhoea samples were taken weekly to assess other enteric pathogens. To determine growing performance, 10 litters per group and batch (60 sows and 725 piglets) were individually weighted at treatment and weaning. Sows were randomly selected between groups trying to distribute them on similar sow cycle numbers. All selected sows farrowed the same weekday and piglets were weaned with the same lactation length.

Results

CT piglets grew 195± 2.97 [190–201] g/day and FO piglets 207 ± 2.94 [202–213] g/day. Differences were statistically significant (p=0.004) using a least square model. Using a Chi Square method, FO group showed statistically better faecal scores at 7 days (p=0.079) and descriptively better at 14. No differences were observed at weaning. Weekly laboratory results tested positive on both groups only for C.perfringens type A and C.suis. There was a trend in litters with higher faecal score, showing higher concentration of coccidia.

Discussion and Conclusion

In cases with C.suis diarrhoea problems, a combined intramuscular gleptoferron and toltrazuril (FORCERIS®) may help to increase growth during lactation due to scour reduction.

HHM-PP-67

SURVEY ON PATHOGEN DIVERSITY AND VACCINATION PRACTICES IN 16 LARGE HUNGARIAN SWINE FARMS

Z. Danyi [1], L. Buza [2], P. Mate [2], I. Makkai [2], L. Ozsvari [1]
[1]*University of Veterinary Medicine Budapest, Hungary*
[2]*MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)*

Background and Objectives

In the European Union the use of antimicrobials is being radically restricted, and various means of prevention, such as vaccination, are becoming increasingly important in the control of infectious diseases in livestock farming. The aim of our research was to survey the prevalence of and vaccination against different pathogens on large commercial pig farms in Hungary.

Material and Methods

Between November 2020 and March 2021, serological test and vaccination data from 16 large Hungarian farrow-to-finish farms (average number of sows: 1,940; min.: 800; max.: 4500; average number of finishers: 9,020; min.: 1,200; max.: 20,500) were collected by using questionnaires through personal interviews with veterinarians. The results of the laboratory tests were also sent to us from the veterinarians after the interviews.

Results

81% of the surveyed farms were free of Aujeszky's disease, PRRS, swine brucellosis and leptospirosis. The most identified pathogens by laboratory tests (serological and/or PCR tests) were PCV2 (in 81.3% of the farms) and Lawsonia intracellularis (81.3%), but Mycoplasma hyopneumoniae (62.5%), swine influenza virus (62.5%) and Actinobacillus pleuropneumoniae (56.3%) were also quite prevalent. All farms vaccinated against PCV2, swine erysipelas, parvovirus and Escherichia coli, and three-quarters (75%) vaccinated against M hyopneumoniae. Breeding herds were vaccinated against PCV2 in 50% of the farms, but both breeding and progeny herds were vaccinated against PCV2 in 44%. Only half of the farms vaccinated the boars. Serological tests to monitor antibody levels against each pathogen were most prevalent for parvovirus (88%) and PCV2 (81%).

Discussion and Conclusion

The high vaccination rate and the large number of serological tests in the surveyed pig farms highlight the fundamental importance to protect their animals against parvovirus, PCV2 and Escherichia coli. Moreover, the high use of intradermal vaccines in the vaccination against PCV-2 and Mycoplasma hyopneumoniae should also be mentioned.

RES-PP-01

IMPLEMENTATION OF "BEST PRACTISE" IN THE FATTENING UNIT - AIR QUALITY, WATER SUPPLY AND STRAW PROVISION IN SWEDISH FINISHER FARMS

R. Westin [1], A. Reneby [2], H. Arosenius [3], C. Ehlorsson [4]
[1]*Department of Animal Environment and Health, Swedish University of Agricultural Sciences, Skara, Sweden*
[2]*Farm & Animal Health, Falkenberg, Sweden*
[3]*Farm & Animal Health, Skara, Sweden*
[4]*Farm & Animal Health, Ängelholm, Sweden*

Background and Objectives

To ensure a good health and production during the finisher period, it is important to provide an optimal environment and good management. To see if and how "best practice" is implemented a survey was conducted in 143 Swedish finisher farms during the yearly visit of a herd health veterinarian.

Material and Methods

Farmers were interviewed about their management routines and a fact sheet with management advice was discussed. Measurements of water flow (5 tested pens/farm), temperature and air quality (NH_4, CO_2, RH%) was performed and the amount of supply of straw or other rooting material was weighed with a scale.

Results

Herd size ranged between 137-9820 finisher places. A majority of the farmers stated that they had an average daily weight gain of 900-1000 g/day (60%) or higher (20%). The mean mortality rate during the fattening period was 1.7%. Air quality was sufficient in most farms. CO_2 did not exceed the limit in Swedish legislation of 3000 ppm above the lying surface on any occasion. Concentration of NH_4 was within the limit (max 10 ppm) in 77% of the farms. Straw or other rooting material was provided on the solid floor daily in all farms but one who provided it every second day. The average amount was 60.5 g straw/pig per day (range 18-343 g/day). Average water flow was 2.2 l/m but in only 45% of the farms had a correct water flow in all tested pens. About a quarter of the visited farms (24%) did not do regular follow-ups of their production results.

Discussion and Conclusion

Swedish finisher farms in general has a high health status, resulting in fast growing pigs and low mortality. The results of this study show that there is still room for improvement, especially regarding water supply and doing follow-ups of production results.

VVD-PP-01

MONITORING PRRSV-1 STABILITY IN SUCKLING PIGLETS BY RT-PCR: COMPARISON OF THE RATE OF DETECTION IN SERUM, FAMILY ORAL FLUID, UDDER WIPES AND ENVIRONMENTAL SAMPLES

A. Lebret [3], S. Chouët [1], D. Duivon [2], F. Preault [1], J. Jeusselin [3], C. Chevance [3], V. Normand [3], F. Bouchet [3], M. Brissonnier [3], G. Boulbria [3], P. Berton [3], C. Teixeira-Costa [4]

[1]*MSD Animal Health, 49 Beaucouzé, France*

[2]*MSD Santé Animale, Beaucouzé, France*

[3]*PORC.SPECTIVE, Swine Vet practice, ZA de Gohélève, 56920 Noyal-Pontivy, France*

[4]*Rezoolution Pig Consulting Services, Noyal-Pontivy, France*

Background and Objectives

Defining shedding and exposure status for PRRSV in breeding herds is essential. For this, due-to-wean pigs are the key population. Recently, alternative sampling procedures to bleeding have been assessed in the US.The aim of this trial was to compare the rate of detection of PRRSV-1 in different samples types at weaning.

Material and Methods

The study was carried out on one unstable farrow-to-finish PRRSV-1 farm. In four batches, 119 litters were sampled. In each, serum from one due-to-wean poor piglet, a family oral fluid (FOF) and an udder wipe (UW) were collected. Four dust samples per batch (one per farrowing room) were also collected.RT-qPCR was performed in all samples.To assess the suitability of the three sample types for detection of PRRSV-1 at the litter level, the result for each was compared to a reference which was the cumulative result of the three samples.At the batch level, we considered each sample type's capacity to detect at least one positive sample.Ct values of positive results were also compared (Wilcoxon test).

Results

In total, 16 litters (13.5%) were positive. At the litter level, the rate of detection in serum and FOF was 81.25% (95% CI: 54.35-95.95) and 56.25% (95% CI: 29.88-80.25) respectively. The results were all negative for dust and all but one UW. Ct were signifcantly lower in sera than in FOF (p=0.0006). At the batch level, at least one sample was positive in FOF or in serum, classifiying the batch as positive. Only one batch could be classifyied positive using UW, and none using dust.

Discussion and Conclusion

UW and dust were not sensitive enough in the conditions of our study. FOF could be a useful alternative sampling practice, more respectful of welfare. Further studies are needed to confirm these observations and to assess sampling procedure.

VVD-PP-03

EVALUATION OF PRRS AND ASF VIRUS DISSEMINATION BETWEEN PIGS WHEN USING CONVENTIONAL NEEDLE AND NEEDLE-FREE DEVICE

D. Nilubol [1], J. Miranda [2], S. Romero [2], S. Traiyarach [2], A. Tantituvanont [3], D. Palabrica [4]
[1]*Department of Veterinary Microbiology, Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand*
[2]*HIPRA HQ, Amer (Girona), Spain*
[3]*Department of Pharmaceutic and Industrial Pharmacies, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok, Thailand*
[4]*Robina Farms Diagnostic Laboratory, Universal Corn Products Compound, Philippines*

Background and Objectives

The objectives of this study were to evaluate ASF and PRRSV transmission between conventional needle and needle-free device.

Material and Methods

Forty-two 3-week-old pigs were procured from a herd free of ASF and PRRSV. Fifteen pigs were allocated into 5 groups called seeders of 3 pigs each including IM/ASF, ID/ASF, IM/PRRSV, ID/PRRSV and NoCh (control group). Twenty-seven age-matched pigs served as sentinels (3 pigs were used as controls). At 0 days post exposure (DPE), IM/ASF and ID/ASF groups were contact-exposed to ASF infected pigs, IM/PRRSV and ID/PRRSV groups were intranasally inoculated with 4 ml of HP-PRRSV-2 (10^6 $TCID_{50}$/ml, 2 ml/nostril). At 7 DPE (0 days post injection (DPI)), IM/ASF and IM/PRRSV groups were intramuscularly injected with 2 ml PBS using needles, ID/ASF and ID/PRRSV groups were intradermally injected with 0.2 ml PBS using needle-free device (Hipradermic®). Also, at 7 DPE the same needles or needle-free device were used to inject the same volume of PBS to sentinel pigs (1 exposed pig to 2 sentinels) with the same route of injection for each. Blood samples were collected from seeders at 0, 7, 14, 21 and 28 DPE and sentinels at 0, 7, 14, 21 and 28 DPI. ASF and PRRSV viremia were evaluated using RT-qPCR.

Results

The results demonstrated that ASF and PRRSV exposed groups had the highest viremia at 7 DPE. Following injection, sentinel pigs of IM/ASF and IM/PRRSV groups were PCR positive at 7 DPI. In contrast, sentinel pigs of both ID/ASF and ID/PRRSV groups were PCR negative throughout the experiment.

Discussion and Conclusion

Our findings revealed the potential of ASF and PRRSV transmission through needle during vaccination. Otherwise, needle-free device inhibits both ASF and PRRSV transmission during vaccination.

VVD-PP-04

INFLUENZA A IN SLOVENIAN PIG HERDS

I. Golinar-Oven [1], B. Slavec [2], J. Plut [1], M. Stukelj [1]

[1]*University of Ljubljana, Veterinary faculty, Clinic for Reproduction and Large Animals, Clinic for Ruminants and Pigs, Ljubljana, Slovenia*

[2]*University of Ljubljana, Veterinary Faculty, Institute of Poultry, Birds, Small Mammals and Reptiles, Ljubljana, Slovenia*

Background and Objectives

In the last decade, the epidemiological situation of influenza A virus (IAV) infections in Slovenia, especially in domestic pigs, was unknown. Therefore, the aim of this study was to determine the prevalence of influenza viruses and the most common subtypes in Slovenian pig herds.

Material and Methods

In 2019, we tested a total of 738 serum samples of fatteners for presence of antibodies against IAV. All samples were tested with IDEXX Influenza A Virus Ab Test Kit (IDEXX, The Netherlands) and ID Screen® Influenza A Ab Competition Multi-species Kit (ID-Vet, France). 143 positive samples were re-tested with the hemagglutination inhibition (IHA) test. For virological investigation 114 nasal swab samples and 35 environmental swab samples (pool samples from feeders, drinkers, enrichment material) from 6 farms with reported respiratory problems were collected. Two farms were sampled twice 14 days apart. Real-time RT-PCR was used for determination of M gene (AI-M) and for determination of H1, H3, N1 and N2 subtypes.

Results

Antibodies against IAV were detected in 35,23% and 37,67% of the serum samples using IDEXX kit and ID-Vet kit respectively. The most prevalent subtype was H1N1 (70%), followed by H3N2 subtype (30%), H1N2 subtype was not detected. Subtype H1N1 was confirmed in 4 out of 6 herds in nasal and environmental swabs. The average Ct value for nasal swabs was 22,8 and 30,6 for environmental swabs. Re-testing of two herds after 14 days showed lower percentage of positive nasal swabs and higher average Ct value (34,3).

Discussion and Conclusion

Despite 2,4% difference in percentage of positive results between both ELISA kits, antibodies against IAV were detected in almost all herds with both tests. When testing the environmental swabs, we were able to confirm IAV in all positive herds. Therefore, environmental samples could be beneficial for IAV detection, although the Ct values were higher compared to animal samples.

VVD-PP-05

ROTAVIRUS INFECTIONS PRECEDE E. COLI POSTWEANING DIARRHEA IN PIGS

M. Schyns [1], R. Van Den Braak [2], A. Folgueiras-González [2], M. Vrijenhoek [3], W. Kuller [4], O. Schreurs [5], M. Deijs [6], L. Van Der Hoek [6], A. De Groof [2]

[1]*MSD AH Benelux, Boxmeer, the Netherlands*

[2]*MSD AH D&T, Boxmeer, the Netherlands*

[3]*MSD AH R&D, Boxmeer, the Netherlands*

[4]*University Farm Animal Practice, Harmelen, The Netherlands*

[5]*DAC Advee, Ysselsteyn, Netherlands*

[6]*Laboratory of Experimental Virology, Department of Medical Microbiology, Amsterdam University Medical Center, Amsterdam, The Netherlands*

Background and Objectives

Postweaning diarrhea in pigs has been associated with bacterial gut infections. Enteric viral infections are often assumed to precede proliferation of bacteria. However, their exact contribution to clinical pathology is unclear. This case report aims to investigate the presence of viral enteric infections prior to onset of postweaning diarrhea in a commercial herd in The Netherlands.

Material and Methods

A farrow-to-finish farm with history of postweaning diarrhea was selected. Intestinal disbalance and watery diarrhea were observed after weaning. Management changes were proved ineffective. A combination of qPCR and Next Generation Sequencing (NGS) was used to investigate the problem in a cohort of piglets 1d before (n=60) and 6d after weaning (n=40). Clinical representants were euthanized 12 days after weaning and investigated by histopathology.

Results

Analyses of rectal swabs revealed a sharp rise in Rotavirus A (RVA) viral load at 6 days after weaning, preceding clinical diarrhea. Multiple Rotavirus genotypes (A, B & C) were detected. NGS analysis identified RVA variants not previously detected by multiplex qPCR. An increase of Astrovirus and Picornavirus was also confirmed. At necropsy, E. coli was isolated from the small intestine and microscopic lesions indicative of E. coli infection were observed, ie small rod-shaped bacteria attached to the intestinal epithelium. Villus atrophy was detected especially in the jejunum.

Discussion and Conclusion

E. Coli infection was confirmed by culture and histological evidence of bacterial adhesion to the gut epithelium. However, the villus atrophy detected cannot be explained with E. Coli infection. A relevant change in the enteric virome, particularly RVA, was observed in the first week after weaning. These results suggest that RVA infection after weaning might have had an effect on subsequent E. Coli infections in this farm. Further research is needed to clarify the role of stress, and feed changes at weaning in this case.

VVD-PP-07

COMPARISON OF INDIVIDUAL, GROUP AND ENVIRONMENTAL SAMPLING STRATEGIES FOR DETECTION OF INFLUENZA A VIRUS

S. Gumbert [1], S. Zwickl [1], T. Harder [2], A. Graaf [2], C. Hennig [2], K. Lillie-Jaschniski [3], M. Koechling [4], M. Ritzmann [1], J. Stadler [1]

[1]*Clinic for swine at the Centre for Clinical Veterinary Medicine, LMU Munich, Oberschleißheim, Germany*

[2]*Friedrich-Loeffler-Institut, Institute of Diagnostic Virology, Greifswald-Insel Riems, Germany*

[3]*Ceva Santé Animale, Libourne, France*

[4]*Ceva Tiergesundheit GmbH, Düsseldorf, Germany*

Background and Objectives

Persistent circulation of influenza-A-virus (IAV) in pig holdings due to the continuous exposure of naïve piglets is associated with unspecific clinical signs. This reinforces the need to improve diagnostic strategies. Detecting IAV can be challenging in low-prevalence scenarios requiring a high sample size. Therefore, samples collected at the group level can be a suitable option to reduce sample size.

Material and Methods

Group sampling strategies (environmental samples, sow udder skin wipes, oral fluids) were evaluated for IAV detection in 17 IAV positive German sow farms. Results were compared to nasal swabs. Sampling was conducted in different age and production groups (sows in gestation/breeding/farrowing unit, suckling piglets, beginning/mid/end of nursery) with 10 nasal swabs and 2 environmental samples per group. In each nursery group 4 oral fluid samples were collected and 10 sows were sampled by udder wipes. IAV genome was detected and subtyped by conventional multiplex qPCR.

Results

In 2 farms IAV was detected in all sampled age groups. In 2 farms IAV was only detected in the sows and suckling piglets and in 2 farms in suckling piglets and the nursery. In one farm it was only found in suckling piglets, in the other 10 farms the virus was only found in the nursery. In 12 of the farms with IAV-positive nursery pigs, the virus was detected in nasal swabs as well as in environmental samples and oral fluids. In the suckling piglets and the sows, IAV was detected in 3 and 2 farms, respectively, in all sample materials. The subtyping rate of positive samples was higher in nasal swabs compared to udder wipes, environmental and oral fluid samples.

Discussion and Conclusion

Our preliminary results suggest that sampling at group level can yield comparable results to extensive individual sampling for surveillance purposes. However, to identify the subtype individual samples should be preferred.

VVD-PP-08

DIAGNOSTIC SERVICE: DETECTION OF DIFFERENT SUBTYPES OF INFLUENZA A VIRUS ON BELGIAN FARMS SUFFERING ACUTE RESPIRATORY DISEASE IN 2021.

E. De Jonghe [1], E. Libbrecht [1], P. De Backer [1]
[1]*Ceva Santé Animale, Brussels, Belgium*

Background and Objectives

Different Influenza A viruses (IAV) are known to circulate in swine. In Europe, the most prevalent subtypes are H1avN1, H1huN2, H3N2, H1pdmN1 and H1pdmN2. The aim of this field observation was to investigate the diversity of IAV in Belgian pig herds suffering clinical outbreaks in 2021.

Material and Methods

As part of Ceva Santé Animale's ongoing diagnostic service for swine vets, nasal swabs(NS) / oral fluids(OF) / tracheo-bronchial swabs (TBS), udder skin wipes (US) or lungs from clinical cases of presumed swine influenza are sent to Dialab (Belsele, Belgium), IVD GmbH (Innovative Veterinary Diagnostics, Seelze, Germany) or Pathosense (Ugent, Belgium) for detection and typing of IAV. 78 Belgian swine herds suffering acute respiratory symptoms, were sampled from January 2021 until October 2021. In total 222 samples were analyzed (96 OF, 46 NS, 66 TBS, 13 lungs, 1 US).

Results

74 (=33%) samples were positive for IAV and 148 (=67%) were negative. 52/78 (=67%) of the farms were positive for IAV. In 6 farms the subtype could not be identified. 9 farms were positive for a pandemic strains (8 farms H1panN2 and 1 farm H1panN1). "Classical" H1avN1 could be detected on 35 farms, H1huN2 on 3 farms and H1avN2 on 2 farms. At 3 farms 2 subtypes were found.

Discussion and Conclusion

The results show that IAV is commonly detected on Belgian farms. We can conclude that H1avN1 remains the most dominant subtype. In comparison with the data of last year, there is a rise of H1panN2 and a decrease of H1panN1. As many different subtypes including pandemic variants circulate on Belgian farms, it is important that vaccination protocols in swine herds cover both classical and pandemic strains to obtain broad protection against circulating strains.

VVD-PP-09

EFFECT OF SOW VACCINATION AGAINST INFLUENZA A VIRUS ON PIGLET MORTALITY AT NURSERY PERIOD.

S. Sánchez [1], J. Gayán [1], D. Espigares [2], L. Garza [2]
[1]*Ars Alendi S.A., Spain*
[2]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

Influenza A virus (IAV) causes respiratory disease in pigs and is one of the main contributors to the porcine respiratory disease complex. Despite sow vaccination is the main strategy used for controlling IAV infection in pigs at weaning, information regarding the impact of sow vaccination on mortality rate at nursery is scarce. Thus, this study aimed to provide information on the effect of the implementation of sow vaccination on piglet mortality rate under field conditions.

Material and Methods

This longitudinal investigation was performed in a farrow-to-nursery farm with 800 sows, where IAV vaccination was not used. Confirmation of IAV infection in nursery piglets by nasal swabs and subtype characterization in those IAV positive samples was performed (H1huN2). Afterwards, a whole herd vaccination protocol was implemented, regardless of reproductive stage. The vaccination program consisted of applying two doses (2mL each) of Respiporc Flu3 with an interval of 3 weeks between injections. Afterwards, vaccination against AIV was applied every 4 months. Piglet batches were considered as the experimental unit and mortality rate in nursery period per batch was recorded before (NV) and after the implementation of the vaccination program against IAV (V). NV and V period were compared using Kruskall-Wallis test and significant differences were considered when $p < 0.05$.

Results

A total of 76 batches were included in this study (28 NV and 48 V). Average of mortality rate (%) was significantly lower in V scenario (3.82%±0.02) compared to NV scenario (5.28%±0.03) ($p=0.008$). Differences in antibiotic consumption during NV (5.46 mg/PCU) and V (3.69 mg/PCU) period were also found.

Discussion and Conclusion

Sow vaccination against IAV significantly reduced mortality rate in nursery period. Therefore, the implementation of whole herd vaccination schedule could represent an efficient strategy for controlling productivity efficiency in nursery period.

VVD-PP-10

PORCINE RESPIROVIRUS 1 (PRV1) IS HIGHLY PREVALENT IN POLISH PIG FARMS

A. Woźniak [3], P. Cybulski [1], L. Dénes [2], G. Balka [2], T. Stadejek [3]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Department of Pathology, University of Veterinary Medicine, Budapest, Hungary*
[3]*Department of Pathology and Veterinary Diagnostics, Institute of Veterinary Medicine, Warsaw University of Life Sciences - SGGW, Warsaw, Poland*

Background and Objectives

Porcine respirovirus 1 (PRV1), also known as porcine parainfluenza virus type 1 (PPIV1), is a member of the family Paramyxoviridae. The role of PRV1 infection for pig health is unknown. The virus was detected in clinically healthy animals, but also in pigs with respiratory clinical signs, including sneezing, coughing, and nasal discharge. The objective of this study was to investigate the prevalence of PRV1 in Polish pig farms.

Material and Methods

Nasal swabs were collected in the frame of grant No. 2018/29/B/NZ7/00257 from pigs at 5–17 weeks of age from 13 farrow-to-finish farms with influenza-like symptoms observed. Samples were pooled by 5 before extraction and one pool corresponded to one pen of nursery pigs (5–12 w.o.a.) or fatteners (>12 w.o.a.). Extracted RNA was tested with in house real time PCR for PRV1 (Ct≤37 were considered positive).

Results

8 farms (61.5%) were PRV1-positive. The virus was detected in 21/43 (48.8%) swabs collected from PRV1-positive farms, mostly in 5–7-week-old pigs (10/13, 76.9%). The virus was less prevalent in fatteners and was found in 42.1% of the samples. The mean Ct values were similar in both stages of production: in nursery pigs 31.9±3.5 and in fatteners 31.2±4.8.

Discussion and Conclusion

Our results indicate that PRV1 is likely to be widely spread in Polish pig farms, which differ in the virus detection patterns. It may suggest that, similarly to other viruses, many management factors may affect PRV1 circulation and eventually impact overall health status.

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VVD-PP-11

RETROSPECTIVE STUDY OF PCV-3 ASSOCIATED DISEASE AND ITS ASSOCIATION WITH SYSTEMIC PERIARTERITIS

A. Cobos [1], M. Sibila [1], E. Huerta [1], M. Perez [1], J. Alomar [3], J. Segales [2]
[1]*IRTA, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain*
[2]*Departament de Sanitat i Anatomia Animals, UAB, 08193 Bellaterra, Barcelona, Spain; UAB, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona (Spain)*
[3]*Departament de Sanitat i Anatomia Animals, Universitat Autònoma de Barcelona (UAB), 08193 Bellaterra, Barcelona, Spain*

Background and Objectives

PCV-3 has been associated to reproductive, perinatal and postweaning disease. One of the most consistent microscopic lesions is non-suppurative periarteritis. The objective of the study was to retrospectively evaluate the presence of PCV-3 genome associated to cases with systemic periarteritis compiled between 1998-2021.

Material and Methods

Histologic slides of piglets submitted to the Servei de Diagnòstic de Patologia Veterinària (Barcelona, Spain) were re-evaluated for the presence of periarteritis. A total of 45 cases (8 lactating and 37 postweaning pigs) showed different degrees of systemic non-suppurative periarteritis. Ten cases representative of the overall observed lesions were tested for RT-PCR from formalin-fixed, paraffin-embedded material, and an in situ hybridization (ISH) was performed using the RNASCOPE® technology. Histopathologic lesions and ISH labelling were scored from 0 (no lesions/lack of viral genome) to 3 (severe lesions/high viral amount).

Results

Among the 45 selected animals, mesentery (95%) and kidney (79%) were the most affected tissues with periarteritis. Other mild lesions present in those pigs were interstitial myocarditis (53%), interstitial pneumonia (35%), interstitial nephritis (21%), brain gliosis (55%) and perivascular cuffing in the brain (23%). Nine out of 10 selected cases were positive by qPCR (with Ct values between 18.67 and 35.51; mean Ct= 25.00) and ISH. The histologic severity, Ct value and ISH score were apparently aligned, with higher Ct value and low ISH score in those animals with mild lesions, and the opposite for pigs with moderate/severe lesions.

Discussion and Conclusion

Periarteritis seems to be a prominent feature of PCV-3 associated diseases in foetuses and lactating/weaned pigs. Although this is an exploratory study, systemic periarteritis in lactating and postweaning pigs is confirmed as a highly valuable diagnostic approach for PCV-3 association with microscopic lesions, being mesenteric vessels and kidney as the most suitable samples to be submitted to confirm PCV-3 infection.

VVD-PP-12

SWINE INFLUENZA A VIRUS DETECTION IN SOW HERDS, A NEW APPROACH

K. Lillie-Jaschniski [1], H. Cotta [1], J. Agnes [2], E. Pileri [3], E. Velazquez [4], M. Lisgara [5], J. Stadler [6]
[1]*Ceva Santé Animale, Libourne, France*
[2]*CEVA ANIMAL HEALTH*
[3]*CEVA Animal Health, Italy*
[4]*Ceva Animal Health Ltd*
[5]*Ceva Hellas LLC, 15, Ag. Nikolaou street, 174 55 Alimos (Attiki) Greece*
[6]*Clinic for Swine, LMU Munich, Germany*

Background and Objectives

Due to concerns in public health and its negative impact on herd health and performance, the interest in surveillance of swine influenza A virus (swIAV) is rising. The gold standard procedure for detecting swIAV is to sample only acute diseased pigs. However, endemic infections with unspecific clinical signs need new approaches to detect the virus. This investigation aimed to evaluate a standardized sampling procedure for the detection of swIAV in sow herds.

Material and Methods

Samples were collected from farms with either an acute outbreak of Influenza-like symptoms or the suspicion of an endemic course of disease. The study is multicentric, consisting of farms from 13 European countries. The sampling procedure included 2 pools/5 nasal swabs taken in suckling piglets, weaners, and middle of nursery. Samples were analyzed for Influenza A by real-time PCR and subtyping of samples with a Ct-value below 30 was done by multiplex real-time PCR. Additionally, clinical signs of sampled animals were recorded.

Results

Data from 180 farms were evaluated. 75% (135) of these farms were positive for swIAV in at least one sample, and out of those 72% could be fully subtyped. In the nurseries of most farms (80%) animals sampled showed swIAV like clinical signs, but only 51% of these diseased pigs were positive for swIAV. Whereas in 70% of the farms, the sampled suckling piglets showed no clinical signs despite being positive for swIAV by 29%.

Discussion and Conclusion

To obtain a complete overview of swIAV on-farm circulation, it is crucial not only to focus on the sampling of acutely diseased pigs but also to include suckling piglets and weaners. Those age groups can already be positive for swIAV without showing clinical signs, particularly in endemic and vaccinated herds, as maternally derived antibodies can prevent suckling piglets from clinical signs, but not from an infection (Deblanc et al. 2018).

VVD-PP-13

WHOLE GENOME SCREENING FOR RESILIENCE AGAINST PRRSV OUTBREAKS IN BREEDING SOWS

M. Laplana [1], R. Ros-Freixedes [1], J. Estany [1], L. Fraile [1], R. Pena [1]
[1]*University of Lleida, Lleida, Spain*

Background and Objectives

The porcine reproductive and respiratory syndrome virus (PRRSV) has a world-wide impact in health and productivity of growing pigs and sows. A genetic component in the resilience of sows facing a PRRSV outbreak has been reported affecting reproductive outcome including abortion rate and the number of piglets born alive and total lost piglets (mummified and stilborns) at farrowing.

Material and Methods

Using data from 305 Landrace x Large White sows in a PRRSV positive-stable farm where a PRRSV outbreak occurred, we investigated the stability of reproductive performance (SRP) of the sows as the number of losses during a PRRSV outbreak minus the mean losses per delivery in an endemic situation. Sows were classified as "stable" if SRP=<1 piglet or "sensitive" if SRP>1 piglet. Extreme animals were considered divergent for resilient responses to the PRRSV outbreak. With the aim to identify genetic variants at whole genome level that influence the SRP under PRRSV infection, 48 sows with extreme SRP phenotypes (stable n=22; sensitive n=26) were sequenced at low coverage (7X).

Results

More than 14.5 million polymorphic variants were segregating in the genome of the sows. A GWAS using a genetic relationship matrix to correct for population structure identified 13 genomic regions on 11 chromosomes that contained 44 variants ($P<10^{-6}$) associated with the "stable" phenotype. A preliminary analysis of the 304 genes located in the ±1Mb regions of the relevant variants highlighted the relationship of these genes with molecular functions such as binding to RAGE receptors, inflammatory processes, embryonic development, angiogenesis and cell migration or binding to growth factors.

Discussion and Conclusion

This result suggests the existence of SRP-related genetic variability. These findings will be tested in the entire population. The identification of genetic markers can be useful to identify resilient sows that can successfully cope with a PRRSV outbreak without compromising their health status or productivity.

VVD-PP-14

WITHIN-HERD VARIATION OF GENETIC SIMILARITY OF ORF5 PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV): A STUDY IN 115 BREEDING HERDS

S. D'Allaire [1], M. Lambert [1]
[1]*Laboratoire d'épidémiologie et de médecine porcine, Centre de recherche en infectiologie porcine et avicole (CRIPA)-FRQNT, Faculty of Veterinary Medicine, Université de Montréal, St. Hyacinthe, Quebec, Canada*

Background and Objectives

Comparing PRRSv sequences within a farm is useful in understanding the epidemiology and control of the disease. The purpose of this study was to evaluate within-herd changes in genetic similarity over time.

Material and Methods

PRRSv (ORF5) sequences submitted to our laboratory from Quebec breeding herds between January 1, 2014 and June 30, 2021 were selected for this study. Herds with 1) only 1 sequence, 2) only 2 sequences with an interval of <60 or >730 day interval between them, and 3) voluntary exposure to PRRSv on a continuous basis were excluded. Vaccine-like sequences were also retrieved; hence, 366 sequences from 115 herds were included: 65 farrowing (F) and 50 farrow-to-finish (FF). Within a herd, an episode did not only refer to an outbreak, but was also defined as a continuous period in which a strain belonging to the same cluster was detected, clusters being designated according Lambert et al. (2019). A pairwise similarity matrix was obtained following a multiple alignment and genetic change during an episode was calculated (GC=100 - % similarity).

Results

Up to 3 episodes were recorded in some herds, leading to 139 different episodes. The mean (min-max) time interval and GC between the first and last sequences within an episode was 13.5 months (2.1-46.7) and 1.37% (0-4.65%), respectively. As time intervals differed between herds and episodes, GC was extrapolated on an annual basis (AGC); it represented 1.56% per year (0-8.70%), slightly higher than reported earlier in the literature.

Discussion and Conclusion

Compared to F herds, FF had longer episodes (17.2 vs.11.0 months) and greater GC within an episode (1.64 vs. 1.19%), however, the AGC was similar. Farrowing herds are possibly more inclined to eliminate and control PRRSv, often by closing the herd and exposing voluntarily all animals to a PRRSv strain, hence limiting the duration and variation of the circulating strain within an episode.

VVD-PP-15

CASES OF MYOCARDITIS ASSOCIATED WITH PORCINE CIRCOVIRUS-3 DETECTED BY ENHANCED SURVEILLANCE

S. Williamson [1], C. Bidewell [2], T. Floyd [2], S. Grierson [1]
[1]*Animal and Plant Health Agency (APHA)*
[2]*Animal and Plant Health Agency, England, UK*

Background and Objectives

Porcine circovirus 3 (PCV3)-associated myocarditis is a recently recognised systemic manifestation of PCV3 infection, however its frequency in postnatal pigs and contribution to disease outbreaks in Great Britain is not known. Enhanced surveillance for cases using myocarditis as an initial screen is described.

Material and Methods

During 2021, hearts from pigs received for postmortem (PM) examination and diagnostic testing were routinely examined by histopathology. In those with non-suppurative myocarditis, PCV3 in situ hybridisation (ISH), PCV2 immunohistochemistry (IHC) and RT-PCRs were undertaken.

Results

Hearts were examined in over 400 submissions. Non-suppurative myocarditis, often with periarteritis, associated with PCV3 nucleic acid labelling by ISH and moderate to high viral loads (low Ct values by PCR) was detected in seven submissions. PCV2 was not detected in these pigs by IHC. Only single pigs in batches of two or three were affected in these submissions. Affected pigs were 10 days to 13 weeks old and most, but not all, were in poor body condition. Other diseases were diagnosed in the pigs including swine influenza, Actinobacillus pleuropneumoniae, Klebsiella pneumoniae septicaemia and PRRS.

Discussion and Conclusion

This enhanced surveillance over 12 months detected only seven PM submissions (1.75% of submissions screened) with individual pigs with myocarditis associated with PCV3. No PCV3-associated outbreaks affecting multiple postnatal pigs were diagnosed. The clinical significance of the PCV3 and lesions detected in these individual pigs and herds is uncertain especially as other significant diseases were diagnosed in the batch and more research is needed. These findings suggest low incidence of systemic PCV3 disease at present and provides a baseline from which to monitor changes; continued surveillance is merited. This is a different manifestation to PCV3-associated foetopathy/perinatal disease which has been diagnosed previously in England involving multiple foetuse and/or neonatal piglets, two further incidents of which were diagnosed in England during 2021.

VVD-PP-16

NEUROINVASIVE PORCINE ASTROVIRUS INFECTION ASSOCIATED WITH RECURRENT OUTBREAKS OF ENCEPHALITIS, POSTERIOR WEAKNESS AND PARALYSIS AMONG WEANED PIGLETS

á. Boros [1], Z. László [2], M. Albert [3], H. Bíró [4], P. Pankovics [1], T.G. Phan [5], E. Delwart [5], G. Reuter [1]

[1]*Department of Medical Microbiology and Immunology, Medical School, University of Pécs, Pécs, Hungary*

[2]*University of Pécs, Medical School, Department of Medical Microbiology and Immunology*

[3]*Ceva Phylaxia Ltd.*

[4]*SHP Ltd.; Kaposvár, Hungary*

[5]*Blood Systems Research Institute, San Francisco, CA, USA*

Background and Objectives

Astroviruses are small, nonenveloped viruses with single-stranded 6.2–7.8 kb RNA genome of positive polarity. The family Astroviridae is currently divided into 2 genera: Mamastrovirus and Avastrovirus. The genetically heterogenic astroviruses that are widespread among mammals are generally associated with gastroenteritis, less commonly with respiratory disease, rarely encephalitis. Astrovirus infections with central nervous system (CNS) involvement were reported recently in human, mink, bovine, ovine, and swine. Most neuroinvasive astroviruses belong to the Virginia/Human-Mink-Ovine (VA/HMO) phylogenetic clade and cluster with enteric astroviruses identified from asymptomatic or diarrheic humans and animals. Authors report the detection of neuroinvasive porcine astrovirus type 3 (Ni-PoAstV-3) in recent and archived CNS samples of weaned paraplegic pigs from three large scale swine farms in Hungary

Material and Methods

Sample Collection from diseased animals; Histology; In situ hybridization (ISH); Reverse transcription PCR (RT-PCR) Quantitative RT-PCR Long-range Amplification, 5'/3' RACE-PCR, and Sanger Sequencing

Results

A large-scale pig herd in Hungary had a neurologic disease among weaned (25- to 35-day-old) pigs, with posterior paraplegia. Pathology of affected pigs revealed encephalomyelitis. Porcine astrovirus type 3 was identified by reverse transcription PCR and in situ hybridization in the central nervous system in several animals. Similar virus was also detected in archived brain and spinal cord samples from another 2 geographically distant farms. Viral RNA was predominantly restricted to neurons, particularly in the brain stem, cerebellum, and cervical spinal cord

Discussion and Conclusion

Authors detected astrovirus RNA in multiple tissues collected during 2015–2017 from paraplegic weaned pigs of unknown origin and from archived brain and spinal samples in 2011 and 2014. These data indicate that a neurovirulent astrovirus is circulating in swine farms since 2011 or earlier in Hungary.The identification of a neurovirulent astrovirus in pigs is a relevant step forward in the differential diagnosis of encephalitis in these farm animals.

VVD-PP-17

POSITIVE EFFECTS OF ALGAL BETA-1,3-GLUCAN ON VIRAL REPLICATION OF PRRSV AND ASFV IN PULMONARY ALVEOLAR MACROPHAGES (PAM

A. De Leon [1], S. Kirwan [2], R. Neto [2], V. Van Hamme [2], J. Tan [1], T. Nguyen [1], H. Thanh [3], D. Vu Hoang [3]
[1]*Kemin Animal Nutrition and Health, Asia Pacific*
[2]*Kemin Europa NV*
[3]*National Institute of Veterinary Research, Vietnam*

Background and Objectives

Globally, PRRS and ASF cause huge economic impact for pig producers, additional tools are needed to help control them. Two studies were done to determine the effect of Algal Beta-1,3-Glucan (BG) in the replication of PRRSv and ASFv in PAM cells, both used an in vitro macrophage model, as the virus is macrophage tropic.

Material and Methods

In the PRRS study, PAM cells were incubated for 1 hour with BG at a rate of 0.1, 1.0, and 10 µm/mL and then challenged with PRRSv strain MN184. The supernatant was collected at different time points (0, 12, 24, and 36 hours after infection) for determination of viral growth by qRT-PCR.

Results

The highest concentration of BG provided the most reduction in 24 hours and the response was dose-dependent, with suppression of PRRS viral growth at 0.1 µm/mL dilution of BG. In the ASF study, PAM cells were incubated at different times (15, 30, 60, and 120 mins) and concentrations of BG of 10 and 20 µm/mL before being challenged with 106 HAD50/ml ASFv Ha Nam strain. The results showed that 50 µm/mL of BG had a significant decrease ($P<0.05$) of quantification cycle (Cq) value at 24 hours after ASFv exposure in both 1 and 2 hours incubation.

Discussion and Conclusion

In both trials, algal beta-glucan showed a dose-dependent inhibition of viral infection and replication in PAM cells and may potentially be a useful tool to support the control of infections caused by viruses, such as PRRS and ASF, through a potential direct effect on viral replication.

VVD-PP-18

PRRS-STATUS ON DUTCH FARMS BETWEEN 2017-EARLY 2021

M. Schyns [1], S. Agten [1], A. Steudle [2]
[1]*MSD AH Benelux, Boxmeer, the Netherlands*
[2]*MSD Animal Health Innovation GmbH, Schwabenheim an der Selz, Germany*

Background and Objectives

The "Coalitie Vitale Varkenshouderij" is to eradicate PRRS from the Netherlands by 2050. The initiative is supported by all important stakeholders in the Dutch swine sector. First it is to create a benchmark system to compare farms to gain insight into the current PRRS status of every farm in the Netherlands. We give an overview of the Dutch PRRS status using historical data.

Material and Methods

All blood samples collected by MSD Netherlands between 2017 and 2021 were investigated by the CDS, Boxmeer. 3112 blood samples were selected from fatteners of 22 weeks of age and 979 (pooled samples) from piglets of 10 weeks of age. The tests used were PRRSv RT-qPCR of INDICAL and IDEXX PRRS X3 ELISA.

Results

2531 of the 3112 samples were serologically positive. The RT-qPCR detected PRRSv in 625 of the 979 samples. When all the samples analyzed in one year on one farm were positive, status of the farm became positive. When all the samples from a farm were negative in that year, status became negative. Some farms had mixed positive and negative results.
In the last 5 years the average % of positive farms constantly ranged between 60–70%. The negative farms saw a rise from 7 to 16%. The farms with both serologically positive and negative fatteners at 22 weeks of age showed a decline. The same trends showed in the piglets of 10 weeks. Between 30 and 35% of the farms scored negative, and between 49 and 60% scored positive.

Discussion and Conclusion

This analysis shows a small increase of negative farms in the Netherlands with serologically negative fatteners. The differences found in this analysis show that the PRRS status of Dutch farms looks stable on country level. There is still a lot of work to be done to become PRRS negative.

VVD-PP-19

PRRSV-1-INDUCED LUNG LESION IS ASSOCIATED WITH AN IMBALANCE BETWEEN COSTIMULATORY AND COINHIBITORY IMMUNE CHECKPOINTS

I. Ruedas-Torres [1], J.M. Sánchez-Carvajal [1], F. Larenas-Muñoz [1], F. Pallarés-Martínez [1], L. Carrasco [1], I.M. Rodríguez-Gómez [1], J. Gómez-Laguna [1]

[1]*Department of Anatomy and Comparative Pathology and Toxicology, Faculty of Veterinary Medicine, University of Córdoba, Córdoba, Spain*

Background and Objectives

Porcine reproductive and respiratory syndrome virus (PRRSV) induces a dysregulation on the innate and adaptive immunity evading host immune response. T cell activation requires a proper interaction and precise balance between costimulatory and coinhibitory molecules, commonly known as `immune checkpoints´. Therefore, this study aims to evaluate the expression of immune checkpoints in target organs, lung and tracheobronchial lymph node (TBLN), from piglets infected with two different virulence PRRSV-1 strains.

Material and Methods

Seventy 4 weeks-old piglets were grouped into three experimental groups: control, 3249-infected group (low virulent strain) and Lena-infected group (virulent strain). Piglets were euthanized at 1, 3, 6, 8 and 13 days post-infection, and lung and TBLN were collected to evaluate histopathological findings, PRRSV viral load and mRNA expression (relative quantification) of costimulatory (CD28, CD226, TNFRSF9, SELL, ICOS and CD40) and coinhibitory (CTLA4, TIGIT, PD1/PDL1, TIM3, LAG3 and IDO1) molecules through RT-qPCR.

Results

Lena-infected pigs exhibited more severe lung lesion associated with a higher viral load in target organs. An upregulation of costimulatory molecules CD28, CD226, TNFRSF9, SELL, ICOS and CD40 was found in both infected groups compared with control group, especially in the lung at the end of the study. Coinhibitory molecules CTLA4, TIGIT, PDL1, TIM3, LAG3 and IDO1 displayed earlier, from first week post-infection onwards, a strong upregulation in PRRSV-1-infected piglets, but in general with a higher expression in those infected with the virulent Lena strain.

Discussion and Conclusion

The imbalance between costimulatory and coinhibitory molecules induced by PRRSV-1 strains is likely to be associated with a more severe lung tissue damage mainly observed in Lena-infected piglets. Therefore, this dysregulation contributes to minimize tissue damage and limit inflammation. Further studies should determine the role of these molecules in the impairment of viral clearance as well as along the chronic stage of the infection.

VVD-PP-20

QUANTITATIVE ANALYSIS OF INFLAMMATORY UTERINE LESIONS OF PREGNANT GILTS WITH DIGITAL IMAGE ANALYSIS SOFTWARE FOLLOWING EXPERIMENTAL PRRSV-INFECTION

D.G. Horváth [1], Z. Abonyi-Tóth [2], T. Rümenapf [3], H. Kreutzmann [4], C. Knecht [4], A. Ladinig [4], G. Balka [1]
[1]*Department of Pathology, University of Veterinary Medicine Budapest, Hungary*
[2]*Department of Biomathematics and Informatics, University of Veterinary Medicine Budapest, Hungary*
[3]*Institute of Virology, Department for Pathobiology, University of Veterinary Medicine Vienna, Vienna, Austria*
[4]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

The pathology of reproductive disorders caused by porcine respiratory and reproductive syndrome virus-1 (PRRSV-1) is not yet characterized in every detail. Our objective was to digitally quantify the endometrial inflammatory cells and to associate the counts with manual scores, viral load measured by quantitative polymerase chain reaction (qPCR), challenge strains, vaccination status and fetal weight.

Material and Methods

We used haematoxylin and eosin-stained endometrial slides from a challenge experiment in which, vaccinated and non-vaccinated pregnant gilts were inoculated with one of two PRRSV-1 strains of low and high pathogenicity. Inflammatory cells of the lamina propria were digitally counted using object classification of QuPath software. We compared the manual scorings of two blinded examiners' and estimated the correlation between the severity of vasculitis and endometritis, also between cell counts and manual scorings, fetal weights, vaccination status and challenge strain, and placental and endometrial qPCR-results. We determined the cell number thresholds of manual endometritis severity categories using the digitally quantified cell numbers.

Results

There was fair agreement between the manual scorings without tendency difference. The distribution of cell counts differed significantly from examiner 1's manual grades and between groups, except the two unvaccinated. Distributions of qPCR-based viral copy numbers differed significantly between manual grades of examiner 1. In both investigators, a higher vasculitis score was associated with a higher endometritis score, and a higher inflammatory cell count was associated with a high vasculitis or endometritis score. Cell number thresholds of endometritis severity categories can be determined by bandwidth curves or simulations using the digital quantification's results. Significant correlations between fetal weights and cell counts were found in the unvaccinated groups and significant positive correlation was found between cell counts and endometrial qPCR-results.

Discussion and Conclusion

In summary, digital image analysis can be efficiently applied to experimental setups where placental inflammation needs to be objectively assessed.

VVD-PP-21

SWINE INFLUENZA VIRUS (SWIAV) DETECTED IN SAMPLES FROM PIGS IN THE NETHERLANDS IN Q1 – Q3 OF 2021.

P. Van Der Wolf [1], M. Olde Monnikhof [1], S. Van Colen [1]
[1]*Ceva Santé Animale, Naaldwijk, the Netherlands*

Background and Objectives

Swine Influenza A viruses (swIAV) are highly prevalent in swine in The Netherlands. Both 'classical' and pandemic Influenza subtypes circulate in the Dutch swine herds. Identification of strains is important for the right choice of vaccine to apply in a herd, for future vaccine development and monitoring of the zoonotic potential.

Material and Methods

Nasal swabs, lungs, oral fluids, BALF or udder wipes were collected by Dutch veterinarians in pig herds suspected of flu infection. Samples were sent to IVD GmbH (Germany) for investigation by PCR (VetMAX-Gold Influenza SIV-PCR swine). Results were expressed as negative (Ct-value > 40, weakly positive (Ct-value 38 - 40) or positive (Ct-value <38). Subtyping was done by PCR (SIV Influenza Subtyping Multiplex-PCR, Henritzi et al. 2016).

Results

From 85 farms, 136 submissions including 425 samples were received. 96 submissions of pooled nasal swabs (N=311), 17 submissions of udder wipes (N=48), 10 submissions oral fluids (N=28), 8 submissions of individual nasal swabs (N=19), 1 lung and 1 BALF (N=3). 67 farms (79%) were positive for IA, 99 submissions (72.8%) had 1 or more positive results, and 240 samples (56.5%) were positive. 131 positive samples from 36 farms could be (partially) typed: 44 H1avN1, 34 H1pdmN2, 25 H1huN2, 2 H1pdmN1pdm, 1 H1avN2 and 1 H1pdmN1 and 24 with only a partial typing. In most farms only one type was found, however, in 4 farms 2 types were found: 2x H1huN2 + H1pdmN2, 1x H1pdmN1 + H1pdmN2 and 1x H1N1 +H1pdmN2.

Discussion and Conclusion

The sampling technique used by Dutch veterinarians to detect swIAV is often successful (72.8%). Both 'classical' H1N1, H1N2 and pandemic (H1pdmN2) and H1pdmN1pdm strains were found, but also reassortants like H1avN2. Some farms were positive for more than one subtype.

VVD-PP-22

USE OF A NEW IMMUNOINFORMATICS TOOL (EPICC) TO ASSESS THE RELATIONSHIP BETWEEN THE EPITOPES OF T LYMPHOCYTES, OF VACCINES AND PCV2 STRAINS CIRCULATING IN FRANCE

F. Colin [1], J. Angulo [2]
[1]*ZOETIS, Bâtiment VIVA, 10 Rue Raymond David, 92240 Malakoff, France*
[2]*Zoetis Inc, Parsippany, NJ, USA*

Background and Objectives

PCV2 is a fast evolving virus, with at least five different genotypes identified to date. The widespread use of vaccines has been successful in reducing PCV2-associated diseases significantly over the last 20 years. However, numerous field reports document the presence of subclinical PCV2 infection, and the question of a progressive immune escape has been raised.

Material and Methods

To substantiate this hypothesis, seventy-five PCV2 strains were collected from 71 farms in different French regions between 2018-2021. All genomes were sequenced and the amino acid sequences of each capsid were deducted, and analysed using an epitope prediction tool (PigMatrix). Within these sequences, the expected T-cell receptor epitopes likely to be recognised by the porcine major histocompatibility complex were identified. They were then analysed by the Epitope Content Comparison (EpiCC) algorithm, to be compared to those extracted from the sequences of strains from three commercially available PCV2 vaccines (two PCV2a-based vaccines and one PCV2a- and PCV2b-based vaccine, CircoMax® Myco).

Results

The majority of French field strains were genotype d (60%), confirming the recent shift from PCV2b to PCV2d. The respective levels of similarity between the putative epitopes of each field strain and each of the three vaccines were scored; the higher the score, the more similar the epitopes, the better the expected cellular immunity coverage. The EpiCC score was substantially higher for CircoMax® Myco than for the other two vaccines, for each field strain (30 - 35 % additional immunological coverage as an average).

Discussion and Conclusion

The genetic shift of field strains, possibly fuelled by the immune pressure of widespread vaccine coverage, may explain that current PCV2a-based vaccines provide a limited immunological coverage compared to a vaccine based on two PCV2 genotypes (PCV2a and PCV2b) with a potential of disease control improvement.

VVD-PP-23

VP7 AND VP4 GENOTYPING OF ROTAVIRUS A IN DANISH SWINE HERDS

K. Pedersen [1], N.B.G. Goecke [1], P. Ryt-Hansen [1], N. Rosager Weber [2], L.E. Larsen [1]
[1]*University of Copenhagen, Dpt. of Veterinary and Animal Sciences, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark*
[2]*SEGES Pig Research Centre, 1609 Copenhagen V, Denmark*

Background and Objectives

Group A rotavirus (RVA) causes gastroenteritis in piglets. The virus is genotyped according to variation within each of the eleven double-stranded RNA gene segments. For simplification, genotypes are often only described by the VP7 (G-genotypes) and VP4 (P-genotypes) genes, encoding the two outer capsid proteins. A total of 12 G-genotypes and at least 14 P-genotypes have been detected in pigs. The porcine RVA vaccine in Denmark is based on the G5P[7] genotype. The efficacy of RVA vaccines depends on the level of heterogenicity between the field strain and the vaccine stain, and thus it is important to know the diversity of circulating strains. Therefore, the objective of this study was to describe the genetic diversity of RVA in Danish swine herds.

Material and Methods

One real time RT-PCR RVA positive fecal sample from 60 swine herds were included. 30 samples were collected as pen floor samples and 30 as rectal swabs from individual piglets. Each sample was tested by conventional PCR with newly designed primers detecting the VP7 and VP4 genes and sequenced by Sanger Sequencing and/or Illumina MiSeq.

Results

The VP7 genotypes G3, G4, G5, G9, G11 and G26 were detected with G5, G9 and G11 being the most prevalent. P[13] and P[23] were the VP4 genotypes most often detected, but P[6], P[7], P[26] and P[32] were also present. G5P[13], G5P[23], G9P[13], G9P[23] and G11P[13] were the predominantly circulating genotype combinations. A possible new VP4 genotype was discovered, and some rectal swabs revealed infections with multiple genotypes.

Discussion and Conclusion

These preliminary results indicate a diverse distribution of RVA genotypes in Danish swine herds. In herds with suspected decreased vaccine efficacy, genetic diversity among RVA should be considered. In vitro neutralisations tests or in vivo challenge studies are needed to investigate this further.

VVD-PP-24

EXPLORATORY STUDY OF THE FREQUENCY OF DETECTION AND TISSUE DISTRIBUTION OF PORCINE CIRCOVIRUS 3 (PCV-3) IN PIG FETUSES AT DIFFERENT GESTATIONAL AGES

A. Ruiz [1], V. Saporiti [4], E. Huerta [4], M. Balasch [2], J. Segales [3], M. Sibila [4]

[1]Zoetis Manufacturing&Research Spain S.L.; IRTA, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain

[2]Zoetis Manufacturing&Research Spain S.L., Ctra. Camprodon s/n, La Riba, 17813 Vall de Bianya (Girona), Spain

[3]Departament de Sanitat i Anatomia Animals, UAB, 08193 Bellaterra, Barcelona, Spain; UAB, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona (Spain)

[4]IRTA, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain

Background and Objectives

Porcine circovirus 3 (PCV-3) has been associated to several pig diseases, being the reproductive disorders the most frequent ones. The objective of this study was to analyze the presence and tissue distribution of PCV-3 DNA in pig fetuses from different gestational timepoints and origins.

Material and Methods

A total of 300 fetuses, at different stages of gestation, were obtained either from farms without overt reproductive disease (NRP, n = 249) and from slaughterhouse (S, n = 51). From these 300 fetuses, 49 were from the second third of the gestation (crown-to-rump length [CRL] <16 cm) and the rest (n=251) were from the last third of gestation (CRL >16 cm). From each fetus, a pool of tissues (brain, heart, lung, kidney and/or spleen) was generated and tested by means of a qPCR PCV-3. Individual tissues were tested by qPCR in case of pool positivity.

Results

The frequency of detection of PCV-3 was significantly higher in NRP fetuses (69/249, 27.7%) than in S ones (5/51, 9.8%). Moreover, PCV-3 was detected in significantly higher percentages in fetuses from the last third of the gestation (69/251, 27.5%) when compared to those from the second third (5/49, 10.2%), although the viral loads were not significantly different. PCV-3 DNA was detected in all tissue types analyzed, but not all the tissues within a pool resulted qPCR positive.

Discussion and Conclusion

Results from this exploratory work suggested that PCV-3 infection is more frequent in fetuses from late periods of the gestation than in fetuses from mid-gestation. Moreover, PCV-3 DNA was detected in all the tissues assessed; further research is needed to investigate which tissues are involved in virus replication.

VVD-PP-25

IMPACT OF INFLUENZA A H1N1PDM VACCINATION ON REPRODUCTIVE PERFORMANCES IN 3 FRENCH SOW HERDS

A. Lebret [1], C. Teixeira-Costa [2], P. Berton [1], J. Jeusselin [1], C. Chevance [3], V. Normand [1], F. Bouchet [1], S. Brilland [4], A. Jardin [4], G. Boulbria [1], M. Brissonnier [1]

[1]*PORC.SPECTIVE, Swine Vet practice, ZA de Gohélève, 56920 Noyal-Pontivy, France*

[2]*Rezoolution Pig Consulting Services, Noyal-Pontivy, France*

[3]*PORC. SPECTIVE, Swine Vet practice, Noyal-Pontivy, France*

[4]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*

Background and Objectives

Influenza A virus (IAV) is an important pathogen in swine causing important economic losses. Since 2020, we observe an evolution of the subtypes circulating in Brittany/France. Particularly, a new genotype H1avN2 (lineage #F), presenting genetic proximity with IAV H1pdmN1pdm, was identified. This case report aims was to evaluate in three herds the effect of sow vaccination with a H1N1pdm vaccine on reproductive performances.

Material and Methods

Three sow herds IAV infected in breeders were selected. Two were tested positive for H1avN2#F and one for H1pdmN1pdm by qPCR and sequencing on nasal swabs. For each herd, the number of total born and born alive per litter (TB and BA), dead born per litter (DB), mummified piglets per litter (MM), losses in suckling piglets (L), weaned piglets per litter (WP) and fertility rate (FR) were compared during a whole cycle of production before and after implementation of vaccination with RESPIPORC FLUpan® H1N1. Differences between means of each group were determined by using one-way analysis of variance method (difference considered as significant when $p<0.05$). Statistical analyses were performed using R Studio (R Core Team).

Results

In all herds, we observed a significant increase of TB, BA and WP ($p<0.05$) in vaccinated sows. In herd 1, BA raised from 16.96 to 17.25 and WP from 14.48 to 14.86. In herd 2, BA raised from 14.84 to 15.42 and WP from 12.48 to 12.58 and finally for herd 3, respectively 15.16 to 16.13 and 13.12 to 13.93.We did not observe significant differences in DB, MM and FR. L was stable in all herds but one (not significant).

Discussion and Conclusion

This case report highlights the benefits on reproductive parameters of sow vaccination with RESPIPORC FLUpan®H1N1. A significant improvement of the main productive data has been noticed in all herds.

VVD-PP-26

LITTER BASED COMPARISON OF UDDER WIPES AND NASAL SWABS FROM SUCKLING PIGLETS FOR THE DETECTION OF INFLUENZA VIRUS.

P. Van Der Wolf [1], M. Olde Monnikhof [1], R. Janssen [2], S. Van Colen [1]
[1]*Ceva Santé Animale, Naaldwijk, the Netherlands*
[2]*Veterinary Practice De Varkenspraktijk, Someren, the Netherlands*

Background and Objectives

Nasal swabs are a standard sampling method for Swine Influenza virus (swIAV). As this method needs lots of effort, using udder wipes of sows during or shortly after suckling could be a convenient alternative. Aim of this comparison was to investigate if udder wipes are as efficient as nasal swabs in suckling piglets.

Material and Methods

Seven farms were sampled 2 or 3 times. At each visit from 3 litters each, 5 nasal swabs (MW113125), pooled per 5, and an udder wipe (synthetic cloth, 5 by 10 cm) were collected. Virocult transport medium was added to the pools (2 ml) and udder wipes (5 ml). Testing was done by IVD GmbH (Germany) by real-time RT-PCR (VetMAX-Gold SIV RNA Detection Kit, Life Technlogies, Darmstadt). Typing was done by Multiplex-PCR Assay (Henritzi et al. 2016). All samples were collected by the same veterinarian.

Results

A total of 54 pools and 51 wipes were collected. 33 Combinations were both negative, 2 pools positive, but wipes negative, 16 both positive (WinEpi: Kappa 0.912, sens. 88.9%, spec. 100%). Four herds were completely negative. On average Ct-values were 27.1 for the pools and 30.4 for the wipes. Nine pools and 8 wipes were typed, average Ct-value 21.6 vs 26.6 resp.. In all 3 herds the typing results were similar in conclusion with regard to circulating type(s), however at combination level typing results could differ (pools vs wipe: H1avNx vs H1avN1; H1pdmN2 and H1avN1 vs H1pdmNx; H1pdmN2 vs H1pdmN1 and N2; H1pdmN2 and N1 vs H1pdmN1; H1pdmN2 vs HxN2; HxNx vs H1pdmN2).

Discussion and Conclusion

At herd level, 3 udder wipes had the same result as 3 pools of 5 nasal swabs each. This investigation shows that udder wipes, although slightly less often positive and Ct-values are somewhat lower in positive samples, can be a suitable alternative to nasal swabs.

VVD-PP-27

OPTIMISATION OF INFLUENZA A VIRUS DETECTION BY PCR IN ORAL FLUIDS SAMPLES BY USING REAL TIME RESPIRATORY HEALTH STATUS (REHS) MONITORING TO DETERMINE TIME OF SAMPLING

P.H. Rathkjen [1], M. Jensen [1], A. Kragh [1], C. Alonso [2]
[1]*Boehringer Ingelheim Animal Health Denmark*
[2]*Boehringer Ingelheim Vetmedica GmbH*

Background and Objectives

Accurately determining the timing of infections in herds impacted by Swine Influenza A Virus (IAV) is important for the implementation of preventative measures. The objective of this study was to demonstrate the value of using SoundTalks® (ST) to determine the optimal timing of diagnostic sampling and intervention programs in the face of IAV outbreaks. The sensor based and algorithm calculated ReHS emits a green light (healthy/ReHS-) that changes to yellow or red alarms with increasing cough (ReHS+)

Material and Methods

During a 6-month period a site nursery containing 8 rooms, weekly filled with 900 4-week-old pigs were evaluated. The rooms were equipped with 2 ST monitors/room. Every week, half of the rooms were tested for IAV by AniCon GmbH, using 2 oral fluids (OF)/room, placed below ST monitor. A Chi-square (non-parametric) test was used to study whether there was a statistically significant difference between the observed and the expected number of positive/negative results with or without ReHS alarms.

Results

A total of 124 rooms were OF sampled during the 6-month period (June – early November) in 2021. IAV was detected in 20/25 ReHS+ rooms and in 31/95 of ReHS- rooms. Results indicated that the ReHS+ was significantly associated with an increase in positive IAV OFs. Positive IAV samples were evenly distributed by room and by month. IAV were detected at highest frequency during week 5th and 6th after placement in the nursery.

Discussion and Conclusion

ReHS monitoring identified multiple episodes of cough in a nursery facility and was a helpful surveillance tool to determine the most optimal time for OF sampling in order to detect IAV. Although IAV was detectable in 28 % of rooms without any respiratory sign, the 80% success rate in ReHS+ alerts saved the farmer significant diagnostic cost and to optimize his intervention.

VVD-PP-28

PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS) EPIDEMIOLOGY IN AN ITALIAN INTEGRATED PIG COMPANY: MULTIPLE CHALLENGES REQUIRING MULTIPLE ACTIONS?

G. Franzo [1], G. Barbierato [1], P. Pesente [2], M. Legnardi [1], C.M. Tucciarone [1], G. Sandri [3], M. Drigo [1]
[1]*Dept. of Animal Medicine, Production and Health, University of Padova, Legnaro, Italy.*
[2]*Laboratorio Tre Valli/Gruppo Veronesi*
[3]*Soc.Agr. La Pellegrina spa/ Gruppo veronesi*

Background and Objectives

Porcine reproductive and respiratory syndrome (PRRS) is probably the most relevant viral disease affecting pig farming. Despite the remarkable efforts paid in terms of vaccination administration and biosecurity, eradication and long-term control have often been frustrated. Unfortunately, a limited number of studies exist that objectively link, using a formal statistical approach, viral molecular epidemiology to the risk factors responsible for the observed scenario. The present study aimed to contribute in filling this knowledge gap benefitting of a broad sequence dataset and advancements in phylodynamics methods.

Material and Methods

Approximately one-thousand ORF7 sequences were obtained from strains collected between 2004 and 2021 from the largest Italian pig company, which implements strict compartmentalization among independent 3-sites (i.e. sow herds, nurseries and finishing units) pig flows. The history and dynamics of the PRRSV population and its evolution over time were reconstructed and linked to the company managerial choices. The viral fluxes within and among independent pig flows were evaluated. The contribution of other integrated pig companies and rurally risen pigs in mediating such spreading was also investigated. Moreover, a continuous phylogeographic approach allowed the reconstruction of the viral circulation in Northern Italy and the impact of several environmental features on PRRSV strain persistence and spreading velocity was assessed.

Results

The results demonstrate that PRRSV epidemiology is shaped by a multitude of factors including pig herd management (e.g. immunization strategy), implementation of strict-independent pig flows and environmental features (e.g. climate, altitude, pig density, road density, etc.) among the others. Small farms and rurally raised animals also emerged as a potential threat for larger, integrated companies.

Discussion and Conclusion

These pieces of evidence suggest that none of the implemented measures can be considered effective alone and a multidimensional approach, ranging from individual herd management to collaboration and information sharing among different companies, is mandatory for effective infection control.

VVD-PP-29

PREVALENCE AND DISTRIBUTION OF PORCINE ROTAVIRUS (RV) GROUP AND TYPE IN SUCKLING PIGLETS IN CANADA BETWEEN JULY 2019 AND JULY 2021

C. Malgarin [1], C. Sebo [2], F. De Grau [1], S. Drapeau [1]
[1]*Merck Animal Health, Canada*
[2]*Merck Animal Health, United States of America*

Background and Objectives

RV is a diarrhea-causing pathogen in swine industry. Major prevalent types are RVA, B and C. As the prevalence of RV C has been observed to be higher in young suckling pigs, the aim of this study was to determine the prevalence of RV groups and types on suckling pigs from different Canadian territories (AB, BC, MB, NB, ON, QB, SK).

Material and Methods

Fecal swabs from neonatal diarrhea were submitted for RV VP7 sequencing. Sequence analysis was performed using Merck Animal Health Sequivity Dashboard to identify the sequence group and type, and to determine their prevalence. Descriptive analysis was employed.

Results

RV+ samples from 245 diarrheic piglets (<7 DOA) were sequenced. RV C was present in 46.5%, RV A in 40.8%, and RV B in 12.6%. Individual RV infection summed 148 cases (60.41%), while 44 cases were co-infections. RV A was present in 84% (37/44) of these cases. Only ON presented higher prevalence of RV A, while the other provinces had higher prevalence of RV C. Sixteen different genotypes were identified. From 100 RV A samples, 57% were type G9, followed by 27% G5. Half of the 31 RV B samples were G17 (32%) and G20 (19%). RV C was detected in 114 samples, 70% were G6. Some RV types were specific to a certain region or province. Only ON observed RV B G18, MB a RV B G25, RV A G11 was only found in AB, RV B G12 was found in AB and SK only, and RV B G16 in MB and ON.

Discussion and Conclusion

Like other studies, suckling piglets were mostly infected by only one RV strain, although co-infections are common. RV C G6 is the most prevalent RV type in Canada (except for Ontario).

VVD-PP-30

PREVALENCE OF INFLUENZA A VIRUS-SWINE SUBTYPES ON HUNGARIAN SWINE FARMS - A FIELD STUDY

P. Mate [1], I. Makkai [1], L. Buza [1], H. Swam [2], L. Ozsvari [3]
[1]*MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)*
[2]*Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands*
[3]*University of Veterinary Medicine Budapest, Hungary*

Background and Objectives

Influenza A virus-swine (IAV-S) can play a significant role in the Porcine Respiratory Disease Complex (PRDC). The aim of this study was to gain knowledge of the herd level prevalence and subtype variance of influenza A virus-swine in Hungary.

Material and Methods

Twenty-five Hungarian large commercial swine farms without IAV-S vaccination history were surveyed for IAV-S subtype prevalence between 2019 and 2021. At least 14 blood samples per age group were collected from 4-, 8-, 12-, 16-, 20- and 24-week-old pigs and fatteners. IAV-S specific antibody levels in blood samples were quantified using the IDEXX ELISA test (reference) and IAV-S subtype specific Hemagglutination inhibition (HI) tests for the identification of subtypes (EurAsian-avian H1N1, pandemic 2009 H1N1, Scotland-1994 H1N2, Gent-1984 H3N2).

Results

We found that 84% of the surveyed farms were Influenza-A positive. 60% of the surveyed farms were positive for H1N1, 65% for pandemic H1N1, 65% for H1N2, and 65% for H3N2.The influenza-A subtype variance on the surveyed farms:Thirty % of farms had all 4 subtypes, 20% had none of them. 5% had only pH1N1, 5% had H3N2+pH1N1+H3N2, 10% had pH1N1+H1N2+H3N2, 5% had H1N1+pH1N1+H1N2, 5% had H1N2+H3N2, 5% had H1N1+pH1N1, 5% had H1N1+H1N2+H3N2, 10% had H1N1+H3N2.

Discussion and Conclusion

Most farms in this study were seropositive for IAV-S. In a positive farm the probability of more than one IAV-S type being present is given. This study could be extended to a representative selection of farms for Hungary to get the full picture of the local IAV-S situation, which might have an impact on control measures and eventually vaccination programs.

VVD-PP-31

THE PREVALENCE OF ATYPICAL PORCINE PESTIVIRUS IN HUNGARIAN PIG FARMS

L. Dénes [1], G. Balka [1]
[1]*University of Veterinary Medicine Budapest, Department of Pathology*

Background and Objectives

Atypical porcine pestivirus (APPV) is a member of the genus Pestivirus and has been identified as the causative agent of congenital tremor (CT) type AII. CT is well known worldwide, and the virus seems to be highly prevalent in major swine producing areas. We aimed to investigate the prevalence of APPV in Hungary.

Material and Methods

In this study processing fluid and cross-sectional blood serum samples from all age groups were analyzed for the presence of APPV. Altogether 1550 serum samples (in pools of 5), 79 processing fluid samples originating from 16 farrow-to-finish farms were tested. Viral nucleic acid was extracted using Indispin/Cador Pathogen Mini Kit (Qiagen) in a QIAcube instrument (Qiagen). qRT-PCR analysis for viral detection was implemented by OneStep RT-PCR Kit (Qiagen) using specific primers for APPV.

Results

APPV was detected in 9 out of 16 farms, in 50 out of 331 serum pools (15,1%) and 14 out of 79 processing fluid samples (17,72%). Regarding the APPV infected farms, 19,3% of the serum pools and 36,8% of the processing fluid samples were positive and in every infected farm, at least one processing fluid sample was positive indicating a relatively high proportion of congenitally infected piglets even without evidence of clinical CT. Surprisingly, only pigs older than 6 weeks of age were APPV positive in their sera, with proportions of 6 and 18-week-olds (21%) and 14-week-olds (16%) showing the highest number of infections. Samples obtained from gilts and sows were negative, except one pool of gilts.

Discussion and Conclusion

Our data show that APPV is widespread across Hungary and mostly it can be found in processing fluids and serum samples obtained from 6-, 14- and 18-week-old animals. Further investigations are needed to reveal why sera obtained from 2- and 4-week-old animals were negative despite the high prevalence observed among the newborns.

VVD-PP-32

ASSESSMENT OF THE VERTICAL TRANSMISSION OF PRRSV1 IN UNSTABLE FARMS: EFFECT OF PARITY AND NEUTRALIZING ANTIBODY TITRES

G. Martin Valls [1], M. Cortey [2], H. Clilverd [3], Y. Li [4], E. Mateu [2]
[1]*Departament de Sanitat i d'Anatomia Animals. Universitat Autonoma de Barcelona*
[2]*Departament de Sanitat i Anatomia Animals, Universitat Autònoma de Barcelona (UAB), 08193 Cerdanyola del Vallès, Spain*
[3]*Universitat Autonoma de Barcelona*
[4]*Department de Sanitat i Anatomia Animals, Facultat de Veterinària, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Spain*

Background and Objectives

The objective of the present study is to determine if the age of the sow and the level of neutralizing antibodies may be correlated with the occurrence of vertical transmission of porcine reproductive and respiratory syndrome type 1 viruses (PRRSV1) in vaccinated farms.

Material and Methods

Two PRRSV1 positive unstable farms vaccinating with MLV were selected. Five days before parturition, 139 and 111 serum samples were collected from sows on each farm, respectively. The day of birth, 6 umbilical cords (UC) were collected from each of these sows. Vertical transmission (VT) of PRRS was determined when at least one of the UC tested positive by qRT-PCR. Sera was analysed by a commercial ELISA. Neutralizing antibodes were measured in sera from 40 sows which tested PRRSV positive on the UC and 40 negatives using the MLV vaccine as antigen. Additionally, serum from 25 young sows (1-2 parturitions) and 25 adult sows (>3 parturitions) was evaluated by neutralization using a panel of 5 heterologous PRRSV1 antigens.

Results

Fivety-eight out of 250 sows tested positive to PRRSV on UC. Young sows were more likely of having VT than adult sows (Relaive risk = 1.70 CI95% 1,22-2,31; p=0,012). ELISA and neutralization against MLV showed no significative differences when comparing sows having or not VT. Younger sows tended to have both ELISA S/P ratios and neutralization titres higher than older sows (p=0.07). The neutralization panel showed no differences except for one of the heterologous strains, in which case a trend (p=0.07) was observed for a higher proportion of older sows having neutralizing antibodies.

Discussion and Conclusion

The results detected in the present work suggest that younger sows have higher risk to deliver PRRSV positive piglets than older sows. Interestingly this could be more related with the broadness of neutralization than with the homologous or level of titres obtained with MLV vaccination.

VVD-PP-33

REPRODUCTIVE PERFORMANCE IN A PIG FARM WITH ENDEMIC AFRICAN SWINE FEVER VIRUS INFECTION IN VIETNAM

N.H. Nguyen [1], T.N. Nguyen [2], T.Q. Nguyen [2], T.T.H. Le [3], H. Lin [4], S. V. Berg [5]
[1]Department of Infectious diseases and Public health, Faculty of Animal sciences and veterinary medicine, Nonglam University, Linhtrung ward, Thuduc city, Hochiminh city, Vietnam.
[2]P&Y Lab of Livestock Service Co., LTD, Vietnam
[3]MSD Animal Health, Vietnam
[4]MSD Animal Health Innovation Pte Ltd, 1 Perahu Road, Singapore
[5]MSD Animal Health, Munich, Germany

Background and Objectives

African Swine Fever (ASF) is an economically devastating disease of swine. Since the Vietnamese Ministry of Agriculture and Rural Development confirmed its first ASF outbreak on 19-February-2019, 6 million pigs across Vietnam have been lost. In the absence of a vaccine, farms in Vietnam are opting to live with ASFV. This abstract aims to outline what living with ASF infection looks like.

Material and Methods

A farm was selected with a history of ASF. This farm did not undergo depopulation. Reproduction parameters were compared pre/post ASF infection across 100 sows. 6 fetuses were randomly collected from 6 sows that experienced abortions and tested for common differentials such as ASFV, PRRSV, Classical Swine Fever, Pseudorabies virus and PCV2 by either PCR or RT-PCR.

Results

All 6 fetuses were positive for ASFV and negative for other pathogens. Pre-ASF, conception rate was 100% and farrowing rate was 95%. Regular returns post AI and sow abortion rates were less than 5% and 1% respectively. Stillbirth and mummy rate was below 7% and 1.5%, respectively. After ASF outbreak, abortion was observed in different stages of gestation with high percentage (14%), stillbirth and mummified piglet rate increased to 7.9% and 18.4%, respectively. The rate of returned heat after AI and the rate of abortion in sows increased to 18% and 14%, respectively. After ASF, total born/litter was 8.65, born alive/ litter was 7.34 and the number of piglets weaned/ litter was 6.34, in comparison to pre-outbreak numbers of 12.5 piglets/ litter, 12 piglets/ litter, and 9 piglets/ litter, respectively.

Discussion and Conclusion

The results show that ASFV continious to be a leading cause of reproductive failure on this farm, and that comparing pre and post ASF performance, we see that endemic living with ASF will greatly decrease the profitability of a swine farm.

VVD-PP-34

CIRCULATION IN FRANCE OF PPV-1 STRAINS GENETICALLY CLOSED TO PPV 27A STRAINS

M. Abed [1], A. Jardin [2], I. Kiss [3], Z. Homonnay [3], M. Baudouard [1], F.X. Briand [4], M. Le Guillermic [1], P. Mortensen [5]

[1]*Labocea Ploufragan - Service Immunologie Virologie PCR. 7 rue du Sabot, Ploufragan, 22440. France*

[2]*Ceva Santé Animale, 33 500 Libourne, France*

[3]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[4]*Anses Ploufragan – Unité VIPAC, B.P 53, Ploufragan, 22440. France*

[5]*Ceva Corporate Swine Team*

Background and Objectives

Porcine parvovirus type 1 (PPV1) is one of the most important pathogens in porcine reproductive disorders characterized by still born, mummified, embryonic death and infertility (SMEDI), irregular returns, and piglets born viraemic. PPV1 comprise several field strains of variable virulence and are split into a genotype 1 (GT1) and 2 (GT2). PPV1 GT2 was defined in 2006 consist of quite homogenous, extremely virulent strains, like PPV1-HUN and -27a. PPV1 GT1 is a more heterogenous group, containing strains ranging from the avirulent PPV1-NADL2 to the very high virulent PPV1-KRESSE. The aim of this study was genetic characterization of PPV1 strains circulating in France and allocate them to GT1 or GT2.

Material and Methods

Since October 2019, foetal tissues form herds experiencing reproductive failure were investigated for PPV1 by PCR and partial sequencing of the genome carried out at Labocea or Ceva-Phylaxia, for genetic characteristics and placement in phylogenetic tree, allocating them to either GT1 or GT2. All herds turned out to perform PPV vaccination of breeding stock. The reproductive disorders were characterised by increased number of mummified foetuses, infertility and/or abortions. A majority were mummies from primiparous sows. Case material originated from sow herds located in West, North and South East parts of France.

Results

PPV1 was identified by PCR, isolated, and partial sequencing allowed for a phylogenetic analysis from 11 herds. Ten strains were allocated to GT2 and one to GT1.

Discussion and Conclusion

This result confirms the presence reproductive failure caused by PPV1 field strains belonging to both GT1 and, mainly, GT2 strains in farms vaccinating against PPV in France. Continuous monitoring on reproductive disorders and in-depth sequence analysis of PPV strains isolated is necessary to follow the possible expansion of the PPV1 GT2 field strains in French territory and to follow the clinical consequences.

VVD-PP-35

DIVA RT-PCR FOR DETECTION AND DISCRIMINATION OF WILD TYPE AND MODIFIED LIVE VACCINE STRAIN OF PRRSV

K. Fornyos [1], A. Balint [2], I. Szabo [3], K. Lebhardt [4]
[1]*M.A.H. Food-Controll Ltd*
[2]*National Foodchain Safety Authority, Budapest (Hungary)*
[3]*National PRRS Eradication Committe, Budapest (Hungary)*
[4]*M.A.H. Food Control Ltd.*

Background and Objectives

Modified live vaccines (MLVs) are often used to control PRRS. Differentiation of vaccinated or infected animals (DIVA) is not possible by antibody response, although DIVA is essential for the farms intend to eradicate PRRS and use MLV.The aim of our study was to develop a cheap, fast, sensitive and robust DIVA RT-PCR, which is able to discriminate between herd-specific wild type PRRSV and the MLV strain used for vaccination.

Material and Methods

The herd specific wild type PRRSV was detected by commercial RT-PCR, its ORF5 was sequenced and appropriate primers were designed to amplify ORF5 on the FAM channel of our in-house DIVA RT-PCR. The MLV's ORF5 was amplified on the HEX channel, its sequence was obtained from gene bank. Sera samples of 21020 pigs from suckling piglets were collected weekly and tested in pools of 3 by an ORF7 based commercial RT-PCR. The positive ones were submitted to our DIVA RT-PCR. The DIVA RT-PCR products were subjected to Sanger sequencing. The herd was followed for a weekly period and approximately 200 samples were tested by our DIVA RT-PCR.

Results

The DIVA RT-PCR 100% correlated with ORF7 RT-PCR when Ct value of the latter was <32. Ct >32 gave 95% positive in the DIVA RT-PCR. Our assay always detected properly the HW or the MLV strain in the case of single infection. When both strains were present in one sample, sequencing usually identified the one with higher copy DNA.During the study period, the detection rate of the HW-PRRSV decreased from 50% to 0% by 2021.

Discussion and Conclusion

The DIVA RT-PCR detects both the MLV and the HW-PRRSV with high confidence and provides a useful diagnostic tool for PRRS eradication.

VVD-PP-36

IMPLEMENTATION AND MONITORING OF A PRRS ERADICATION PROGRAMME IN A FRENCH BREEDER-FINISHER FARM COMBINING MASS VACCINATION FROM 4 DAYS OF AGE AND COMPLIANCE WITH BIOSECURITY MEASURES

M. Dethinne [1], F. Colin [2]
[1]*Société vétérinaire de l'Iroise, Pen ar Forest, 29860 Kersaint-Plabennec, France*
[2]*ZOETIS, Bâtiment VIVA, 10 Rue Raymond David, 92240 Malakoff, France*

Background and Objectives

PRRSV is frequent problem on swine farms in Brittany (Western France), where no regional eradication programme is in place. Control of infection is usually performed at farm level, using commercially available vaccines. The owner of a 200-sow farrow-to-finishing farm from Brittany contacted his swine veterinarian in June 2019 requesting PRRSV eradication. The steps implemented in this eradication programme including mass vaccination and compliance with biosecurity measures are outlined.

Material and Methods

Step 1: In June 2019, a complete internal and external biosecurity audit of the farm was conducted (two sites).
Step 2: Mass vaccination with an approved vaccine from one day of age (SUVAXYN PRRS MLV®) was implemented in September 2019, given twice, three weeks apart. On both sites, all breeding animals and all pigs aged 4 days or older were vaccinated.
Step 3: Sows then received booster shots every 12 weeks, and naïve gilts were vaccinated upon arrival and 3 weeks later. Fourteen batches of piglets were vaccinated at 4 days of age and at weaning at 28 days of age.
Step 4: PCR tests on four consecutive batches from piglet blood were performed at weaning. Serologic monitoring of sentinel piglets and sentinel gilts and of fatteners was performed.

Results

Step 1: Critical biosecurity gaps were identified and corrected, including cleaning/disinfection of ventilation shafts when cleaning barns, a 9-week closure of the farm and the purchase of semen, site-specific clothing for presumed viraemic and non-viraemic sectors of the farm as the protocol progressed, etc.
Step 2 and 3: no harmful reaction was detected among vaccinates.
Step 4: All sampled animals proved to be seronegative. By mid-January 2021, PRRS vaccination was stopped.

Discussion and Conclusion

Eradication can be achieved at farm level through mass vaccination providing serological monitoring and biosecurity measures are strictly complied with.

VVD-PP-37

PREVALENCE OF PCV2 SUBTYPES A, B AND D IN FATTENERS PIGS IN BENELUX FARMS BETWEEN OCTOBER 2020 AND FEBRUARY 2021

A. Vanderzeypen [2], T. Meyns [2], A. Verhaegen [1], J. Angulo [3]
[1]*ZOETIS BV, Rivium Westlaan 74, Capelle ad Ijssel, The Netherlands*
[2]*ZOETIS Benelux, Mercuriusstraat 20, 1930 Zaventem, Belgium*
[3]*Zoetis Inc, Parsippany, NJ, USA*

Background and Objectives

PCV2 is changing with the emerging of new subtypes classified from PCV2a through PCV2h. PCV2 high-evolutionary rate causes an increase of diversity of epitopes in its capsid, affecting the binding-capacity to the host cells. PCV2 subtypes a, b and d are known for their clinical importance. Currently, there is little information about prevalence of different subtypes in Benelux. Therefore, the objective was to generate information about prevalence of PCV2a, b and d in farms from Benelux.

Material and Methods

Fatteners from 167 farms (71-Belgium, 96-The Netherlands) were sampled using Oral-Fluids. Farms were randomly selected by herd veterinarians without other specific criteria. Cross-sectional sampling in pigs from 3 ages, 10-15, 16-19 and >20 weeks were sampled using 5 ropes per farm, one pool per age group was send to the D-lab of the University of Munich for ORF2-genotyping by TaqMan-based-real-time PCR. Additionally, questionnaires were completed by the veterinarian.

Results

The presence of PCV2 was confirmed in 65% of the farms and genotyping success rate in 91% of the positive farms. Finding the distribution of single-genotype distribution of 33% ,18% and 28% for subtypes a, b and d respectively. 21% of the farms showed subtypes co-infections being subtype d the most prevalent (20%). Overall, regardless single or coinfections, subtypes a, b and d were found in 46%, 30% and 48% of the farms respectively.
In 14 farms where subtype d was more prevalence followed by a and b, the herd veterinarian mentioned the appearance of PDNS clinical signs in the questionary. In 10 of these farms, piglets were vaccinated against PCV2.

Discussion and Conclusion

PCV2d appears to be the most common subtype (48%), followed by PCV2a (46%) and PCV2b (18%) in Benelux. In 21% of the farms, co-infections of 2 or 3 subtypes were found. Some of the farms mentioned PDNS in the fatteners despite vaccination

VVD-PP-38

REPRODUCTIVE PERFORMANCE OF A PANDEMIC INFLUENZA A INFECTED BELGIAN FARM BEFORE AND AFTER IMPLEMENTATION OF A VACCINE AGAINST THE INFLUENZA A (H1N1)PDM 09 VIRUS.

E. De Jonghe [1], P. De-Backer [1], E. Libbrecht [1]
[1]*Ceva Santé Animale, Brussels, Belgium*

Background and Objectives

Belgian farmers increasingly decide to vaccinate against swine influenza A (swIAV) pandemic subtypes to protect their sows. An association between these pandemic subtypes and reproductive losses was demonstrated in a study. In this field observation reproductive performance parameters were compared before and after the implementation of vaccination against the influenza A (H1N1)pdm09 virus on a Belgian sow herd infected with the pandemic influenza A virus.

Material and Methods

A Belgian farrow to finish farm faced respiratory problems in the nursery. Samples were positive for a pandemic subtype panH1NX. The farmer decided to vaccinate his sows with Respiporc FLUpan H1N1, a vaccine against the influenza A (H1N1)pdm09 virus. Average performance parameters (number of piglets born alive per litter, number of piglets weaned per litter, % repeated breeders, preweaning mortality rate and number of piglets weaned per sow per year) were analysed 12 months before vaccination and 12 months after completion of primary vaccination with a vaccine against the influenza A (H1N1)pdm09 virus.

Results

The analysis showed a significant increase of the number of piglets weaned per litter (12.7 vs. 13.2) and the number of piglets weaned per sow per year (31.3 vs. 32.8). The results showed a numerically decrease of the percentage of repeated breeders (5.5% vs. 4.9%). The number of piglets born alive per litter increased numerically (14.9 before and 15.3 after) and the preweaning mortality before and after (14.2% vs. 14.2%) remained the same.

Discussion and Conclusion

These results show that vaccination against the influenza A (H1N1)pdm09 virus improved several reproductive parameters on this farm. Farms infected by a pandemic swIAV can suffer from reproductive failure. It is therefore important to know which subtypes are circulating on farms and to implement the correct vaccines because there is no cross protection between a vaccine protecting against H1av and a vaccine protecting against H1pdm strains.

VVD-PP-39

EMERGENCE OF PCV2 INFECTIONS WITH TROPISM TO THE GUT AND ITS ASSOCIATED TISSUES

R. Renzhammer [1], R. Brunthaler [2], V. Martin [1], J. Matt [2], N. Nedorost [2], A. Auer [3], C. Weissenbacher-Lang [2], C. Unterweger [1]

[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*

[2]*Institute of Pathology, University of Veterinary Medicine Vienna, Austria*

[3]*Institute of Virology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Despite an abundance of clinical manifestations due to infections with the porcine circovirus type 2 (PCV2) is described, PCV2-SD seems to be more frequent than other PCV2 – associated diseases. However, recently we observed an increase of PCV2-infections mainly limited to the gut and its associated tissues.

Material and Methods

This was demonstrated once more by a case of PCV2-AD in an Austrian gilt-producing farm, where only female piglets were vaccinated against PCV2. While wasting had already been a major problem in that farm before, diarrhea in the nursery was observed more frequently. Two male and two female eight-weeks-old piglets were submitted to the Vetmeduni for pathological examination and further diagnostic workup.

Results

A moderate to severe lymphocyte depletion and infiltrations with histiocytes and multinucleated giant cells was observed in the Peyer's patches, the intramural lymphoid tissue of the colon and mesenteric lymph nodes of the male piglets. The same lesions were observed in mentioned organs of female piglets, but were less severe. Lesions were not observed in any other lymphatic tissue including inguinal lymph nodes, were PCV2-DNA was detectable via qPCR with 10^7 GE/mg tissue in female and 10^8 GE/mg tissue in male piglets. Intestines and mesenteric lymph nodes of male piglets yielded moderate positive signals in in situ-hybridization.

Discussion and Conclusion

This case demonstrates that vaccination of only female piglets does neither lead to sufficient protection of unvaccinated nor vaccinated piglets. Due to lymphocyte depletion being observed in mesenteric lymph nodes but not the inguinal lymph node, we recommend to always examine several lymph nodes. Since we recently observed similar cases more frequently, a shift of tropism of PCV2 mainly to the gut and associated tissue can be hypothesized.

VVD-PP-40

EXPECT THE UNEXPECTED: FIRST INCIDENTAL DETECTION OF PCV-2E GENOTYPE IN EUROPE

G. Franzo [1], M. Ustulin [2], P. Zanardelli [3], N. Villa [3], A. Manfredda [3], D. Vio [2], M. Drigo [1]
[1]*Dept. of Animal Medicine, Production and Health, University of Padova, Legnaro, Italy.*
[2]*Peripheral Diagnostic Laboratory of Pordenone, Istituto Zooprofilattico Sperimentale delle Venezie, Cordenons, PN, Italy*
[3]*Zoetis Italia s.r.l. Via Andrea Doria, 41M, 00192, Roma*

Background and Objectives

Porcine circovirus 2 causes one of the most economically impacting infections in swine farming. Several variants have emerged over time and are currently classified into several genotypes. However, only tPCV-2a, PCV-2b, and PCV-2d demonstrate a worldwide distribution. The occurrence of underdiagnosis or underreporting of other genotypes cannot be excluded.

Material and Methods

Samples were collected from a farrow-to-weaning reproduction farm located in Northern Italy, hosting approximately 500 Danish sows. PCV-2 diagnosis was performed in the framework of monitoring activity. Viral presence and titration were performed by real-time PCR and the complete genome of positive samples was sequenced and compared with a set of references sequences. Thereafter, a cross-sectional study was planned to investigate the viral distribution within the farm.

Results

Two samples collected during the first part of the study from sows, before and after-farrow, were PCV-2 positive with low titers. The complete genomes were obtained for both samples. The two sequences were 99.9% identical and classified as PCV-2e with high support. Two sows at 14 and 21 days after farrowing, sampled during the follow-up study, also tested PCV-2 positive. Their ORF2 were 100% identical to the previously obtained. No clinical sign ascribable to PCVD could be detected in all the considered animals.

Discussion and Conclusion

The identified strains represent the first detection of PCV-2e in Europe. Their origin remains unknown since no link with the areas where PCV-2e circulates could be identified. Wider than expected PCV-2e circulation in Italy cannot thus be excluded. Since diagnostic activity is typically limited to symptomatic pigs, a recent introduction could have passed undetected, stressing the need for more intensive monitoring activity. PCV-2e is the most divergent PCV-2 genotype and displays a quite distinct phenotype. Therefore, the efficacy of currently available vaccines and molecular diagnostic assays should be considered.

VVD-PP-41

HIGH PREVALENCE OF PCV3 IN HUNGARIAN PIG HERDS

B. Igriczi [1], L. Dénes [1], E. Albert [1], I. Biksi [1], G. Balka [1]
[1]*Department of Pathology, University of Veterinary Medicine, Budapest, Hungary*

Background and Objectives

Porcine circovirus type 3 (PCV3), a member of the Circovirus family was identified in 2016, in tissues of pigs suffering from porcine dermatitis and nephropathy syndrome (PDNS), reproductive failure, myocarditis or multisystemic inflammation. The presence of the virus has since been reported in different countries of Europe, Asia and America. Since then, PCV3 infection has been linked with several clinical-pathological conditions, however the most frequently reported ones are reproductive failures and multisystemic inflammation. Our aim was to monitor the prevalence and the genetic diversity of PCV3 in Hungarian herds, to investigate the within-herd infection dynamics of the virus and to gain information regarding its pathogenicity.

Material and Methods

For the estimation of the prevalence altogether 1695 serum samples from different age groups, 158 oral fluid and 87 processing fluid samples were collected in a systematic, cross sectional method from 18 large scale swine herds, and tested by real-time qPCR. In some cases full-genom sequencing and phylogenetic analysis was performed.

Results

PCV3 was present in at least one type of diagnostic matrix in 17 out of the 18 (94%) pig farms. The highest detection rates were observed in the processing fluid samples. The virus was found in all age groups, but besides the processing fluid samples of the newborn piglets, 6-weeks old pigs, gilts and sows of two parities were the age groups with the most frequent detection rate, as almost one third of these samples were positive. In the routine diagnostic material sent to our laboratory PCV3 was detected with particularly low Ct values in tissue homogenates of piglets showing lesions of multisystemic wasting and multiorgan inflammation.

Discussion and Conclusion

Our results indicate that PCV3 is widely spread in Hungary. Although the virus seems to circulate subclinically, high levels of virus replication might be associated with wasting and multisystemic inflammation.

VVD-PP-42

INTRODUCTION AND LARGE-SCALE EVALUATION OF A NOVEL ONE-STEP TRIPLEX RT-QPCR ASSAY FOR SIMULTANEOUS DETECTION OF PATHOGENIC PORCINE SAPELOVIRUSES, TESCHOVIRUSES (PICORNAVIRIDAE) AND TYPE 3 PORCINE ASTROVIRUSES (ASTROVIRIDAE) IN SWINE

Z. László [1], P. Pankovics [1], G. Reuter [1], A. Cságola [2], K. Bodó [3], G. Gáspár [1], M. Albert [2], H. Bíró [4], á. Boros [1]

[1]*Department of Medical Microbiology and Immunology, Medical School, University of Pécs, Pécs, Hungary*

[2]*Ceva Phylaxia Ltd. Budapest, Hungary*

[3]*Department of Immunology and Biotechnology, University of Pécs, Medical School, Pécs, Hungary*

[4]*SHP Ltd.; Kaposvár, Hungary*

Background and Objectives

Porcine sapeloviruses (PSV), teschoviruses (PTV) of the family Picornaviridae and type 3 porcine astroviruses (PoAstV-3) of the family Astroviridae are (re-)emerging enteric pathogens of swine. These viruses could be associated with severe, disseminated infections with high mortality rate affecting the central nervous system. Furthermore, previous small-scale studies indicate the presence of these viruses in nasal samples to various extents. Our aims were (i) to create a novel triplex RT-qPCR assay capable of the simultaneous detection of these three pathogens (ii) to gather additional data about the nasal presence of these viruses in Hungarian swine farms.

Material and Methods

Using in silico sequence analyses virus-specific primer pairs and different TaqMan probes for one-step RT-qPCR were designed manually. The assay was evaluated using in vitro synthesized RNA standards and a total of 142 RNA samples including known PSV, PTV and PoAstV-3 positive and negative specimens. Total of 473 nasal swab samples were collected from 21-25-day-old asymptomatic swine from N=28 highly prolific, industrial-type swine farms.

Results

The analytical sensitivity and specificity tests indicated the optimal performance of the assay. The limit of detection was 100 copies/reaction regarding all three viruses. PoAstV-3 was found to be the most prevalent (17.8% overall positivity in the nasal swab samples, 24/28 positive farms) followed by PTV and PSV which were detected in a much lower proportion (9.9% sample positivity 9/28 positive farms, and 7.8% sample positivity, 16/28 positive farms).

Discussion and Conclusion

Based on the results of performance tests this one-step triplex RT-qPCR assay could be useful in the accurate diagnosis of PSV, PTV and/or PoAstV-3 infection(s) in various sample types with diverse nucleic acid environments. Furthermore, large-scale epidemiological investigations on nasal samples demonstrated the widespread presence of these neurotropic viruses especially type 3 astroviruses in Hungarian swine herds which could raise veterinary concerns.

VVD-PP-43

REPRODUCTIVE CONSEQUENCES OF H1AVN2 (1C.2.4) INFECTION AND IMPACT OF TRIVALENT VACCINE IMPLEMENTATION IN ONE FRENCH SOW HERD

C. Colimard [1], A. Jardin [2], G. Anthony [4], S. Brilland [3], K. Lillie-Jaschniski [5]
[1]*BREIZHPIG SCOP SAS, rue Edgar Brandt, 56500 Locminé, France*
[2]*Ceva Santé Animale, 33 500 Libourne, France*
[3]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*
[4]*Breizhpig SCOP SAS, ZA de Kerjean, 7 rue Edgar Brandt, 56500 Locminé, France*
[5]*Ceva Santé Animale, Libourne, France*

Background and Objectives

Swine influenza A virus (swIAV) is one of the most important infectious diseases in pig farms, for its financial and productive impact. In 2020 many French pig farms got infected by an unknown swIAV strain in France: H1avN2 (H1 belonging to clade 1C.2.4). Aim of this paper is to describe the clinical consequences of this infection in one farm in particular, its impact on production parameters and to follow up the changes after vaccine implementation.

Material and Methods

The case occurred in a farrow-to-finish 170 sow farm. H1avN2 was diagnosed in August 2020 on weaners during an all-herd flu-like syndrome. A second wave of clinical signs appeared in February 2021 mainly on lactating sows: late abortions, fever, anorexia, drop of milk production, increase of losses on life born piglets. Again, H1avN2 was detected on suckling piglets and on weaners. An inactivated trivalent vaccine (Respiporc® FLU3) was implemented in mass vaccination protocol twice in March 2021. Productivity criteria were followed during key periods: before H1avN2 first infection (P1), during first flu syndrome (P2), in-between syndromes (P3), during second flu syndrome (P4), after vaccine implementation (P5).

Results

Production data during P1, P3 and P5 periods are quite similar: between 11.6 and 12 weaned piglets per litter and between 6.8% and 8.7% of still born per total born piglets. These results are numerically different to the ones during influenza outbreaks: the number of weaned piglets per litter dropped to 11.2 (P2) and 10.1 (P4) and the rate of still born piglets reached 10.7% (P2) and 10.1% (P4). Only after the second injection of primary vaccination (early P5) the productivity criteria at farrowing went back to normal.

Discussion and Conclusion

This case demonstrates the high impact of an influenza outbreak on productive parameters. In this farm, Respiporc® FLU3 was able to provide a correct protection against H1avN2 infection.

VVD-PP-44

USE OF AN ALTERNATIVE TRANSPORT MEDIA FOR PRRSV MONITORING IN A GILT DEVELOPMENT UNIT

J. Miranda [1], L. De Lucas [1], S. Sopena [1], L. Valls [1], J. Maldonado [1], S. Rosina [2], U. Rolla [3], C. Lasagna [3]
[1]*HIPRA HQ, Amer (Girona), Spain*
[2]*HIPRA Italy*
[3]*Martini Gruppo - Italia*

Background and Objectives

Acclimatization of gilts is crucial to control PRRS and the use of oral fluids (OF) represents a practical, convenient and cost-effective sampling for PRRSV monitoring. However, PRRSV detection by RT-qPCR in OF samples is challenging, due to the denature of the virus during transit. For this reason, alternative transport methods have been proposed. The objective of this trial was to analyse the performance of a transport liquid (TL) for shipping OF samples in a PRRSV-monitoring project for gilts.

Material and Methods

Between October and December 2020, a Gilt Development Unit (GDU) in Italy was enrolled in a PRRSV monitoring project. PRRS-free gilts arrived at the GDU at 90 day of age, were vaccinated with Unistrain® PRRS and left the GDU two weeks before the first farrowing. Each batch of gilts was sampled weekly using 1 rope per pen and paired OF samples (mixed and unmixed with TL) were submitted to Diagnos HIPRA laboratory in Spain. Samples were tested by RT-qPCR for PRRSV detection and ORF5 sequencing for PRRSV characterization. Results were obtained within the same week and used to organize gilts movement to commercial farms.

Results

Up to 8/48 (16%) and 10/48 (21%) samples were RT-qPCR positive after being unmixed and mixed with TL, respectively. A total of 40/48 samples (83%) showed the same results when comparing both methodologies. However, 3/48 (6%) of the samples were positive unmixed and negative mixed and 5/48 (10%) the other way around. In addition, 6/8 (75%) and 7/10 (70%) samples were successfully sequenced after being unmixed and mixed, respectively.

Discussion and Conclusion

Comparable sensitivity was demonstrated for RT-qPCR and ORF5 sequencing for PRRSV when OF samples were unmixed or mixed with TL. All-in-all, TL ensures good preservation of PRRSV in OF samples and represents a good alternative, as sampling is faster, easier and samples can be shipped at room temperature.

VVD-PP-45

SPATIO-TEMPORAL DYNAMICS OF PORCINE CIRCOVIRUS TYPE 2 (PCV2) OF VARIOUS GENOTYPES CIRCULATING IN JAPAN

I. Sasaki [2], F. Koike [1], J. Mago [2], D. Tsukamoto [2], C.K. Mah [3]
[1]*SMC Co., Ltd.*
[2]*Livestock Techniclal Service in Zoetis Japan*
[3]*Zoetis*

Background and Objectives

All the known strains of PCV2 can currently be classified into eight genotypes (PCV2a-PCV2h) based on phylogenetic analysis of ORF2 and complete genome sequences. PCV2 genotypes 2b and mutant 2b (mPCV2b or PCV2d) in the recent years predominate the world, and these two genotypes were also reported in Japan. However, none have investigated their distribution status across different regions of Japan. This study aimed at providing an up-to-date information on the molecular epidemiology of PCV2 circulating in Japan with a focus on the spatio-temporal dynamics of the existing and emerging genotypes of PCV2.

Material and Methods

Using blood samples obtained from clinically diagnosed cases of PCV-associated diseases in commercial pig herds, real-time PCR screening for PCV2 DNA sequences was conducted from December 2019 to November 2020 in Mishima Laboratory of Zoetis Japan. The full-length sequence of ORF2 from these local PCV2 isolates along with various PCV2 genotypes of reference sequences obtained from GenBank were aligned using ClustalW.

Results

A total of 80 PCV2 strains in the reported pig farms were recovered from this investigation. The phylogenetic analysis of PCV2 based on the ORF2 sequence showed only three genotypes: PCV2a, PCV2b and PCV2d. 9 strains (11.3%) and 4 strains (5.0%) belonged to the PCV2a and PCV2b genotype respectively, while 67 (83.8%) belonged to the PCV2d genotype. The distribution of PCV2d by regions were 42.9% (North), 82.9% (Middle), and 92.1% (West), respectively in Japan. A few farms were found to have more than one genotypes in circulation.

Discussion and Conclusion

This study indicated that PCV2d is the predominant genotype of PCV2 found in the middle (Kanto Koshinetsu) and west (Kinki, Chugoku-Shikoku, Kyushu) regions of Japan. These findings may help our swine veterinarians to devise effective vaccination strategies for PCV2 prevention and control in pigs under field conditions.

VVD-PP-47

PORCINE CIRCOVIRUS 3 PREVALENCE IN HUNGARY

L. Molnár [1], P. Mate [2], I. Makkai [2], L. Buza [2], H. Swam [3], L. Ozsvari [1]
[1]University of Veterinary Medicine Budapest, Hungary
[2]MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)
[3]Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands

Background and Objectives

Porcine Circovirus 3 (PCV-3) was first discovered in 2016 in the USA. It belongs to the genus Circovirus in the family Circoviridae. The exact pathogenesis of PCV-3 has yet to be elucidated. So far, we know that it is related to numerous clinical conditions: reproductive failure, cardiac or multi-organ inflammation, PDNS-like clinical signs, and respiratory disease. The aim of our study was to survey the PCV-3 virus prevalence on Hungarian swine farms.

Material and Methods

To monitor the prevalence of PCV-3 infection, we took blood samples from 1- to 34-week-old piglets on 15 Hungarian farms, and the samples were tested with qPCR. We sampled 14 animals each in every age group to get representative results. We used the “five pool” PCR method.

Results

Based on the Cq-values , the distribution of viral loads was as follows: 23% of positive samples showed a viral load of $Cq>30$, 7% a viral load of $30\geq Cq\geq 28$, 1% a viral load of $Cq<28$. Most positive cases came from 24-week-old piglets.

Discussion and Conclusion

PCV-3 was detected in all farms, although no clinical signs were observed. The subclinical impact of the PCV-3 infection needs further research. In the future, we intend to focus on co-infections with other pathogens, such as PCV-2, PRRSV, and PPV.

VVD-PP-48

WHAT IS THE REAL INFLUENCE OF CLIMATIC AND ENVIRONMENTAL FACTORS IN THE OUTBREAKS OF AFRICAN SWINE FEVER?

A. Ungur [1], C.D. Cazan [1], L. Panait [1], C. Cătoi [1]
[1]*University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania*

Background and Objectives

African swine fever (ASF) has a significant economic, social and environmental impact due to official regulation of the disease, namely the mass depopulation of all pigs in confirmed outbreaks. The main objective of the present study was to statistically analyze the possible correlation between the number of outbreaks and infected pigs from backyard farms with the altitude, seasonal average annual humidity, average temperature during spring and summer, distance from forests, rivers, and lakes in Romania.

Material and Methods

The study included all infected backyard pigs with African Swine Fever Virus (ASFV) (n = 7534) and outbreaks (n =417) that occurred in Romania between 6th of February2020 and 4th of March 2021.

Results

The number of infected pigs and ASF outbreaks were significantly higher in localities at altitudes between 100 and 500 m, average annual humidity between 60 and 80%, average spring temperature between 10 and 14 °C, average summer temperature between 16 and 22 °C, at distances of less than 5 km from the forests, less than 15 km from lakes and less than 5 km from the rivers. The number of affected pigs decreased significantly at the summer temperatures below 16 °C.

Discussion and Conclusion

A possible explanation for the higher number of outbreaks near forests, rivers, and lakes is the higher average humidity values around them. Considering the distance from the forests, the wild boars (natural ASFV reservoir) leave the forest in search of food, located near or around the Romanian backyard farms. The massive shedding of the virus through excretions can contaminate the pigs' food. Also, it was recently cited the possible involvement of arthropod vector species in the ASFV transmission. The insects are more abundant near forests and backyard farms, during summer times. More data is necessary in order to have a better prediction of possible new ASF outbreaks.

VVD-PP-49

COMPARISON OF PORCINE CIRCOVIRUS TYPE 2 (PCV2) DETECTION IN FATTENING PIGS DERIVED FROM DANISH AND POLISH SUPPLIERS

ł. Budzich [1], I. Turulski [1], A. Mikołajczyk [1], A. Woźniak [2], T. Stadejek [2]
[1]*The Scientific Society of Veterinary Medicine Students, Warsaw University of Life Sciences - SGGW*
[2]*Department of Pathology and Veterinary Diagnostics, Institute of Veterinary Medicine, Warsaw University of Life Sciences - SGGW, Warsaw, Poland*

Background and Objectives

Porcine circovirus type 2 (PCV2) is a globally spread pathogen controlled with generally highly efficacious vaccines. The impact of the vaccination in farms finishing purchased pigs is difficult to assess. The aim of this study was to compare PCV2 prevalence in oral fluids and feces of finishing pigs of Danish and Polish origin.

Material and Methods

The longitudinal study was performed on two Polish finishing farms, which purchase weaners vaccinated against PCV2 from Denmark (farm A) or locally in Poland (farm B). In farm A the pigs were purchased from one supplier at 12 weeks of age and in farm B from three suppliers at 9-10 weeks of age. Feces and oral fluids were collected every 3-4 weeks from 3 pens from each farm. In farm B each of the pens contained pigs from one supplier. qPCR was used to detect PCV2.

Results

In farm A PCV2 was detected in both matrices in all pens in 15-week-old and older pigs, with Ct<30, which corresponded to $>10^6$ PCV2 genome copies/mL. In Farm B PCV2 loads were consistently lower and different patterns of the virus detection were observed in different pens. In pen 1, PCV2 was detected in all oral fluids, but in feces of only 21-week-old pigs. In pen 2 PCV2 was detected in all oral fluids and in feces of only 10-18-week-old pigs. Interestingly in pen 3 only 1 feces sample from 22-week-old pigs reacted PCV2-positive.

Discussion and Conclusion

The results proved that the effectiveness of the vaccination against PCV2 may depend on supplier. Most likely the observed differences are due to vaccination compliance but the impact of antigenic diversity cannot be excluded. The testing of fecal samples should be considered more reliable measure of the PCV2 monitoring than the testing of oral fluids.

VVD-PP-50

FIELD TRIAL COMPARING DIFFERENT VACCINATION STRATEGIES IN PIGLETS COMBINING PROTOCOLS USING MLV AND INACTIVATED VACCINE ON CLINICAL PRESENTATION OF PRRSV DURING AN OUTBREAK WITH A HIGH VIRULENCE STRAIN

A. Vela [1], L. Lafoz Del Rio [1]
[1]*Thinkinpig, Zaragoza, Spain*

Background and Objectives

High virulence PRRSv strains cause severe damage that may remain persistent especially at nurseries. The aim of the study was to evaluate the impact of suckling piglet vaccination with a protocol including MLV and inactivated (KV) vaccines on productive results at the nursery phase.

Material and Methods

The field trial was performed in a Spanish 1800 sow farm, weaning at 28 days around 600 piglets per week. The initial single MLV established treatment in piglets was not offering positive results. A low proportion of piglets were PRRS positive at 10 days life, so it was decided to test 2 different treatments: KV group with ½ dose KV at weaning and a MLV-KV group with ½ dose MLV at 2 days life + ½ KV at weaning. Both off-label protocols were established by the farm vet and compared with a control group with no vaccination. Each protocol was tested on 4 consecutive batches (around 2400 piglets per treatment). Mortality and Average Daily Gain (ADG) were assessed in all 3 groups and PRRSv circulation was performed by PCR.

Results

NV mortality rate was 19,3% and ADG 317 g/day, KV mortality was 7,2% and ADG 312 g/day, MLV-KV mortality was 8,5% and ADG 294 g/day. Mortality rate differences were statistically significant ($p<0,05$) between NV group and the 2 vaccinated groups. No statistically differences were found in mortality between KV and MLV-KV groups and between ADG in all groups. PRRSv circulation was detected in all 12 batches.

Discussion and Conclusion

The mortality rate clearly diminishes on both treatment groups using a PRRS inactivated vaccine, although none of the protocols stopped PRRSv circulation during the nursery phase. Both vaccination protocols were able to reduce morbidity. That the reduced morbidity and mortality was not converted into a higher ADV may be attributed to a smaller size of survivors.

VVD-PP-51

CYTOLOGICAL AND HAEMATOLOGICAL CHARACTERIZATION OF PROCESSING FLUIDS

N. Tonelli [1], M. Tonni [1], N. Formenti [1], B. Passeri [2], I. Archetti [1], M.B. Boniotti [1], G.L. Alborali [1]
[1]*IZSLER (Istituto Zooprofilattico Sperimentale della Lombardia e Dell'Emilia Romagna), Brescia ITALY*
[2]*Department of Veterinary Science, University of Parma*

Background and Objectives

Processing fluids (PF) are a diagnostic material collected during routine procedures at 3-4 days of life, mainly used for PRRS herd monitoring. Easiness of collection and the excellent representativeness of the herd lead to become a widespread diagnostic material. Reliability of PF as a PRRSV diagnostic sample has been widely demonstrated. Nevertheless, the cytological and haematological composition has never been investigated. Aim of this study was the cytological and haematological characterization of processing fluids.

Material and Methods

A farrow-to-finish farm in the north of Italy was selected for PRRS monitoring. Work organization followed the 3-week batch system procedures, PF were collected each litter during castration operation and subsequently pooled in one sample. Thirty blood samples per batch were collected during pre-weaning phase. Presence of PRRSV were assessed by Real-time RT-PCR in PF and blood serum. Both materials were haematological characterized through an automated analyser with commercial kit. PF were also cytological examinated after the May-Grumwald Giemsa stain.

Results

A total of 4 batches were monitored with 120 blood samples and 8 PF during the four months of study. PRRS virus was detected only in PF samples, emphasise the reliability of this diagnostic material. The cytological evaluation of PF showed clusters of cells organized in seminiferous tubules, germ cells and interstitial cells. The haematological characterization of PF revealed a ratio of components very similar to standard blood composition.

Discussion and Conclusion

PF contained less cells than blood, except for monocytes. The role of monocytes, immature circulating macrophages, needs to be investigated in future studies, as they may play a role in PPRSV pathogenesis.

VVD-PP-52

ELIMINATION OF PRRS VIRUS INFECTION USING AN INACTIVATED VACCINE IN COMBINATION WITH A ROLL-OVER METHOD IN A HUNGARIAN LARGE-SCALE PIG HERD

A. Pertich [1], Z. Barna [1], O. Makai [1], J. Farkas [1], T. Molnar [2], A. Balint [3], I. Szabo [2], M. Albert [4]
[1]*Piginveszt Ltd., Tótkomlós, Hungary*
[2]*National PRRS Eradication Committe, Budapest (Hungary)*
[3]*National Foodchain Safety Authority, Budapest (Hungary)*
[4]*Ceva Phylaxia Ltd.*

Background and Objectives

The Porcine Reproductive and Respiratory Syndrome virus (PRRSV) causes severe economic losses worldwide. Complete depopulation-repopulation is the safest and fastest among the applied methods, but also the most expensive. Another possible way to eliminate an endemic infection is to replace the infected breeding stock by gilts reared PRRSV free on the infected farm. The authors present the first, successful elimination method (using inactivated vaccine, segregated rearing of offspring) in a Hungarian large scale pig farm.

Material and Methods

Results

A farm of 1475 sows (A) was infected with PRRSV. The clinical signs of reproductive failure were eliminated by using Progressis® (Ceva) inactivated vaccine. At the beginning of the elimination programme, gilts selected for breeding were vaccinated at 60 and 90–100 days of age, respectively. After that, breeding animals were vaccinated at 6 months of age, on the 60–70th day of pregnancy and at weaning. Approximately 1200 piglets of the vaccinated sows were transported at 7 weeks of age to a closed, empty farm (B) after being tested negative with PCR, and they were reared until 14 weeks of age. Seronegative gilts from Farm B were subsequently transported to a third, closed farm (C), and (having reached the breeding age) they were inseminated here after a negative serological test (ELISA). At the same time, Farm A was depopulated and disinfected. Pregnant gilts were transported from Farm C to Farm A after being tested negative with ELISA. Follow-up serology tests were performed after farrowing. Based on the negative test results, the authority declared the herd PRRSV free.

Discussion and Conclusion

The presented farm was the first during the National PRRS Eradication Programme to eradicate PRRSV successfully by vaccinating the sows with inactivated vaccine, performing segregated rearing of the offspring. Production was almost continuous during the whole process of the population replacement.

VVD-PP-53

EFFICACY OF PCV2 SOW AND PIGLET VACCINATION PROGRAM IN CONTROLLING EARLY PCV2 INFECTIONS

S. Oliver [1], S. Cárceles [1], L. Garza [1], C. Casanovas [1], D. Espigares [1]
[1]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

The aim of this study was to evaluate the effect of PCV2 sow and piglet vaccination program during two years in two early PCV2 infection scenarios.

Material and Methods

In 2019, 2 farms where piglets were vaccinated at weaning with a PCV2 subunit vaccine and sows remained unvaccinated were selected. Farm A showed PCV2 PCR positive blood samples at 6 and 9 weeks of age (woa) with loads of 1.2×10^5 and 2.3×10^7 PCV2 copies/mL, respectively. While, in farm B, PCV2 viraemic piglets were detected at 6 woa (1.5×10^6 PCV2 copies/mL). Therefore, a new vaccination program was started using Circovac® in sows (one dose at the end of lactation) and piglets. In piglets from vaccinated sows, blood samples were taken at 3, 6 and 9 woa (10 samples per age, sampling the smallest piglets from each pen) and processed by PCV2 PCR (pools of 5 samples). This sampling was repeated every 6 months during the two years of duration of the study. Additionally, blood samples were taken at 3 and 5 woa in the first batch of piglets born from vaccinated sows to evaluate the levels of PCV2 maternally derived antibodies by ELISA.

Results

At 3 woa, the first piglets from vaccinated sows presented higher levels of antibodies than those observed at the beginning of the study in piglets from unvaccinated sows. At 5 woa, a decrease in antibody levels was observed, therefore it was decided to vaccinate at that age the piglets from vaccinated sows on both farms. Moreover, no PCV2 PCR positive samples at 3, 6 or 9 woa were detected in any of the samplings carried out throughout the study.

Discussion and Conclusion

Sow and piglet vaccination protocol with Circovac® has proven to be an effective tool for the control of early PCV2 infections.

VPH-PP-01

ATTITUDES TO THE ANTIMICROBIAL USE ON SWINE FARMS IN HUNGARY; A SURVEY

L. Becsei [1], T. Faragó [2], I. Nemes [3], J. Földi [4]
[1]*Doctoral School of Social Sciences, Semmelweis University, Budapest, Hungary*
[2]*Master of Business Administration School, University of Technology and Economics, Budapest, Hungary*
[3]*Hungarian Swine Breeders and Farmers Association*
[4]*Euvet Bt.*

Background and Objectives

A survey was performed among swine farm professionals in Hungary to assess their (i) attitudes, opinions to the antimicrobial use; (ii) information, knowledge about AMR and 'One Health'. The study aimed to provide suggestions for further steps toward reduced antimicrobial consumption.

Material and Methods

The survey methods were (1) an anonymous questionnaire distributed over the professionals by email and social media and (2) personal interviews with CEOs and/or managing owners of large swine (agricultural) companies.

Results

One hundred and twenty-three (123) questionnaire responses and seven (7) interviews were evaluated. Approx. half (50%) of the large pig farms (>200 sows + fatteners) and ~5% of the smaller ones (<200 sows) were represented by the survey. Eighty-two percent (82%) of the responders consider antimicrobial resistance (AMR) as an important problem, 62% believe that too much antimicrobials are used by the pig farms in Hungary and 66% are willing to cooperate in reduction of the antibiotics' consumption. Huge differences were detected concerning the knowledge about AMR and 'One Health' between the high (MSc, BSc) and mid (Secondary school) educated responders, which strongly correlates with the farm size: large farms have more higher educated professionals and generally they are more advanced in antimicrobial reduction. The responders usually do not realize the importance of the antimicrobial contamination of the environment caused by the medicated feed and drinking water waste, they rather presume contamination of the pork.

Discussion and Conclusion

Education, beside the legal pressure, is crucial, especially for the small farms' staff and owners. The survey results allow a careful conclusion that some improvement in antimicrobial use may have been reached as compared to the ESVAC 2018 data in Hungary.

VPH-PP-02

REAL TIME SOUND BASED MONITORING SUPPORTS TIMELY AND INTELLIGENT DATA-BASED INTERVENTIONS BASED ON THE ACTUAL RESPIRATORY HEALTH STATUS (REHS) IN NURSERY FACILITIES

P.H. Rathkjen [1], A. Priebe [2], L. Rasmussen [2], L.M. Jensen [2], M.V. Agerlin [3], C. Alonso [4]
[1]*Boehringer Ingelheim Animal Health Denmark*
[2]*PORCUS Oerbaekvej 276, DK-5220 Odense*
[3]*Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark*
[4]*Boehringer Ingelheim Vetmedica GmbH*

Background and Objectives

Coughing is a well-recognized sign of respiratory disease that provides no definitive information regarding causative pathogens and no clear intervention guidance. Furthermore, due to limited daily periods of observation, the onset and duration of coughing is not fully appreciated. Often, standardized treatments are implemented that are not necessary nor applied at the optimal time. SoundTalks®, a sound-monitoring system that transforms pig respiratory sounds into a Respiratory Health Status (ReHS) metric, provides an alarm system for producers to intervene quickly in respiratory events that involve coughing (ReHS+ status). This promotes optimally timed diagnostics and the application of treatments when needed. The objective of this study was to describe the ReHS in a sound-monitored commercial farm and to improve the accuracy of interventions compared to historical data.

Material and Methods

A 2500 head nursery was sound-monitored for 18 months (1 monitor/room, 13 rooms). The nursery received weaned piglets into 2-3 rooms weekly. Diagnostics and treatments were performed based on ReHS alarms (ReHS+). Historical intervention data was compared to ReHS triggered intervention data.

Results

SoundTalks® detected coughing events that started at various ages in the nursery. Results from our study demonstrated that sound-monitoring led to a more objective and accurate identification of the onset of actual coughing events that required an intervention (i.e. diagnostics and therapies). Additionally, there was a 30% reduction in the number of batches that required an intervention when compared to implementing a standardized therapy at a specific post-placement interval.

Discussion and Conclusion

Sensor-based respiratory health monitoring effectively identifies nursery facility coughing events and optimizes the application of both diagnostic sampling and treatment interventions. As well, the absence of ReHS alarms is an excellent indicator of the pig respiratory health providing confidence that no treatment is needed and effectively decreasing antibiotic use.

BBD-PP-01

RECTAL SHEDDING OF CHLAMYDIA SUIS IN A PIG FARM WITHOUT CLASSICAL CLINICAL SIGNS OF CHLAMYDIOSIS

C. Unterweger [1], M. Dippel [1], M. Koch [1], A. Ladinig [1]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Chlamydia (C.) suis is a well-known cause of fertility problems and conjunctivitis in pigs. The intestine, however, represents the main reservoir. Little is known about rectal shedding and transfer between pigs. The objective of the study was to illustrate both rectal excretion and infection dynamics in a piglet producing farm without clinical chlamydial history and vaginal/cervical shedding.

Material and Methods

A cross-sectional study was done by taking rectal swabs from sows, own-reared gilts, suckling and nursery piglets at a single timepoint. In addition, rectal excretion of one sow and her offspring (5 of 12) was monitored longitudinally at regular intervals over a period of three months after birth. All samples were analysed by quantitative PCR for the presence of C.suis-specific DNA.

Results

Only 29% of the sows and 30% of the gilts shed C.suis rectally. While no rectal excretion of C.suis by suckling piglets was seen, excretion by nursery piglets was present (100%) and increased in quantities with age (10^4/g faeces in week 5; 10^5/g faeces in week 11). Excretion was highest, when pig density was highest. The longitudinal study showed intermittent low-level C.suis shedding of the sow during suckling period. First positive faeces was detected 16 days after birth (10^1/g faeces) in one piglet, while high-level faecal shedding was found three weeks after weaning in all piglets (10^4/g faeces).

Discussion and Conclusion

Even if C.suis is not causing clinical signs in a herd, faecal shedding is detectable, most likely in nursery and fattening pigs. Intestinal colonisation in suckling piglets appears to be a slow process. In contrast, colonisation after mixing litters is much faster and seems unavoidable. The faecal bacterial load seems to be dependent on pig density. This might be a valuable information, when it comes to the question of reduction of chlamydial loads in farms with typical chlamydia-associated diseases.

BBD-PP-02

ANTIMICROBIAL SUSCEPTIBILITY OF TRUEPERELLA PYOGENES ISOLATES OBTAINED FROM CONDEMNED CARCASSES

P. Cybulski [1], A. Jabłoński [2]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Center of Translational Medicine, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*

Background and Objectives

Trueperella pyogenes is an opportunistic bacterium causing a wide range of suppurative lesions in swine, such as abscessation, suppurative pneumonia, mastitis, arthritis, pyometra, endometritis, and umbilical infections. The aim of our study was to determine the minimal inhibitory concentration (MIC) of T. pyogenes isolates obtained during post-slaughter inspection of condemned carcasses.

Material and Methods

The research materials were obtained by inserting swab sticks into abscesses found in randomly selected condemned carcasses in an abattoir slaughtering up to 10 thousands finishers per week. A total number of 18 T. pyogenes isolates were identified by matrix-assisted laser desorption/ionisation - time of flight mass spectrometry (MALDI-TOF MS) and analysed to determine the susceptibility to 13 antimicrobials commonly applied in veterinary practice, i.e. amoxicillin/clavulanic acid (AMC), ampicillin (AMP), ceftiofur (CTF), doxycycline (DOX), enrofloxacin (ENR), florfenicol (FLO), gentamicin (GEN), penicillin (PEN), spectinomycin (SPE), oxytetracycline (OTC), tulathromycin (TUL), tiamulin (TIA), trimethoprim/sulfamethoxazole (TMP-SMX), using a broth dilution assay.

Results

Low MIC values for 13 antimicrobials were obtained, with the lowest MIC values identified for beta lactam antibiotics, TMP-SMX, DOX, TIA, and SPE.

Discussion and Conclusion

Our results indicate that commonly used antimicrobials would be effective against T. pyogenes infections in swine; however, ubiquity of the bacteria and their association with wound contamination strictly limit practical therapeutic possibilities in swine herds. Therefore, successful prevention of all the possible factors leading to damage to the skin (e.g. tail biting, sharp objects, damaged slatted floors), procedures regarding teeth clipping, and poor technique of injections should be considered as crucial for development of pyemic infections in pigs.

BBD-PP-03

UNDERSTANDING THE ESCHERICHIA COLI INHIBITORY MECHANISMS OF A DUAL-STRAIN BACILLUS PROBIOTIC TO PIGS

L. Skjøt-Rasmussen [1], E. Juncker Boll [1], L. Catrine Capern [1], J. Svan Nielsson [1], R. Almeida Faria [2], L. Hubertz Birch Hansen [3]

[1]*Chr. Hansen A/S, Animal Health Innovation*

[2]*Chr. Hansen A/S, Biochemical Assays*

[3]*Chr. Hansen A/S, Animal Health Commercial Development*

Background and Objectives

Enterotoxigenic Proliferation of Enterotoxigenic Escherichia coli (ETEC) in the small intestine is a primary cause of post-weaning diarrhea in pigs. Bacillus species are known to be capable of producing antimicrobial substances including e.g. bacteriocins which may inhibit Gram-negative bacteria such as E. coli. The study investigated the in vitro inhibitory effect of a dual-strain probiotic for swine containing a unique combination of B. subtilis (DSM25841) and B. amyloliquefaciens (DSM25840) on ETEC F4. The mechanisms behind inhibition of ETEC were investigated by assessing production of antimicrobial compounds as a direct inhibition mechanism as well as the ability of the probiotic to competitively exclude binding of ETEC to intestinal epithelial cells, considered as an indirect inhibition mechanism.

Material and Methods

The inhibitory potential of the probiotic on ETEC F4 was evaluated using an agar well diffusion method. The indirect inhibitory mechanism was assessed in an adhesion assay using human cancer-derived epithelial intestinal Caco-2 cells. Finally, production of surfactins by the probiotic product was evaluated as an indication of a direct inhibition mechanism, by LC-MS.

Results

In the agar well diffusion assay, the Bacillus probiotic expressed clear inhibition zones of 0.6 cm in diameter towards ETEC F4. The probiotic product significantly reduced binding of ETEC F4 to the Caco-2 cells with 76% ($P<0.0001$). Under the experimental conditions, the probiotic produced approximately 43±3 mg/L of surfactins, no surfactins were detected in the control.

Discussion and Conclusion

The mechanisms of action behind ETEC F4 inhibition by the probiotic product can be, not exclusively, attributed to the production of antimicrobial compounds belonging to the surfactins group and to a prevention of ETEC adhesion to the intestinal epithelial barrier. The beneficial effect of the Bacillus-based probiotic on reducing ETEC in vitro points towards the potential of the product as a prophylactic strategy against post-weaning diarrhea in pigs.

BBD-PP-04

A PROGRAM TO CONTROL DYSENTERY AT NATIONAL LEVEL INITIATED IN SWEDEN

P. Wallgren [1]
[1]*National Veterinary Institute SVA, 751 89 Uppsala, Sweden*

Background and Objectives

Endemic diseases affect health and drive antimicrobial resistance. Despite this, control generally lack governmental fundings. Dysentery became evident in Sweden following the ban of growth promotors in 1988. Affected herds combat dysentery, but a national strategy has been lacking.

Material and Methods

By October 2019, a network comprising Pig-producers, SVA, all large abattoirs and all animal health organisations was established. All dysentery outbreaks during 2016-2019 and the present status of affected herds were collectively documented. A program aimed to free Sweden from dysentery turned active by 2020. Dysentery was to always be examined whenever regarded as a potential diagnosis.

Results

Dysentery was diagnosed in totally 25 herds 2016-2019, whereof 16 had been sanitised. Thus, 9 herds were deemed with dysentery by January 2020.During 2020, 147 herds were examined for dysentery. Dysentery was diagnosed in 5 new herds, while two herds were declared free from dysentery, leaving 9 herds deemed with the disease.By November 2021, 139 herds had been examined for dysentery. Dysentery was diagnosed in four herds: One integrated herd previously diagnosed with dysentery but declared free following 3 negative samplings in 2020. Three fattening herds; one was supplied from a deemed herd whereas dysentery was unable to diagnose in the suppliers to the other herds. By November, 13 herds were deemed with dysentery, whereof sanitation was ongoing in 11.

Discussion and Conclusion

To control un-notifiable diseases, actors need to co-operate and share information. By doing so, and by actively search for dysentery we aim to eradicate the disease. As dysentery is difficult to diagnose from healthy pigs, the program recommends three negative samplings before declaring diagnosed herds free from dysentery. Still, the incidence with the integrated herd in 2021 illustrate the difficulties to truly guarantee full freedom from dysentery.

BBD-PP-05

COMPARATIVE ANALYSIS OF ANTIMICROBIAL RESISTANCE IN GUT PATHOGENIC ESCHERICHIA COLI FIELD STRAINS FROM SWINE

S. Van Hoorde [1], B. Devriendt [1], D. Sperling [2], E. Cox [1]
[1]*Laboratory of Immunology, Department of Translational Physiology, Infectiology and Public Health, Faculty of Veterinary Medicine, Ghent University, Belgium*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Enterotoxigenic (ETEC) and Shiga toxin-producing E. coli (STEC) cause diarrhoea and oedema disease in pigs, respectively, leading to significant losses to the industry. With antibiotics being the first-line therapy and the global growing concern on antimicrobial resistance, this study aimed to assess the antimicrobial susceptibility of E. coli strains recently collected on farms with oedema disease from Belgium, the Netherlands, the Czech Republic and Spain.

Material and Methods

The presence of virulence genes was evaluated by multiplex PCR, susceptibility to 17 antibiotics was tested by disk diffusion test.

Results

Of the 88 isolates, 39 were single positive for Stx2e, 1 for LT, and 12 for STb, while 20 were STb+Stx2e+, 5 LT+STb+ and 2 LT+STb+Stx2e+. Of these strains, 11 were F4+ and 40 F18+. Overall, strains were most resistant to amoxicillin (68%), cefalexin (44%), doxycycline (44%), tetracycline (44%) and trimethoprim (39%), with 67% being multidrug-resistant (MDR). Strains from Belgium (3.6) and the Netherlands (3.5) were resistant to significantly more antibiotics than those from the Czech Republic (1.3) ($p<0.05$). Furthermore, strains from the Netherlands (37) were resistant to 13 of the 17 tested antibiotics, while strains from Belgium (21), the Czech Republic (25), and Spain (5) were resistant to 8, 5, and 6 antibiotics, respectively. None of the isolates were resistant to enrofloxacin, cefquinome, ceftiofur, or marbofloxacin.

Discussion and Conclusion

ETEC and STEC strains exhibited resistance to older classes of antibiotics frequently used in mass-medication of pigs such as penicillins, tetracyclines, sulphonamides, and 1st generation cephalosporins. Importantly, resistance was absent against critical antibiotics, either restricted or voluntarily banned in most European countries, like fluoroquinolones and 3rd and 4th generation cephalosporins. The data also showed a significant regional difference in the MDR profile of the strains.

BBD-PP-06

COMPARATIVE ANALYSIS OF STX2E SECRETION IN SHIGA TOXIN-PRODUCING ESCHERICHIA COLI (STEC) FIELD STRAINS FROM SWINE

S. Van Hoorde [1], B. Devriendt [1], D. Sperling [2], E. Cox [3]

[1]*Laboratory of Immunology, Department of Translational Physiology, Infectiology and Public Health, Faculty of Veterinary Medicine, Ghent University, Belgium*

[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

[3]*Laboratory of Immunology, Faculty of Veterinary Medicine, University of Ghent, Belgium*

Background and Objectives

Shiga toxin-producing Escherichia coli (STEC) are known to cause diarrhoea and oedema disease in pigs, causing significant losses to the industry. Previous research showed that Stx2e secretion varies between different STEC, which likely plays a role in their pathogenesis and potentially in the severity of clinical manifestation. These studies however only looked at relative amounts of released toxin and did not take into consideration the presence of other virulence factors. Therefore, the aim of this study was to characterize 68 STEC field isolates recently collected on farms with oedema disease and quantitatively compare their Stx2e secretion.

Material and Methods

The presence of virulence genes associated with STEC was evaluated by an in-house developed multiplex PCR. Stx2e secretion was measured by enzyme-linked immunosorbent assay (ELISA) and quantified using recombinant toxin.

Results

Of the 68 field isolates, 39 were single-virulent for Stx2e, while 20 were STb+Stx2e, and 2 were LT+STb+Stx2e+. Of these, 18, 14, and 2 were F18-positive, respectively. The secreted Stx2e concentrations ranged from 62 to 7152 CD50/mL in a non-normal distributed way ($p<0.001$). The isolates were divided into three categories: undetectable-to-low secretors (33), moderate secretors (25), and high secretors (10). No significant difference in Stx2e secretion was observed between either F18-positive and -negative strains, or single- and multi-virulent isolates. Furthermore, no significant differences could be found in the number of strains for every secretion category based on their virulence status.

Discussion and Conclusion

Stx2e secretion varied greatly between STEC field strains with up to 100-fold differences. However, no significant differences were observed based on F18-status, and a similar amount of strains per secretion category were found for single- and multi-virulence factor-containing strains.

BBD-PP-07

CORRELATION OF QPCR VALUES FOR LAWSONIA INTRACELLULARIS FROM TWO DIFFERENT EUROPEAN LABORATORIES

J. Haugegaard [1], P. Astrup [2]
[1]*MSD Animal Health, Nordic*
[2]*MSD Animal Health, Copenhagen, Denmark*

Background and Objectives

Lawsonia intracellularis (Li) is a major cause of diarrhea in growing pigs. Shedding of Li in levels above 6 log10/g feces are considered clinical important for pigs. Several laboratories are offering a diagnostic qPCR test on feces to determine the level. As both processing and analysis differs from different laboratories, it is important to consider the details of tests performed when evaluating the results. IVD (Gesellschaft für Innovative Veterinärdiagnostik GmbH) is an accredited laboratory offering a qPCR for Li on feces. CDS (MSD Animal Health R&D service lab) is a research lab performing a similar qPCR test. IVD is reporting levels in units of log10/g feces, whereas CDS report levels in units of log10/µL of feces.

Material and Methods

In total, 37 fecal samples were collected. Each sample was a mix of 10-20 different droppings in 10-20 pens. After collection, the samples of 20-40 g were mixed thoroughly and divided into two. One sample was shipped to IVD, one to CDS. Testing and reporting was done according to the lab's normal procedure. To avoid values below detection level, 16 samples from CDS, with values < 2,5 log10/ µL, were excluded. None of the excluded samples had values > 0,5 log10/g at IVD. The remaining 21 samples were tested for correlation by linear regression.

Results

The correlation coefficient (cc) is 0,998 ($p < 0,0000$). Based on this significant and high correlation, the regression model can translate IVD levels into CDS levels and vice versa. The equation used for translation is IVD qPCR = 1,36112*CDS qPCR.

Discussion and Conclusion

In conclusion the high cc demonstrates that the tests performed are very accurate and repeatable between the two labs. Further it demonstrates that values can be translated from lab to lab if a sufficient ring-testing has been done to document the cc.

BBD-PP-08

DETERMINATION OF MACROLIDE AND LINCOMYCIN SUSCEPTIBILITY OF MYCOPLASMA HYORHINIS ISOLATES BY A MOLECULAR BIOLOGICAL ASSAY

D. Földi [1], U. Klein [2], N. Belecz [1], S. Catania [3], A. Dors [4], U. Siesenop [5], P. Vyt [6], Z. Kreizinger [1], M. Gyuranecz [1]

[1]*Veterinary Medical Research Institute Budapest Hungary*
[2]*Huvepharma NV, Belgium*
[3]*Istituto Zooprofilattico Sperimentale della Venezie, Legnaro, Italy*
[4]*Department of Swine Diseases, National Veterinary Research Institute, Al. Partyzantów 57, 24-100 Puławy, Poland*
[5]*University of Veterinary Medicine Hannover, Institute for Microbiology, Bischofsholer Damm 15, 30173 Hanover, Germany*
[6]*Dialab, diagnostic laboratory, Belgium*

Background and Objectives

Mycoplasma hyorhinis causes clinical infection in weaners (three to ten weeks of age) and finishers, leading to significant economic losses. Proper antibiotic treatment can decrease the severity of clinical signs, hence the economic losses. Our aim was to investigate resistance-related single nucleotide polymorphisms and to develop a mismatch amplification mutation assay (MAMA) for rapid and cost-effective evaluation of the macrolide and lincomycin susceptibility profiles of M. hyorhinis isolates.

Material and Methods

Whole genome sequences of 37 M. hyorhinis isolates were used to find resistance-related mutations and for the development of MAMA. For further evaluation, 84 M. hyorhinis isolates (30 Hungarian, 20 Italian, 19 Polish, 13 German and 2 Belgian) and the type strain (NCTC10130) were analysed and the results of the molecular assay were compared with the results of the traditional broth micro-dilution method.

Results

A MAMA targeting the 23S rRNA gene at nucleotide position 2058 (Escherichia coli numbering) was developed to identify isolates with high or low susceptibility to macrolides and lincomycin. The results of the MAMA assay lined with the broth micro-dilution method results in every case. The growth of isolates with resistant genotypes was inhibited by concentrations of ≥32 µg/ml of tylosin, tilmicosin, tulathromycin and lincomycin. While isolates with the sensitive genotype were inhibited by ≤8 µg/ml of tylosin, tilmicosin, tulathromycin and lincomycin. About fifty percent of the isolates showed decreased susceptibility to macrolides and lincomycin.

Discussion and Conclusion

The developed molecular biological assay proved to be a reliable tool for the determination of macrolide and lincomycin susceptibility of M. hyorhinis isolates. Application of this assay shortens duration of antibiotic susceptibility testing (weeks to hours), supports targeted antibiotic use, which is in line with the EU One Health Action plan to tackle antimicrobial resistance.

BBD-PP-09

NEONATAL DIARRHOEA (ND) - RESULTS FROM A MONITORING PROGRAM

A. Ullerich [1], K. Dohmann [1], K. Strutzberg-Minder [1], I. Zerbin [1], D. Sperling [2], F. Schmelz [3]
[1]*IVD GmbH, Innovative Veterinary Diagnostics, Seelze, Germany*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*
[3]*Ceva Santé Animale, Dessau-Rosslau, Germany*

Background and Objectives

ND in swine causes morbidity and mortality. Most common pathogens are bacteriological like Escherichia coli (E. coli) and Clostridium perfringens (C. perfringens). This study evaluated the occurrence of bacteriological pathogens in piglets suffering from ND from various European countries during 2020.

Material and Methods

A total of 324 mostly fecal samples from 116 farms were tested bacteriologically for diarrheal pathogens. The isolated E.coli and C. perfringens strains were typed molecular biologically in order to determine the occurrence of virulence and toxin genes. Most of the farms were located in Germany (n=59), in The Netherlands and Poland (each n=19), Denmark (n=9), UK (n=8), Austria (n=1) and Ireland (n=1).

Results

A total of 710 isolates were found, among them E. coli (48.6%) was the most frequently found, followed by C. perfringens (33.9%) and Clostridioides difficile (15.9%).In the semiquantitative examination, Clostridioides difficile was mostly detected with minor (53.1%), C. perfringens with moderate to high content (96.7 %).Of these a total of 276 E. coli and 117 C. perfringens isolates were confirmed to differ from one another with regard to their virulence-associated factors resp. toxin gene patterns within a single farm. Only 19.9% (n=55) of these E. coli isolates could be assigned to one of the known pathotypes (EDEC, EPEC, ETEC, NTEC), another 104 (37.7%) carried genes for fimbriae and adhesins as well as for toxins, and therefore may be considered potentially virulent. All of the C. perfringens isolates could be classified as type A. 106 (90.6%) of the isolates carried the β2-toxin gene beside the species-specific α-toxin-gene.

Discussion and Conclusion

This study confirms E. coli and C. perfringens as the main bacterial pathogens that occur in suckling piglet diarrhoea.In this study, 57.6% (n=159) of the E. coli isolates can be considered virulent or potentially virulent based on their gene pattern, and even 90.6% of the C. perfringens isolates.

BBD-PP-10

PK/PD AND CLINICAL RELATIONSHIPS OF VETMULIN (TIAMULIN BASE) ADMINISTERED TO PIGS FOR THE TREATMENT OF MYCOPLASMAL ARTHRITIS

U. Klein [1], M. Gyuranecz [2], M. Gyuranecz [3], S. Catania [4], L. Claerhout [1], W. Depondt [1]
[1]*Huvepharma NV Antwerp, Belgium*
[2]*Veterinary Medical Research Institute, Budapest, Hungary*
[3]*MolliScience Kft., Biatorbagy, Hungary*
[4]*Istituto Zooprofilattico Sperimentale della Venezie, Legnaro, Italy*

Background and Objectives

Mycoplasmal arthritis infections in pigs can lead to significant economic losses due to lameness, swollen joints and poor growth. Tiamulin (Vetmulin® - Huvepharma) Injectable is registered for therapy of Mycoplasmal arthritis infections. The pharmacokinetics (PK) of tiamulin after parenteral administration was compared, the synovial fluid concentration (SFC) related to the minimum inhibitory concentration determined by testing of Mycoplasma hyorhinis (Mhr) isolates and tiamulin`s clinical efficacy were evaluated based on infection study data.

Material and Methods

Tiamulin plasma concentration and SFC beside other specimen were determined in a pharmacokinetic study with forty healthy pigs (mixed breed, equally male/female, age 3-7 days) medicated once with tiamulin base at 15mg/kg bw. Plasma and synovial fluid concentrations were determined at pre-defined time points over 24 hours. Tiamulin MICs (MIC_{50}, MIC_{90}, MIC ranges) were determined based on testing of Mhr strains isolated 2019-2021 in Hungary and Italy (20 strains per country).

Results

The tiamulin SFC was recorded at a consistent plateau concentration between 2-12 hours p.i. (average 0.6µg/ml). A peak (C_{max}) of 0.77 µg/ml was determined 4 hours p.i. Plasma tiamulin concentrations were higher with a mean ratio plasma:SFC of 1.6:1. Tiamulin MIC_{90} (0.156) value and MIC range (≤0.039-0.156) for Hungarian Mhr strains were slightly lower vs. the MIC_{90} (0.312) value and MIC range (0.078-0.312) for Italian strains. The tiamulin synovial fluid concentration exceeds the MIC_{90} for approximately 24h recommended dose interval.

Discussion and Conclusion

Tiamulin Injection PK correlates well with its indication for Mycoplasmal arthritis treatment. The use of PK/PD relationship data is an effective tool in predicting the efficacy of Tiamulin Injection in the case of Mycoplasmal arthritis/joint infections in pigs. Clinical trial data verify the PK/PD data.

BBD-PP-11

PREVALENCE AND RISK FACTORS OF BRACHYSPIRA SPP. IN EUROPEAN PIG HERDS WITH A HISTORY OF DIARRHEA

M. Arnold [4], A. Crienen [1], H. Swam [1], G. Schüpbach [2], S. Von Berg [3], H. Nathues [4]
[1]*Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands*
[2]*Veterinary Public Health Institute, University of Bern, Liebefeld*
[3]*MSD Animal Health, Munich, Germany*
[4]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

Brachyspira (B.) hyodysenteriae and B. pilosicoli which, in case of disease outbreak, can lead to economic losses and reduced animal welfare, are of worldwide importance. To provide an overview of the current European situation, this study determined the prevalence of these pathogens in six European countries and identified associated risk factors.

Material and Methods

6355 faecal samples of nursery to finishing pigs out of 144 herds from Denmark, France, Germany, the Netherlands, Spain and United Kingdom were analysed using polymerase chain reaction. Questionnaires were evaluated and risk factors identified using a multivariable model.

Results

B. hyodysenteriae and B. pilosicoli could be detected in at least one sample in 21.5% and 28.5% of the herds, and 13.0% and 37.2% of samples within positive herds, respectively. With a herd- and within-herd prevalence of 45.8% and 15.4% respectively, significantly more herds ($p<0.02$) and more samples ($p<0.01$) were B. hyodysenteriae positive in United Kingdom than in France (herd prevalence of 4.2%, within-herd prevalence of 2.2%). B. pilosicoli was significantly more often detected in Danish herds and samples compared to all other countries ($p<0.001$). Overall, nursery pigs were significantly less often positive for one of the pathogens than growing or finishing pigs ($p<0.001$).
Thirty nursery pigs or more per pen was a risk factors for both pathogens associated with a higher number of animals positive/ herd ($p<0.02$). Deworming of growing or finishing pigs on the other hand was associated with fewer positive animals in one age category each, for both pathogens ($p<0.05$).

Discussion and Conclusion

The two pathogens were found with varying frequency in European countries, which should be considered in animal trade between European countries and the probability of disease. In addition, known risk factors could be confirmed and supplemented by new ones.

BBD-PP-12

FIELD REPORT OF A SUCCESSFUL MYCOPLASMA HYOPNEUMONIAE ELIMINATION PROGRAM SHORTLY AFTER INFECTION

B. Maxwell [1], J. Miclette [2], J. Mora [3], D. Richard [1]
[1]*Pharmgate Animal Health, Canada*
[2]*Agri-Marche, QC, Canada*
[3]*ECO ANIMAL HEALTH, LTD*

Background and Objectives

A 2,500 Mycoplasma hyopneumoniae (Mhp)-free sow multiplier unit located in northern Quebec, Canada started coughing on February 22nd, 2020. Mhp infection was confirmed by PCR on five coughing sows. Thirty-one females without clinical signs were screened by ELISA on March 24th with 71% positive results. This report outlines the elimination program designed to return the herd to Mhp-negative status.

Material and Methods

An elimination program began on April 12th using Aivlosin® 17% Premix (Tylvalosin) (ECO Animal Heath, UK) fed continuously to all sows at 2.125 mgs tylvalosin/kg BW/day for 9 weeks. One month after sow medication began, piglets were medicated over a 6-week period with Draxxin® (Zoetis, USA) injections at processing and 12 days of age. All sows were vaccinated with a Mhp vaccine on April 7th, August 3rd and September 1st.On June 22nd, 220 tracheobronchial samples were taken for PCR analysis. Positive animals were retested, yielding negative results. As two gilts were Mhp positive on August 17th, the elimination program was repeated twice starting September 26th and November 7th as a precaution using the same medication and dose rate for 4 weeks only. By October 26th all results were negative.

Results

On-farm screening has continued since October 26th with negative results to date.

Discussion and Conclusion

This experience demonstrates success when an elimination program was started a few weeks after the outbreak rather than the traditional one year. Success may require high serological surveillance and a longer-than-usual medication period. As some animals which tested positive at the end of the medication period later became negative, DNA detection of non- viable bacteria was likely. Sufficient time between the end of the medication period and start of PCR screening should be allowed to confirm the success of the elimination protocol. Further studies are required.

BBD-PP-13

IDENTIFICATION OF ACTINOBACILLUS PLEUROPNEUMONIAE (AP) SEROTYPES FROM RECENT CLINICAL CASES IN GERMAN SWINE HERDS

I. Hennig-Pauka [1], Y. Li [2], C. Waehner [3], J.T. Bossé [4], P.R. Langford [2], C. Soeckler [3], P. Mortensen [5]

[1]*Field Station for Epidemiology, Bakum, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany*

[2]*Department of Infectious Disease, Imperial College London, London, UK*

[3]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*

[4]*Section of Paediatrics, Department of Medicine, Imperial College London, London, UK*

[5]*Ceva Corporate Swine Team*

Background and Objectives

Regional Ap serotype (ST) prevalence can change over time and different typing methods lead to different outcomes. Historical German non-ST2-Ap isolates (2002-2019) has been recently analysed by a highly reliable Ap multiplex (m)PCR. ST2, 5, 6, 9/11, 16, and 18 were identified. The objective of this study was to verify clinically relevant non-ST2-isolates from recent clinical cases in Germany using a new and reliable typing method.

Material and Methods

Thirty-two Ap isolates harvested from Ap-like lung lesions from pigs suffering from respiratory disease in 2018-2021 were typed by toxin gene PCR and agglutination with commercial rabbit antisera (Porcs Reactif coagglutine, BioVac, Beaucouzé Cedex, France). Isolates were transferred to FTA-cards and typed at the Imperial College, London by mPCR based on capsular loci.

Results

Distribution of STs identified by mPCR of 32 Ap isolates: ST2=3.1%, 5=21.9%, 6=18,8%, 7=6.3%, 9/11=31.3%, 12=3.1%, 18=12.5%, 3/18=3.1%. The comparison of typing based on toxin gene PCR/agglutination with mPCR based on capsular genes (in brackets) was concordant in 9 isolates: ST9/11 (n=8), ST7 (n=1), but differing in 13 non-typable isolates (ST18 (n=4), 5 (n=7), 7 (n=1), 3/18 (n=1)), 2 ST1 isolates (ST9/11), 5 ST8 isolates (ST6 (n=4), ST2 (n=1)), 1 ST6 isolate (ST12), 2 ST2/8/15 isolates (ST6), 1 ST1/9/11 isolate (ST9/11).

Discussion and Conclusion

Compared to the historical data, serovars 13 and 16 were not found but serovars 7 and 12 appear in recent material. Due to the small number of isolates and by excluding the most frequent ST2, identified serotype prevalence are not representative for the country. The mPCR can at present be considered as the gold standard, so that the identification of Ap serovars 2, 3, 5, 6, 7, 9/11, 12, and 18 involved in recent clinical outbreaks due to Ap in Germany is highly reliable.

BBD-PP-14

INDUCING STREPTOCOCCUS SUIS DISEASE IN NURSERY PIGS

E. Arndt [1], E. Hanna [1], M. Amezcua [1], R. Friendship [1], V. Farzan [1]
[1]*Department of Population Medicine, University of Guelph, Canada*

Background and Objectives

Streptococcus suis serotype 2 continues to be the most predominant and virulent strain on swine farms. A predictive in vivo infection model mimicking natural S. suis infections in pigs is needed to evaluate the control methods. The objective of this study was to induce clinical signs of S. suis infection in nursery pigs challenged by S. suis serotype 2.

Material and Methods

Twenty-four, 3-week-old pigs were assigned to either “oral”, “nasal”, or “oral/nasal” group and challenged with S. suis serotype 2 during weeks 3 and 4 post weaning or as “control” (not challenged). Pigs were monitored for clinical signs of S. suis infection up to 6 weeks post-weaning, and nasal, tonsillar, and rectal swabs taken. The pigs showing clinical signs of S. suis disease were euthanized and samples from meninges, blood, spleen, and ileum collected. At the end of the trial all remaining pigs were euthanized, and samples from tonsil and ileum collected. All samples were tested for presence of S. suis, and the isolates were serotyped by multiplex PCR.

Results

Five pigs (three in “oral/nasal”, one in “nasal”, and one in “control” group) developed disease. Except the pig in the “control” group, serotype 2 was recovered from blood, meninges, and spleen of those pigs and from tonsil tissue of euthanized pigs in the “oral/nasal” group. In “oral” group serotype 2 was found in the tonsil tissue of 2 pigs with no clinical signs of infection. Compared to pigs in the “oral” and “nasal” group, pigs in the “oral/nasal” group had a higher rectal temperature post-challenge ($P<0.05$).

Discussion and Conclusion

The clinical signs of S. suis disease could more likely be induced in pigs with the oral/nasal inoculation method. Serotype 2 did not colonize the tonsils or nasal cavities of most pigs; however, those non-systemic sites were colonized with other serotypes.

BBD-PP-15

PROTEOMICS CHARACTERIZATION AND COMPARISON OF TWO MYCOPLASMA HYOPNEUMONIAE STRAINS USED IN COMMERCIAL VACCINES

L. Garza [1], J. Segalés [2], V. Casas [3], M. Carrascal [3], H. Smits [4], M. Sibila [5]
[1]*Ceva Salud Animal, Barcelona, Spain*
[2]*Centre de Recerca en Sanitat Animal (CReSA-IRTA) and Dept. Sanitat i Anatomia Animals, UAB, 08193 Bellaterra (Barcelona, Spain)*
[3]*CSIC/UAB Proteomics Laboratory, Instituto de Investigaciones Biomedicas de Barcelona–Consejo Superior de Investigaciones Científicas, Institut d'investigacions Biomèdiques August Pi i Sunyer, Barcelona, Spain*
[4]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*
[5]*IRTA, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain*

Background and Objectives

Characterization of M. hyopneumoniae (Mhyo) is mainly done by genomic typing techniques. Since those methods have been unsuccessful to associate some loci with virulence, proteomics analysis might provide a better understanding of the phenotypic differences among strains. However, limited number of strains have been tested and minimal information is available about strains included in vaccines. Thus, this study aimed to compare the proteomic profiles of two Mhyo strains used in commercial vaccines

Material and Methods

Two Mhyo isolates used as bacterins in different commercial vaccines were cultured: 1) strain 2940 and 2) the reference strain J (J, NTCT 10110™). Bacterial pellets, obtained by centrifugation, were lysed, quantified by microBCA and digested following FASP procedure. Samples were analyzed by LC-MS/MS in a high resolution LTQ-Orbitrap Velos mass spectrometer. Proteins were identified by database search using Proteome Discoverer 1.4 and quantitative analysis was done using MaxQuant/Perseus. A statistical analysis from normalized data was carried out taking the reference strain J as control. Proteins with p-value <0.05 and ratio (reporter ion value in study condition/reporter ion value in control) >10 or <0.1 were considered significant.

Results

A total of 211 Mycoplasma proteins were identified in both strains. In the comparison 2940/J, 21 proteins were found with a ratio >10 and 22 proteins showed a ratio <0.1. The ten most overrepresented proteins in 2940 were predicted as unknown (5), membrane proteins (4) and proteins involved in enzymatic processes (1). Regarding the ten proteins overrepresented in J, the analysis identified membrane proteins (6), proteins involved in enzymatic processes (3) and unknown proteins (1).

Discussion and Conclusion

Differences on proteomic profiles of evaluated strains were detected. Further investigations are needed to elucidate if the expression of different proteins may imply differences in the immune response elicited by these strains used as a bacterin

BBD-PP-17

SALMONELLA TYPHIMURIUM ENVIRONMENTAL REDUCTION IN A FARROW-TO-FINISH PIG HERD, USING A LIVE ATTENUATED SALMONELLA TYPHIMURIUM VACCINE, FOLLOW-UP

P. Van Der Wolf [1], E. Gijsen [2], S. Van Colen [1], E. De Jonghe [3]
[1]*Ceva Santé Animale, Naaldwijk, the Netherlands*
[2]*Veterinary practice "VarkensArtsenZuid", Panningen, The Netherlands*
[3]*Ceva Santé Animale, Brussels, Belgium*

Background and Objectives

This abstract presents a follow up of the case study describing a farrow-to-finish pig herd which had experienced clinical outbreaks of salmonellosis due to Salmonella Typhimurium (ST) since 2002. The aim of that investigation was to see whether using Salmoporc® vaccination of sows and piglets starting in 2016, in combination with standard hygienic precautions, was able to reduce ST to below the bacteriological detection limit. In September and November 2019 and in October 2020 all three samplings were completely negative for ST (van der Wolf, P. et al. Porc Health Manag 7, 43 (2021)). The aim of this follow-up was to investigate if the herd was still negative in October 2021.

Material and Methods

Monitoring of the presence of Salmonella was done in October 2021 using a total of 17 sock and 3 dust samples from different corridors (N=3, sock and dust) and compartments housing sows (N=1), weaned piglets (N=6) and finishing pigs (N=7). Culture was done using an improved ISO-standard 6579 1:2017. Sows and gilts are vaccinated according to SPC, piglets are vaccinated once during the suckling period.

Results

All samples were negative for Salmonella field strains. In 3 sock samples from compartments with weaned piglets the vaccine strain was found. All 3 pairs of sock and dust swabs from corridors and all other sock samples were negative.

Discussion and Conclusion

It is hard to eradicate Salmonella Typhimurium from pig farms. This case describes a farm that used a MLV ST-vaccine to reduce the clinical signs, pig losses and antimicrobial use related to outbreaks of salmonellosis. After two and a halve years of vaccinating sows and piglets, no Salmonella field strains could be found in three consecutive samplings. This new sampling showed that one year later again no ST could be found, corroborating the indication that this farm is still free of Salmonella.

BBD-PP-18

SYSTEMIC LEPTOSPIROSIS DISEASE INCIDENTS ASSOCIATED WITH JAUNDICE IN PIGS IN ENGLAND

L. Pittalis [1], E. Fullick [1], C. Bidewell [1], S. Williamson [2]
[1]*Animal and Plant Health Agency, England, UK*
[2]*Animal and Plant Health Agency (APHA)*

Background and Objectives

Jaundice is an uncommon clinical sign in pigs. Disease incident investigations involving jaundice and subsequently confirmed as systemic leptospirosis are described.

Material and Methods

Postmortem examination of pre and postweaned pigs with jaundice and diagnostic testing including PCR and serology for pathogenic leptospires were undertaken.

Results

From 2012-2021, kidneys of pigs in submissions from 32 farms were tested for Leptospira by PCR with positive results for eight farms, all between August and December. These involved jaundice in three to eight-week-old pigs, some with wasting, lethargy and mortality. Differentials for jaundice including septicaemia, hepatotoxins (e.g. coal tar), porcine circovirus-2-associated disease and Mycoplasma suis were ruled out. Gross pathology involved yellow discolouration of skin, sclera, subcutaneous fat and connective tissue, sometimes with oedema and renal congestion or haemorrhage. Histopathological lesions in kidneys examined were non-specific with tubular degeneration and inflammation consistent with leptospirosis. Serology on surviving cohorts to identify the infecting serovar was possible in some incidents and indicated infection with rodent-associated leptospires, (Icterohaemorrhagiae or Copenhageni).

Discussion and Conclusion

Over a ten-year period, eight incidents of systemic leptospirosis were diagnosed in jaundiced pre and postweaned pigs. The autumn-winter seasonality may reflect greater rodent (or other wild mammal) contact with pig accommodation, bedding and feed as it becomes colder and food sources are scarcer; wetter conditions also favour leptospire survival. Measures to control leptospirosis include treatment of sick pigs, control of rodents, preventing direct and indirect contact between pigs and live or dead rodents and other wildlife, minimising wet conditions and good hygiene. For some Leptospira serovars, vaccination may be appropriate. Attention to quarantine protocols, acclimatisation and integration of replacement stock is also recommended. To reduce the risk of human infection from pigs and rodents, people working with pigs should wear protective outer clothing and boots dedicated to the pig unit and practise good personal hygiene.

BBD-PP-19

COMPARATIVE TRIAL OF THE LUNG LESIONS ASSOCIATED WITH MYCOPLASAMA HYOPNEUMONIAE USING ARTIFICIAL INTELLIGENCE IN GREECE

I. Bernal [1], R. Jordà [1], S. Flora [2], S. Argyros [3], G. Labronikou [3]
[1]*HIPRA, Amer, Spain*
[2]*Pieriki Swine Farm*
[3]*HIPRA Hellas*

Background and Objectives

The assessment of pulmonary lesions compatible with Enzootic Pneumonia (EP) at the slaughterhouse is the technique of reference for assessing the incidence of Mycoplasma hyopneumoniae (Mhyo) on swine herds. Recently, HIPRA has developed and validated a new method to assess Mhyo like lesions via artificial intelligence (AI) diagnostic software that uses a MADEC modified system.The aim of this trial is to compare lung lesions of two different vaccination protocols in a Greek swine farm using AI.

Material and Methods

The comparative trial was done in a 600-sow farm in Greece, where 323 piglets were vaccinated with Treatment A (Mhyosphere® PCV ID, a new intradermal needle free vaccine against Mhyo and PCV2 all-in-one, at 23 days of age), and 280 piglets were vaccinated with Treatment B (Mhyo intramuscular vaccine at days 20 and 40 of age, and a PCV2 intramuscular vaccine at 28 days of age).50 animals of each group were randomly selected at slaughter and lung lesions were scored using Artificial Intelligence Diagnos (AI Diagnos). AI Diagnos is a smart system capable of keeping the score of lesions individually and objectively based on images of lungs. Production parameters were also monitored with the whole treatment group acting as an experimental unit.

Results

Regarding the AI assessment, the disease index of Treatment A (0,76) was statistically significantly lower ($p<0,001$) than treatment B (1,74). Besides that, the incidence of Mhyo lesions were lower on Treatment A (61%) compared to Treatment B (97%) ($p<0,001$). ADWG from weaning to slaughter was higher on Treatment A (0,793) compared to Treatment B (0,777) without significant differences.

Discussion and Conclusion

Mhyosphere® PCV ID was effective in reducing the lung lesions after vaccination with significant differences on disease index and lesion index.

BBD-PP-20

IDENTIFICATION OF ACTINOBACILLUS PLEUROPNEUMONIAE (AP) SEROTYPES IN SWINE PLEUROPNEUMONIA OUTBREAKS IN ITALIAN SWINE HERDS

C. Torreggiani [1], A. Luppi [1], E. Pileri [4], Y. Li [2], J.T. Bossé [3], P.R. Langford [2], P. Casappa [4], E. Baraldini-Molgora [1], R. Manfredi [1], A. Prosperi [1], P. Mortensen [5]

[1]*Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Brescia, Italy*

[2]*Department of Infectious Disease, Imperial College London, London, UK*

[3]*Section of Paediatrics, Department of Medicine, Imperial College London, London, UK*

[4]*CEVA Animal Health, Italy*

[5]*Ceva Corporate Swine Team*

Background and Objectives

Pleuropneumonia remains an important challenge to swine production worldwide. Country Ap serotype prevalence can change over time. Previous Ap prevalence studies in Italy using coagglutination in 1987 found Ap serovars 1, 2, 3, 4, 5, and 7 with 5 being dominant (Dubreuil 2000), and on 50 farms in 2016-17 Ap serovars 2 (28%), 5 (11%), 7 (10%), and 9 (55%) (unpublished data IZSLER). The objective of this study was to identify the clinically relevant serovars of Ap currently present in Italy.

Material and Methods

Forty-nine samples of lung lesions typical of Ap infection were collected during clinical outbreaks of swine pleuropneumonia in finishers between January and October 2021. Ap isolation was performed at IZSLER, transferred to FTA-cards and shipped to Imperial College London. All significant swine producing regions of Italy were represented in the 49 samples collected at 44 farms. Three integrators contributed with 32 samples of 27 farms: 25 of 21, 5 of 4, and 2 of 2, respectively. Serotyping, based on capsular loci, was carried out by multiplex-PCR as described by Bossé et al. (2018).

Results

Seven serovars and one non-typable (nt) were detected from the 49 Ap isolates: Serovar 2 (7/49=14.3%), 5 (26/49=53.1%), 6 (1/49=2.0%), 8 (4/49=8.2%), 9 (6/49=12.2%), 13 (3/49=6.1%), 18 (1/49=2.0%), and nt (1/49=2.0%). One farm had serovars 5 and 13, another 9 and nt (nt in sequencing.)

Discussion and Conclusion

Although representing all swine producing regions of Italy, 49 Ap isolates of 44 farms (two with two serovars), cannot be considered truly representative; the rate of serotype identification cannot be translated into a country prevalence. However, the quality of data obtained from PCR serotyping is high; at present state-of-the art, so the identification of Ap serovars 2, 5, 6, 8, 9, 13, and 18 as causes of clinical Ap in Italy is highly reliable.

BBD-PP-21

ASSESSMENT OF BARRIER FUNCTION IN DIFFERENTIATED INTESTINAL PORCINE EPITHELIAL CELLS (IPEC-J2) IN RESPONSE TO SALMONELLA (LPS) CHALLENGE AND TREATMENT WITH YEAST CELL WALL PRODUCTS.

N. Browne [1], D. Daly [1], K. Horgan [1]

[1]*Alltech Bioscience Centre, Summerhill Road, Dunboyne, Co. Meath, Ireland.*

Background and Objectives

The intestinal epithelium is a layer of cells lining the gut that acts as a selective barrier, allowing the absorption of nutrients and water from the intestines. This barrier also prevents harmful substances such as microorganisms from infecting animals. This work assessed MRF and other yeast mannan products impact on intestinal barrier function in response to Salmonella LPS challenge.

Material and Methods

TEER readings from differentiated IPEC-J2 cells were taken up to 14 days (~4500 Ohms/cm2) with MRF or mannan products A, B, and C applied prior to and after LPS (1µg/mL) challenge until TEER recovery. IPEC-J2 cells at recovery phase were lysed, protein was isolated and quantified (Qubit™). Protein samples (50µg) were run on 10-20% gradient gels and subsequent western blots probed for target antibody, Claudin-3, Occludin, or TJP-1 and housekeeping protein GAPDH. Cell wounding assay was adapted from Grada et al.,2017. Three independent biological replicates performed. Statistical analysis by One-way ANOVA unless stated other.

Results

TEER readings showed MRF significantly recovered barrier function ($P \leq 0.05$) over the positive control (LPS only) while products A, B and C demonstrated no significant improvement to the positive control. Protein abundances of Claudin-3, Occludin and TJP-1 were significantly ($p \leq 0.05$) higher following MRF application to LPS challenged IPEC cells over the positive control. MRF demonstrated significant reductions in wound size after 48hrs (51.02%±5.14$p \leq 0.001$) compared to the larger wound size of the positive control (no treatment) (73.19%±7.56). Product C (83.59±7.04$p \leq 0.05$) and B (82.53±8.18$p \leq 0.05$) displayed significantly slower wound healing relative to control at 48hrs while Product A addition led to faster wound healing (65.72%±3.05) at 48hrs.

Discussion and Conclusion

The action of MRF demonstrates its potential capacity to recover intestinal barrier integrity of IPEC-J2 intestinal cells in-vitro. Wound repair is also faster with MRF compared to other products.

BBD-PP-22

COMPARING TYLVALOSIN AND TILMICOSIN FOR THE IMPROVEMENT OF CLINICAL SIGNS AND PERFORMANCE FOLLOWING MYCOPLASMA HYOPNEUMONIAE (MHP) AEROSOL CHALLENGE IN FINISHING PIGS

G. Greaves [1], C. Lichty [1], C. Werth [1], G. Moser [1], A. Lopez [2], J. Mora [2]
[1]*SW Ontario Veterinary Services, Stratford, Ontario, Canada*
[2]*ECO Animal Health Ltd, London, UK*

Background and Objectives

The goal of this study was to compare the impact of tylvalosin (Aivlosin® Water Soluble Granules 62.5%, ECO Animal Health, London) and tilmicosin (Pulmotil® AC, Elanco) for Mhp in a finishing site in Ontario, Canada.

Material and Methods

A total of 350 finishing pigs negative for Mhp, PCV2, PED and positive for PRRSV and IAV were randomly allocated based on average pig weight to either tylvalosin (10mg/kg BW/day for 5 consecutive days) or tilmicosin (20mg/kg BW/day for 5 consecutive days) (n=175 per group) groups. Pigs were exposed to field strain Mhp aerosol at 12 weeks of age. Infection was confirmed via Mhp PCR and ELISA serology at three time points. Individual weights were obtained throughout the trial.Barn- and pen-level cough scores were collected at specific time points. Average daily weight gain (ADG), Average feed intake (ADFI), feed efficiency (FE) and cough score indices were calculated for each time point. Carcass quality and lung lesions were evaluated at slaughter.

Results

Coughing score indices for pigs at pen- and barn-level in both treatment groups were significantly reduced over treatment- ($p<0.01$) and post-treatment periods ($p<0.001$). For tylvalosin-pigs, there were fewer pig removals for all reasons though the differences were not statistically significant (4.2% vs. 9.3%; P=0.0549), significantly lower lung lesion scores (mean 2.21 vs. 2.90; p=0.0485) and significantly fewer lung lobes affected (7% pigs with >2lobes affected vs. 15%; P=0.0391). Average hot dress weights were significantly (p=0.02) higher in tylvalosin-pigs versus tilmicosin-pigs (107.7 vs 105.8 kgs).

Discussion and Conclusion

In this study, tylvalosin-pigs performed significantly better regarding number of Mhp-affected lung lobes and average hot dress weights, while medicated with 50% less antibiotic (mg/kg BW) than the tilmicosin-pigs.

BBD-PP-23

DEVELOPMENT OF A DIGITAL POLYMERASE CHAIN REACTION ASSAY TO DETECT MYCOPLASMA HYOPNEUMONIAE DNA

L. Beuckelaere [1], D. Gleerup [4], B. Devriendt [2], F. Boyen [3], W. De Spiegelaere [4], D. Maes [1], E. Biebaut [5]
[1]*Department of Internal Medicine, Reproduction and Population Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*
[2]*Department of Translational Physiology, Infectiology and Public Health, Faculty of Veterinary Medicine, Ghent University, Belgium*
[3]*Department of Pathobiology, Pharmacology and Zoological Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*
[4]*Department of Morphology, Imaging, Orthopedics, Rehabilitation and Nutrition, Faculty of Veterinary Medicine, Ghent University, Belgium*
[5]*Unit of Porcine Health Management, Department of Reproduction, Obstetrics and Herd Health, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium*

Background and Objectives

Digital PCR (dPCR) enables direct quantification of target nucleic acids, without the need for a standard curve, increasing interlaboratory repeatability. Furthermore, it provides a higher quantitative accuracy and precision compared to qPCR. We established a dPCR assay using the primers and probe designed by Marois et al. (2010) to quantify M. hyopneumoniae DNA targeting the P102 gene.

Material and Methods

Fifty-nine non-template controls (10 ng/µL salmon sperm DNA) were used to determine limit of blank (LOB) and theoretical limit of detection (LOD). The dPCR data was quantified, using the ddpcRquant method. Subsequently, the LOB and theoretical LOD were calculated. Finally, we analyzed 88 clinical BAL samples from an experimental M. hyopneumoniae challenge study and compared these results with results from previous studies (Michiels et al., 2017, 2018; Matthijs et al., 2019), in which the same sample type was analyzed using the P102 targeted qPCR assay.

Results

LOD for qPCR was 1.3 equivalent organisms/µL (as determined by Marois et al.), while for dPCR, LOB (95 %) was 3 positive partitions per well, providing a theoretical LOD (95%) of 0.47 organisms/µL. Previously, clinical BAL samples were considered as negative if they were below the highest standard curve dilution (36 organisms/µL; Ct-value between 25.28 and 27.81). In our study, 27 BAL samples had a Ct above 27.81, of which 25 did contain M. hyopneumoniae using dPCR (concentration ranged between 2.5 – 190.5 organisms/µL).

Discussion and Conclusion

We here show that the primers and probe used in the P102-targeted qPCR assay work in the dPCR assay. Moreover, dPCR LOD was 3 times lower compared to qPCR LOD. The increased sensitivity of dPCR, its high precision and accuracy without the need for a standard curve, shows that dPCR forms a promising quantitative tool, especially for studies in which small differences in DNA concentration need to be measured accurately.

BBD-PP-24

DEVELOPMENT OF A MYCOPLASMA HYORHINIS CHALLENGE MODEL IN FOUR WEEK OLD PIGS

D. Földi [1], E.Z. Nagy [1], N. Belecz [1], L. Szeredi [2], J. Földi [3], Z. Kreizinger [1], M. Tenk [2], M. Gyuranecz [1]
[1]*Veterinary Medical Research Institute Budapest Hungary*
[2]*University of Veterinary Medicine Budapest, Hungary*
[3]*Euvet Bt.*

Background and Objectives

Mycoplasma hyorhinis causes polyserositis, arthritis, and in some cases conjunctivitis and otitis media in piglets. Our aim was to develop a challenge model for the triggering of both polyserositis and arthritis in four-week-old animals.

Material and Methods

The M. hyorhinis negative status of the animals was confirmed by real-time PCR analysis and culture of nasal swab samples. The pigs were challenged two consecutive days with freshly prepared M. hyorhinis broth cultures either by intravenous route (10 ml) on both days (group A), or by intravenous route (10 ml) on the first day and by intraperitoneal route (20 ml) the next day (group B). The challenge material contained 10^6 color changing unit/ml bacteria. The piglets were checked daily for clinical signs and body temperature. Nasal swabs were taken twice a week for real-time PCR analysis and isolation and the weight gain of the animals was also measured. After 28 days, the animals were euthanized, pathological examination was performed and samples were taken to detect the presence of M. hyorhinis, for histopathological examination and bacteriology.

Results

Differences were detected in the weight gain of the challenged groups and the control group. Average weight gains were 11.7, 7.4 and 5.7 kg for the control group, group A and group B, respectively. The first pig with swollen joints were observed on day 6 in group B and on day 14 in group A. More severe swelling of the joints in all animal was observed in group B, while in group A the swelling was milder and only half of the animals were affected. The severity of the clinical signs was in line with the detected macroscopic lesions.

Discussion and Conclusion

A M. hyorhinis challenge model was established in four-week-old piglets suitable for evaluation of future vaccine candidates.

BBD-PP-25

EVALUATION OF MALDI-TOF MS AS A SPECIES IDENTIFICATION TOOL FOR STREPTOCOCCUS SUIS

A. Werinder [1], A. Aspán [2], R. Söderlund [2], A. Backhans [3], M. Sjölund [3], B. Guss [4], M. Jacobson [1]
[1]Department of Clinical Sciences, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden
[2]Department of Microbiology, National Veterinary Institute (SVA), Uppsala, Sweden
[3]Department of Animal Health and Antimicrobial Strategies, National Veterinary Institute (SVA), Uppsala, Sweden
[4]Department of Biomedical Science and Veterinary Public Health, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden

Background and Objectives

Streptococcus suis can cause meningitis, arthritis, and death in pigs, and has a major impact on pig production. Accurate bacterial species identification is essential for identifying the cause of disease in individuals and herds, and for outbreak detection and disease surveillance. Therefore, sequence analysis methods were used to evaluate MALDI-TOF MS identification of S. suis.

Material and Methods

Isolates (n = 348), from diseased and healthy pigs and wild boar, were classified as S. suis by MALDI-TOF MS and subsequently whole-genome sequenced and investigated using analyses of (i) the 16S rRNA gene, (ii) the recN gene, and (iii) average nucleotide identity (ANI).

Results

Analysis of the 16S rRNA gene indicated that 82.8% (288 out of 348) of the isolates were S. suis, while analysis of the recN gene and ANI indicated that 75.6% (263 out of 348) and 44.3% (154 out of 348), respectively, were S. suis. A total of 44% (153 out of 348) of the isolates were classified as S. suis by all three species identification methods.

Discussion and Conclusion

The mean MALDI-TOF MS score was significantly higher for S. suis case isolates than for tonsil isolates; however, the difference is of limited practical use. The results show that additional species confirmation is needed for S. suis isolates, particularly in research settings, and for this purpose ANI analysis with a lowered cutoff of 94% may be used instead of, or in addition to recN gene analysis. Supplementation of the MALDI-TOF MS reference library with mass spectra from S. orisratti, S. parasuis, S. ruminantium, and additional S. suis serotypes should be considered in order to produce more accurate classifications.

Reference:
Werinder, A, et al. “Whole-Genome Sequencing Evaluation of MALDI-TOF MS as a Species Identification Tool for Streptococcus suis.” J Clin Microbiol. 2021 Oct 19;59(11):e0129721. doi: 10.1128/JCM.01297-21.

BBD-PP-27

OPTIMIZATION OF ANTIMICROBIAL TREATMENTS FOR SWINE RESPIRATORY PATHOGENS USING AN EPIDEMIOLOGICAL APPROACH UNDER FIELD CONDITIONS

A. Vilaró [1], E. Novell [1], J. Baliellas [1], V. Tarancón [1], L. Fraile [2]
[1]*Grup de Sanejament Porci, Lleida, Spain*
[2]*University of Lleida, Lleida, Spain*

Background and Objectives

Antimicrobials (AB) are essential tools to control swine respiratory pathogens. There are many guidelines about AB use but a more practical approach is urgently needed to put these recommendations into practice according to the new European legislation. The aim of this research work is to describe a method based on pharmacodynamic determination and an epidemiological approach to select the most suitable AB for swine respiratory pathogens under practical conditions.

Material and Methods

Samples coming from respiratory clinical cases, collected in the main pig producing areas from Spain since 2019, were cultured on suitable medium culture. After 2-3 days of culture, colonies were selected and cultured again for identification and further analysis using MALDIT-TOF. Antimicrobial susceptibility tests for MIC determination were performed for a battery of twelve AB, using the broth microdilution method, according to CLSI guideline Vet01 and Vet01 1S 5th edition with modifications to automate the procedure (Thermofisher scientific proposal). This MIC value was used to select the most suitable antimicrobial taking into account drug pharmacokinetic information, clinical breakpoints, recommendations published by the European Union about the different antimicrobial categories and the epidemiological link with the sow origin in order to use this information for future clinical cases.

Results

The MIC value was determined for 162 Actinobacillus pleuropneumoniae (APP) and 130 Pasteurella multocida strains. Both bacteria were highly susceptible to many families of antimicrobials with the exception of tetracyclines for both pathogens and amoxicillin for APP. This prediction was checked with clinical information from the field after applying the treatments.

Discussion and Conclusion

These results highlight the relevance of determining pharmacodynamic parameters (MIC) to optimize antimicrobial treatments in pig medicine. The generated information can justify an antimicrobial treatment for the present and future clinical cases if this epidemiological information is linked with the sow origin.

BBD-PP-28

PK/PD AND CLINICAL RELATIONSHIPS OF PHARMASIN PREMIX (TYLOSIN PHOSPHATE) ADMINISTERED TO PIGS FOR THE TREATMENT OF NECROTIC ENTERITIS

U. Klein [1], M. Karanikolova [2], A. Kanora [1], L. Claerhout [1], W. Depondt [1], D. Pashov [3]
[1]*Huvepharma NV Antwerp, Belgium*
[2]*Department of R&D, Biovet JSC, Peshtera, Bulgaria*
[3]*Department of Pharmacology, Faculty of Veterinary Medicine, Stara Zagora, Bulgaria*

Background and Objectives

The objective of the investigation was to compare the pharmacokinetics (PK) of tylosin phosphate (Pharmasin® - Huvepharma NV) colon content concentration based on feed medication and relate this to tylosin MICs against Clostridium perfringens (CP) Type A strains (pharmacodynamics - PD).

Material and Methods

Tylosin colon content concentration (CC) was determined in a PK study with eleven pigs (bodyweight 20-25kg), which were medicated at 10mg/kg bw dosage. Medicated feed was offered ad libitum (5 consecutive days). On day 5 of the PK study pigs were euthanized at 5 different time points. Tylosin PK parameters (AUC_{0-12} µg.h/g; T_{max} (h); C_{max} (g); AUC µg.h/g/hour) were determined. AUC per hour (AUC µg.h/g/hour) was calculated to determine the tylosin colon concentrations at registered (5mg/kg = 100ppm) enteric infection treatment dose and at 10mg/kg (200ppm) dosage. Tylosin MIC data were generated based on susceptibility testing of Clostridium perfringens toxinotype A strains from Italy and Brazil. 51 CP Italian and 50 CP Brazil strains were MIC tested (dilutions: 0.06-512 µg/ml). MIC_{50}, MIC_{90} and MIC ranges were determined.

Results

The tylosin CC $_{AUC0-12h\ µg.h/g}$ was recorded at 915.90 after feed medication. The CC per hour was estimated at 38.2µg/g at treatment (5mg tylosin/kg bw) and 76.3µg/g at double treatment dose. In the Italian study tylosin MIC_{90} values of 64 and MIC range of 0.12-128 were measured. A tylosin MIC_{90} value of 16 and MIC range of 0.25-32 were determined in the Brazil study. PK/PD relationships show that tylosin CC`s are high and exceed the MIC values of all Brazil and of 85% of the tested Italian CP strains.

Discussion and Conclusion

An excellent therapeutic and metaphylactic effect of Pharmasin® Premix in the case of oral CP infection treatment can be expected based on available PK/PD data.

BBD-PP-29

PK/PD AND CLINICAL RELATIONSHIPS OF PHARMASIN (TYLOSIN PHOSPHATE/TYLOSIN TARTRATE) ADMINISTERED TO PIGS FOR THE TREATMENT OF NECROTIC ENTERITIS

U. Klein [1], S. Vesselova [2], A. Kanora [1], L. Claerhout [1], W. Depondt [1], D. Pashov [3]
[1]*Huvepharma NV Antwerp, Belgium*
[2]*Department of R&D, Biovet JSC, Peshtera, Bulgaria*
[3]*Department of Pharmacology, Faculty of Veterinary Medicine, Stara Zagora, Bulgaria*

Background and Objectives

The pharmacokinetics (PK) of tylosin phosphate and tylosin tartrate (Pharmasin® - Huvepharma NV) colon content concentration (CC) based on feed and water medication was related to tylosin MICs against Clostridium perfringens (CP) Type A strains (pharmacodynamics - PD).

Material and Methods

The tylosin CC was determined in two PK studies with eleven pigs (bodyweight 20-25kg), which were medicated at a dose of 10mg/kg bw. Medicated feed/water was offered ad libitum (5 consecutive days). On day 5 of the PK studies pigs were euthanized at 5 different time points. Tylosin PK parameters (AUC_{0-12} µg.h/g; T_{max} (h); C_{max} (g); AUC µg.h/g/hour) were determined. AUC per hour (AUC µg.h/g/hour) was calculated to determine the tylosin CC at registered feed/water enteric infection treatment dose. Tylosin MIC data were generated based on susceptibility testing of Clostridium perfringens toxinotype A strains in an Italian and a Brazil study. 51 CP Italian and 50 CP Brazil strains were MIC tested (MIC dilutions: 0.06-512 µg/ml). The MIC_{50}, MIC_{90} and MIC ranges were determined.

Results

The tylosin CC $_{AUC0-12h\ µg.h/g}$ was recorded at 915.90/816.85 after feed and water medication. The CC per hour was estimated at 38.2µg/g at registered feed and 34.0µg/g and 68.1µg/g at registered water medication doses. In the Italian MIC study tylosin MIC_{90} values of 64 and MIC range of 0.12-128 were measured. A tylosin MIC_{90} value of 16 and MIC range of 0.25-32 were determined for the Brazil SP strains. PK/PD relationships show that tylosin CC`s are high and exceed the MIC values of all Brazil and 85% of the tested Italian CP strains.

Discussion and Conclusion

An excellent therapeutic and metaphylactic effect of tylosin phosphate and tylosin tartrate in the case of oral CP infection treatment can be expected based on available PK/PD data.

BBD-PP-30

REDUCTION OF ZINC OXIDE BY PROBIOTIC CLOSTRIDIUM BUTYRICUM, ORGANIC ACID AND WATER DISINFECTION

P. Bak [1], L. Kunstmann [2], L. Meedom [2], W. Van Der Veken [3]
[1]*Danvet, Denmark*
[2]*Huvepharma NV, Denmark*
[3]*Huvepharma NV, Belgium*

Background and Objectives

Alternatives to Zinc oxide in therapeutic doses to control post weaning diarrhoea are investigated. A concept for an E. coli control program with probiotic Clostridium butyricum, water disinfection and organic acids as complementary feed was tested to reduce use of Zinc oxide.

Material and Methods

A pig farm weaning 500 piglet per week controlling clinical E. coli F18+ diarrhoea by 3 kg zinc oxide per ton of feed was enrolled in the trial. Pigs were diagnosed E. coli F18+ by PCR in rectal swabs before and after inclusion of alternatives to Zinc oxide. Probiotic C. butyricum (Top Gut® 1, $25x10^9$ CFU/g product) was added: prior to weaning as 10 g per 50 L of milk replacer in farrowing crates from birth till weaning. Day 0-7 Postweaning daily inclusion in drinking water for 8 hours: 0, 1 g per pig. Day 7- 21 after weaning as 0, 2 g per pig. The drinking water was added a drinkable solution of 50 ppm 15% bleach in between probiotic inclusion. During the 21 first days after weaning 2.5 kg/ton of a complementary propionate feed was added per ton of feed. Feed composition was not changed. Data from 2 consecutive quarters (5380 pigs prior to concept) were compared (6294 pigs concept).

Results

The Zinc-oxide inclusion in feed went from 3 kg / ton before to 1,25 kg / ton after. The antibiotic consumption measured in average daily doses per month was unchanged 8 average daily doses / 100 pigs / day. Feed conversion 7-30 kg was improved from 1,75 to 1,70, age at 30 kg unchanged 79 days before and after, and average daily gain stable 531 g/day before and 525 g/day after.

Discussion and Conclusion

The herd reduced the amount of Zinc oxide used for post weaning diarrhoea without loss of performance and increase in antibiotic use.

BBD-PP-31

BACTERIA IN MILK FROM SOWS WITH MASTITIS

A. Backhans [1], F. Matti [2], M. Lindberg [3], K. Ryytty Sylvén [4], K. Pedersen [1]
[1]*National Veterinary Institute (SVA), Uppsala, Sweden*
[2]*Farm & Animal Health, Vreta Kloster, Sweden*
[3]*Farm and Animal Health, Uppsala, Sweden*
[4]*Farm & Animal Health, Uppsala, Sweden*

Background and Objectives

Mastitis in lactating sows is common, often as a part of postpartum dysgalactia syndrome, and is sometimes treated with antibiotics. The aim of this study was to isolate and susceptibility-test bacteria from sows with mastitis and characterize the clinical presentation in sampled sows. The study is an ongoing project within the Swedish programme SvarmPat, financed by the Swedish Board of Agriculture.

Material and Methods

Between 2016 and 2020, milk samples from 30 sows with clinical mastitis were taken by herd veterinarians and sent to the mastitis laboratory at the National Veterinary Institute. Isolated bacteria were antibiotic susceptibility tested with commercial broth microdilution plates. Information and clinical symptoms of the sow, the udder and the piglets were submitted together with the samples.

Results

Thirty-six milk samples from 30 sows were cultured. From 21 samples one specific bacterial species was isolated: nine isolates of Escherichia coli, four Staphylococcus aureus (three of which were penicillinase producing), three Streptococcus equisimilis, two Staphylococcus hyicus, two beta-hemolytic Streptococci and one Staphylococcus simulans. No specific bacterial species was demonstrated in the other samples, of which two were negative and 13 resulted in a mixed culture. Most common resistance in E. coli was to ampicillin (3/9), tetracycline, (2/9) and trimethoprim-sulphonamide (3/9). Most common signs of mastitis were oedema and redness of the udder (23/30 and 22/30, respectively). Vaginal discharge was present in 10 out of 30 sows. Symptoms seen in the piglets were hunger (15/30 litters) and low weight (13/30 litters). Rectal temperatures were noted in 20 sows of which 7 had ≥39,5° C. Escherichia coli was more frequently isolated from high-temperature sows (4/7) than in low-temperature sows (3/13).

Discussion and Conclusion

Escherichia coli was the most common species but from 12/21 samples staphylococci or streptococci were isolated. More samples are needed to survey mastitis pathogens in sows.

BBD-PP-33

EFFECT OF THE VACCINATION AGAINST SHIGA TOXIN 2E IN A PIGLET PRODUCING FARM WITH HISTORY OF OEDEMA DISEASE- RETROSPECTIVE ANALYSIS

D. Sperling [1], J. Vinduska [2], E. Smidova [2], J. Vanhara [3]
[1]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*
[2]*ZOD Zichlinek, Czech Republic*
[3]*University of Veterinary Sciences Brno, Czech Republic*

Background and Objectives

Oedema disease (OD) is one of the major diseases in pigs during nursery causing significant losses on affected farms. The goal of this study was to assess retrospective efficacy of vaccine-Ecoporc Shiga® (Ceva Santé Animale, France) on mortality on a farm experiencing OD.

Material and Methods

The study was carried out on a farm of 1100 sows practicing one-week batch management system with confirmed history of OD. Retrospective data on % of overall mortality and non-standard piglets in the nursery were collected for period of 23 weeks before and 29 weeks after implementation of vaccination against OD at 4 DOA of piglets. Mortality was expressed as the mean % of all dead piglets during nursery period per weaned piglets on weekly basis without regard to the reason of death. The assumption was made, that if the vaccination against OD had an effect on mortality due to OD, then the parameter would be reduced significantly in comparison of two periods.

Results

During routine diagnostic and 3 outbreaks of OD at farm in period before the vaccination, 16 E. coli strains were characterized by PCR as stx2e+. The mean overall mortality in nursery of 3.37 ±1.32% prior to vaccination was significantly reduced to 1.44 ±0.21% after vaccination ($p < 0.0001$). Overall losses expressed as sum of mortality + nonstandard piglets were as well reduced significantly ($p < 0.0001$).

Discussion and Conclusion

The negative role of OD on farm was confirmed by benefit of vaccination of piglets in significant reduction of overall mortality and total losses comparing to period before and after its implementation. Limitation of the presented study is the fact that the results were obtained on different groups of pigs (time periods), and consequently rearing conditions may differ.

BBD-PP-34

EVALUATION THE PREVALENCE OF PORCINE ENZOOTIC PNEUMONIA AND PORCINE PLEUROPNEUMONIA IN POLAND IN 2018-2021

P. Przyborowska-Zhalniarovich [1], R. Lewko-Wojtowicz [2], K. Janeczko [3]

[1]*Department of Veterinary Public Health, Faculty of Veterinary Medicine, University of Warmia and Mazury in Olsztyn, Poland*

[2]*Ceva Animal Health Poland*

[3]*Ceva Animal Health Poland; Department of Reproduction and Clinic of Farm Animals, Faculty of Veterinary Medicine, Wroclaw University of Environmental and Life Sciences, Poland*

Background and Objectives

Broncho-pneumonic lesions suggestive of Enzootic Pneumonia (EP-like lesions) and pleural lesions involving dorso- caudal lobes (App- like lesions) suggestive of Pleuropneumonia due to Actinobacillus pleuropneumoniae are common findings in slaughtered pigs. A cross-sectional study was conducted to identify the prevalence and severity of Enzootic Pneumonia and Pleuropneumonia in slaughter pigs in Poland over the years 2018-2021.

Material and Methods

Data were collected following abattoir inspection of 165 batches of pigs from January 2018 to November 2021. Macroscopic pulmonary lesions were identified and scored using softwere Ceva Lung Program. Five indicators of selected pulmonary diseases were analysed.

Results

The average percent of affected lungs with Enzootic Pneumonia- like lesions in examined population was 59.58%. The average Enzootic Pneumonia Index was 2.56. The average percent of affected surface- broncho-pneumonic lungs was 5.87 %. The average percent of affected lungs with dorso-caudal pleurisy was 11.25%. The average Actinobacillus Pleuropneumonia Index was 0.34.

Discussion and Conclusion

The findings of this study indicate that the prevalence and severity of Enzootic Pneumonia and Pleuropneumonia remains high in Poland, however obtained results are comparable to results reported by other authors in Europe. Moreover, high prevalence of documented conditions indicate that the management factors are crucial to disease control.

BBD-PP-35

GENETIC IDENTIFICATION OF LEPTOSPIRA SEROVARS DETECTED ON SWINE ABORTIONS OF IBERIAN PENINSULA

J.L. Arnal Bernal [1], M. Ubieto [1], A.A. Benito [1], G. Chacon [1], S. Lázaro [1], D. Martin [1]
[1]*EXOPOL*

Background and Objectives

Leptospira causes different swine reproductive disorders including infertility and abortion. Although most of farms are expected to be infected just 10% of abortion cases results in Leptospira antigen detection. Microbiological isolation is hard and diagnosis is usually based on serological herd testing (MAT) which poses important constraints.. Direct information about which specific serovar is involved in a particular case has been hardly available so far. Thus, we decided to characterize the leptospira found in swine abortion cases from Iberian Peninsula through molecular techniques.

Material and Methods

Thirty-one abortion cases which had been resulted positive for Leptospira by LipL32 qPCR at Exopol were studied for serovar characterization. At least 12 of those cases belonged to Iberian breed. The 31 cases were submitted from 17 different farms based in Spain (n=24) and Portugal (n=7).
DNA extracted from different fetal tissues and placenta were analyzed following the Sanger sequencing method previously described by Martínez et al. with several modifications. Obtained 1Kb sequences were compared with those from reference strains of different serovars to reach the identification.

Results

Twenty-nine cases (Cq values ranged from 24 to 36) were successfully sequenced. Serovar pomona was the most frequently found (n=19; 66%) followed by gryppotyphosa (n=9, 31%) and hardjo (n=1; 3%).

Discussion and Conclusion

This molecular method identified the particular serovar in 93% of the cases; even those samples containing low amount of Leptospira. Serovars pomona and bratislava are uniquely adapted to swine. Our results highlight the role of serovar pomona in swine abortion, nevertheless, serovar bratislava was not detected. Its presence cannot be discarded in other infertility cases which have not been studied. Moreover, other non adapted serovars were detected. Considering the particular breeding conditions of Iberian pigs we could understand the high prevalence of serovar gryppotyphosa which is usually hosted by rodents.

BBD-PP-36

MULTIFACTORIAL OUTBREAKS OF ACTINOBACILLUS PLEUROPNEUMONIAE RELATED DISEASE IN THREE HERDS

E. Schreiber [1], M.C. Bonilla [2], R. Imker [2], M. Beumer [3], M. Heimann [3], N. De Buhr [2], I. Hennig-Pauka [4]
[1]Field Station for Epidemiology, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany
[2]Department of Biochemistry, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany
[3]Field Station for Epidemiology in Bakum, University of Veterinary Medicine Hannover, Germany
[4]Field Station for Epidemiology, Bakum, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany

Background and Objectives

Most swine farms in Germany are positive for Actinobacillus pleuropneumoniae (App) and can be assessed as endemically infected. Recurrent outbreaks of colonized animals are mostly due to trigger factors which are difficult to identify. We aimed to understand the host-pathogen interaction during App outbreaks in herds based on immune parameters, coinfections and environmental factors on the farms.

Material and Methods

App was found to be the causative agent of severe acute respiratory disease outbreaks in three German swine farms. Necropsy of pigs showing severe signs of respiratory disease and spontaneously died animals revealed characteristic hemorrhagic necrotizing lung alterations. On all three farms the App strains causing the disease were isolated. During farm visits, we searched for the risk factor constellation for the outbreak. Blood samples, nasal swabs and tonsillar scrapings were taken from living pigs in different age groups with and without clinical symptoms serum for ApxIV-ELISA and functional assays, nasal swabs or tonsillar scrapings for PCR). A reconstituted whole blood killing assay was performed to detect opsonizing antibodiesantibodies directed against the respective App field strains isolated from diseased animals. Findings in this functional assay might serve as a potential correlate of protection in different age groups.

Results

In all three farms trigger factors as e.g. cold air draught, Streptococcus suis coinfections, PRRSV- or PCV2-viraemic animals could be identified. The findings confirm that an outbreak of porcine pleuropneumonia is a multifactorial process. Depending on the farm the proportion of animals with protective opsonophagocytotic antibodies varied. Anti-ApxIV-antibody-titres were not correlated with results in the functional assay based on opsonophagocytotic antibodies.

Discussion and Conclusion

Assessment of the respective impact of the involved App strains, the coinfections, the host immunity and environmental factors on a farm might be successful to prioritize specific measures to prevent from further App outbreaks.

BBD-PP-37

NEONATAL PIGLET DIARRHEA IN FRANCE: WHICH PATHOGENS ARE INVOLVED?

A. Jardin [1], S. Brilland [2], P. Leneveu [2], D. Sperling [3]
[1]*Ceva Santé Animale, 33 500 Libourne, France*
[2]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*
[3]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Neonatal diarrhea (ND) is common in pig farms and induces economic losses because of poor zootechnical performances and increased mortality, together with increased frequency of antimicrobial use. The aim of this study was to identify potential pathogens in affected French farms and the frequency of histological lesions that could be attributed to these pathogens.

Material and Methods

From 2015 to 2019, 477 submissions and analyses were performed on fecal samples from French diarrheic piglets in IVD GmbH (Germany). All samples were subjected to standard procedure including bacterial culture and genotyping of pathogenic isolates combined with PCR (Polymerase Chain Reaction) detection of viral pathogens. In addition, 198 samples of tissue (intestine) were investigated by histological examination from corresponding piglets.

Results

Clostridium perfringens type A (CpA) and Enterococcus hirae () were the most frequently detected bacterial pathogens. Their respective frequencies were 83,6% and 62,8% (expressed as isolate rate). Rotavirus type A was detected in 37,8% of the submitted cases and Rotavirus type C (detection included since late 2017) in 26,8%. Enterotoxic Escherichia coli strains were detected in 21,3% of the cases, mainly in farms where piglets were born from not vaccinated sows. No Clostridium perfringens type C and no TGE (Transmissible Gastro Enteritis) coronavirus were found. PED (Porcine Epidemic diarrhea) coronavirus was found in only one case. In the cases where histological, bacterial and viral diagnostics led to a consistent conclusion, responsibility of Eh was highly suspected in 49% of the cases, responsibility of rotavirus in 41,9% of the cases and responsibility of CpA in 27% of the cases.

Discussion and Conclusion

In 76% of the submitted cases, potential pathogens (Eh and CpA) seem to be frequently involved alone or in the form of mixed infection in cases of clinical ND. Further studies of factors enhancing role of these pathogens in ND would be of benefit.

BBD-PP-38

PREVALENCE OF C.DIFFICILE IN DIARRHOEIC PIGLETS IN EUROPE

O. Boix [1], I. Galé [1], G. Labronikou [2], K. Haliniarz [3], S. Sudeick [4], M. Annelies [5], A. Melendez [6], S. Van Poucke [7]
[1]*HIPRA, Amer (Girona), Spain*
[2]*HIPRA Hellas*
[3]*HIPRA Polska*
[4]*HIPRA Deutschland GmbH*
[5]*Hipra Benelux*
[6]*HIPRA Spain*
[7]*Syn+*

Background and Objectives

Clostridioides difficile (C. difficile) is an emerging causative agent of porcine neonatal diarrhoea and is of economic concern for swine producers[1]. However, there is currently no clear data concerning the prevalence of this microorganism in piglets presenting scours[2]. The aim of this study was to evaluate and characterize the presence of C. difficile from scouring neonatal piglets in large integrated production systems and smaller independent farms across Europe.

Material and Methods

A total of 530 diarrhoeic piglets, from 177 farms and 14 countries across Europe were analysed from January to October 2021 and are included in the study. One rectal swab sample per piglet was taken using FTA® ELUTE cards (Whatman Inc., Florham Park, NJ). A multiplex polymerase chain reaction (PCR) test was performed to detect genes encoding A and B toxins of C.difficile.

Results

The average positivity was 75% for the A toxin and 66% for the B toxin. Sweden was the country with the highest positivity (91% and 87% for A and B toxin) while the Netherlands showed the lowest positivity from all countries, 62% for both toxins. A strong and significant correlation ($R=0.79$, $p\text{-value} < 0.005$) was seen between toxin A and B positivity.

Discussion and Conclusion

C.difficile is considered a ubiquitous pathogen and an early colonizer of the intestinal tract of piglets but not all isolates are expressing A and/or B toxins. These results provide insights into the prevalence of the bacterium in Europe and although more research is needed, it might be considered as an etiological agent of neonatal diarrhoea.

BBD-PP-39

SALIVA SAMPLING AS ALTERNATIVE METHOD BESIDES POOLED FECES SAMPLES FOR MEASURING QPCR LAWSONIA INTRACELLULARIS LEVELS

N. Wertenbroek [1], O. Schreurs [2], Q. Cao [1]
[1]*MSD AH NL, The Netherlands*
[2]*DAC Advee, Ysselsteyn, Netherlands*

Background and Objectives

Lawsonia intracellularis bacterium is still causing significant economic damage in pigs with pooled faeces sample tested by qPCR as an ordinary measure of the disease level. Saliva sampling method is recently getting more attentions due to its advantage as being more user-friendly by veterinarians.The aim of this study is to investigate whether a saliva sampling can be adapted as an alternative method in the field using statistical correlation analysis compared to the pooled faeces sampling.

Material and Methods

In a Dutch finishing farm samples were taken from 12 different compartments, at different time points in all these compartments. At sampling point, in different pens a pooled faeces sample was collected from different fresh faeces present in that pen with a small spoon in a small container and stirred for making a homogenous sample. At the same time in that same pen, a saliva sample was collected by a chewing rope offered to the same pigs[1].In total 195 times both samples of faeces and saliva were tested by qPCR Lawsonia in the BactoReal Lawsonia kit of Ingentix at the CDS in Boxmeer, The Netherlands. Statistical calculations were conducted using Spearman's correlation (on amount of Lawsonia present) and inter-rater reliability by Cohen's kappa (on Lawsonia status with 38.5 as the cut-off of Saliva sampling and 0 or not 0 as the cut-off of faeces sampling).

Results

A significantly strong correlation ($r=-0.804$, $p<0.001$) was detected between both sampling methods. The Kappa value was 0.49 with $p<0.001$ to show the concordance of both measurements (110/195 being positive by both sampling methods).

Discussion and Conclusion

This study presents a relatively strong correlation between both sampling methods for qPCR Lawsonia. It indicates that saliva sample is a reliable alternative sampling method for practical use in the field.

BBD-PP-40

THE EFFECT OF VACCINATION AGAINST ACTINOBACILLUS PLEUROPNEUMONIAE IN A FINISHING FARM WITH BATCHES EXPERIENCING SUBCLINICAL PLEUROPNEUMONIA.

L.H. Diness [1], H.B. Pedersen [2], A. Haglund [3], M. Lisgara [4], P. Mortensen [5]
[1]*Ceva Animal Health A/S, Denmark.*
[2]*Ceva Animal Health A/S, Vejle, Denmark*
[3]*Farm and Animal Health Service, Sweden.*
[4]*Ceva Hellas LLC, 15, Ag. Nikolaou street, 174 55 Alimos (Attiki) Greece*
[5]*Ceva Corporate Swine Team*

Background and Objectives

A. pleuropneumoniae (Ap), present itself in peracute-acute over subacute-subclinical to chronic forms, all potential of major losses. The aim of this study was to evaluate the benefits of Ap vaccination during periods of no clinical signs experienced in a farm with a history of high level of Ap-like lung lesions at slaughter.

Material and Methods

An Ap serovar 2, 6, 7 and 12 endemic, fully segregated Swedish finisher farm, receiving 310-pig batches every 2. week, already vaccinating with Coglapix® (Ceva Animal Health) stopped vaccination for a period of 3 months, then reinstituted Coglapix®. Groups of pigs included were vaccinated Feb-Sept 2020 (V1); non-vaccinated batches with no clinical signs Oct-Dec 2020 (C); vaccinated Jan-July 2021 (V2). Full data sets were achieved from 14 batches=4331 pigs in V1, 9=279 in V2, and 6=1859 in C. Monitoring of clinical signs and mortality and clinical signs 2-3 times daily. Lungs from 110 (C) and 78 (V1) pigs were randomly selected at the slaughterhouse and scored by Ceva Lung Program (CLP). Ap-like lesion, dorsocaudal pleurisy rate (DCP%) and the rate of fulminant and severe lung lesions (>DCP2), was calculated.

Results

Mortality for V1+V2 vs C were 1.6% and 3.0% ($p<0.001$). DCP% and >DCP2 for V1 vs C were 11.5 vs 30.0 ($p=0.015$), and 3.8 vs 17.3 ($p=0.011$), respectively.

Discussion and Conclusion

Substantial and significant reductions in prevalence and severity of Ap-like lesions in subclinical Ap induced pleuropneumoniae, and mortality was offered by Coglapix® vaccination under subclinical Ap conditions in this study. Correlation between Ap-like lesions and losses in productivity was clearly indicated. Subacute Ap may play a role in perceived subclinical Ap, a topic highly relevant for further and more in-depth investigation.

BBD-PP-41

USE OF QUANTITATIVE PCR TO DIAGNOSE CLOSTRIDIUM DIFFICILE IN NEONATAL PIGLETS

O. Boix [2], A. Melendez [1], I. Galé [2], G. Ricardo [3], C. Ardies [4], J. Hernandez [6], S. Rosina [5], A.M. Strunz [7]
[1]*HIPRA Spain*
[2]*HIPRA, Amer (Girona), Spain*
[3]*HIPRA Portugal*
[4]*HIPRA, 7 rue Roland Garros, Bat H, 44700 ORVAULT, FRANCE*
[5]*HIPRA Italy*
[6]*HIPRA UK*
[7]*Hipra Nordic Aps*

Background and Objectives

Clostridioides difficile(C.difficile) is an emerging anaerobic bacterium causing piglet diarrhoea during the first week of life and is responsible for an increased preweaning mortality rate, decreased growing rates and thus lower weight at weaning[1,2]. The aim of the study was to evaluate the potential of PCR based testing (targeting toxin A and/or toxin B genes) to detect C.difficile in infected piglets.

Material and Methods

A total of 693 piglets, from 218 farms and 14 European countries were analysed and included on the study. Samples were taken from piglets suffering from neonatal diarrhoea (Group A, n=530) and healthy piglets as a control group (Group B, n=143). Samples were fixed in FTA® ELUTE cards (Whatman) and sent to DIAGNOS® Laboratory (Amer, Spain). A multiplex quantitative polymerase chain reaction (PCR) test was performed to detect genes encoding A and B toxins of C.difficile. Statistical logistic regression was performed.

Results

Toxin A PCR results presented differences (p-value<0,001) between Group A and B (406 [76%]vs 85 [59%]), with similar results for toxin B (p-value<0,001), 358 [67%] vs 72% [50%]). The presence of piglets with diarrhoea was significantly higher when the Ct value of the sample was lower than 35 (p-value < 0,005) for both A and B toxins. Farm size (>500 sows), piglet age (<10 days) and parity (primiparous > multiparous sows) were significantly related to C.difficile detection.

Discussion and Conclusion

The study establishes a correlation between the presence of C.difficile in commercial farms with the presence of neonatal diarrhoea and provides more evidence for some risk factors that could be associated with the disease, such as the quantity of bacteria (Ct-value), farm size, piglet age, and parity.

BBD-PP-42

VACCINATION OF DANISH NURSERY PIGS AGAINST LAWSONIA INTRACELLULARIS BY ID OR IM ROUTE, USING RESPECTIVELY AN ID PCV2 VACCINE OR AN IM PCV2/MHYO RTU VACCINE AS DILUENT

J. Haugegaard [1], G. Blach Nielsen [2]
[1]*MSD Animal Health, Nordic*
[2]*MSD Animal Health*

Background and Objectives

Lawsonia intracellularis (Li) is frequently causing disease in Danish nurseries. Parenteral vaccination against Li is possible by intramuscular (im) or intradermal (id) route.

Material and Methods

A farm, with batchwise weaning of 650 pigs and Li infection in the nursery, investigated effect on average daily gain (ADG) after applying Li-vaccine either by the im or id route.Four groups of 50 pigs in one batch were vaccinated at 3 weeks of age according to label: 1) Porcilis PCV M Hyo im 2) Porcilis Lawsonia Vet. dissolved in Porcilis PCV M Hyo im 3) Porcilis Lawsonia ID Vet. dissolved in Porcilis PCV ID id and 4) Unvaccinated control. Eight suckling pigs from each of 25 sows were ear tagged and two from each sow allocated to one of the above groups. After vaccination and weighing pigs were randomly weaned into one batch placed in 12 pens and comingled within groups and with unvaccinated pigs. Pigs were individually bled and weighed 6½ weeks later, apart from 9 pigs in total from all groups, which had either died or were moved to hospital pen. The overall effect of group was evaluated by ANOVA supplemented by pair-wise Student´s t-tests to evaluate inter-group differences.

Results

All pigs were negative in qPCR test for PCV2 and free from signs of Mycoplasma hyopneumoniae. High levels of Li were demonstrated in fecal floorsamples from pens in the batch housing the trial pigs.The mean ADG during the 6½ weeks was 437^{a}, 452^{ab}, 485^{b} and 434^{a} g/day for respectively group 1), 2, 3) and 4).

Discussion and Conclusion

Intradermal PCV2- and Li-vaccination (group 3) significantly increased the ADG compared to group 1) and 4). Id vaccination was not significantly increased compared to 2). Im vaccination against PCV2, M Hyo and Li (group 2) was not significantly increased compared to group 1) and 4).

BBD-PP-43

CONTROL OF S. SUIS ASSOCIATED MORTALITY THROUGH NON-PROGRESSIVE ATROPHIC RHINITIS VACCINATION

A. Puigredon [1], M. Baratelli [1], G. Irene [1], L.D.R. Laura [2], A. Vela [2]
[1]*HIPRA HQ, Amer (Girona), Spain*
[2]*Thinkinpig, Zaragoza, Spain*

Background and Objectives

Streptococcus suis is currently an extremely important concern in the swine industry. Beside its role in atrophic rhinitis, Bordetella bronchiseptica (Bb) is also considered a primary pathogen for other diseases including S. suis infections. The present study was meant to evaluate if a vaccine against non-progressive atrophic rhinitis caused by Bb might aid reducing indirectly the burden of S. suis issues under field conditions.

Material and Methods

The study was conducted in site 1&2 swine farm (1370 sows) located in Spain. This was showing mortality and clinical signs associated with S. suis, and atrophic rhinitis associated with Bb during the nursery phase. 3 batches of sows were vaccinated with RHINISENG® whereas 3 were left not vaccinated. The piglets born from the studied sows (3209 vaccinated, 2820 control) were monitored. The antibiotic treatments were administered to pigs just for therapeutic purposes. Oral fluids samples were periodically collected to check the presence of Bb.

Results

The vaccinated pigs showed a statistically significant reduction of Bb in oral fluids compared to the control group (Chi-square, p=0.004). The mortality due to meningitis in vaccinated batches was reduced 79.41% (from 0.34% to 0.07%, p=0.046). Vaccinated animals showed less general (19.18-26.24%) and meningitis antibiotics treatments compared to the control though in the second case the difference between groups was not statistically significant.

Discussion and Conclusion

Results suggested RHINISENG® reduced the herd presence of Bb and contributed to reduce the burden of meningitis in a farm with S. suis issues. This finding deserves further studies to better evaluate the involvement of Bb in the disease and to evaluate if vaccination against this might be a reliable tool to control S. suis.

BBD-PP-44

DEMONSTRATING THE INTER-HERD TRANSMISSION OF ACTINOBACILLUS PLEUROPNEUMONIAE (APP) INFECTION BY EPIDEMIOLOGICAL AND MOLECULAR METHODS

I. Szabo [1], B. Ujvari [2], T. Molnar [1], J. Gimesiné Fodor [3], I. Biksi [4], L. Makrai [4], L. Buza [5], T. Magyar [2]
[1]*National PRRS Eradication Committe, Budapest (Hungary)*
[2]*Veterinary Research Institute, Budapest*
[3]*Bonafarm Co. Budapest, Hungary*
[4]*University of Veterinary Medicine Budapest, Hungary*
[5]*MSD Animal Health Central-Europe region, Swine Business Unit (Hungary)*

Background and Objectives

Respiratory disease caused by APP is a source of major economic loss to the swine industry all over the world. Determining the source of infection with the pathogen is an important objective of epidemiological investigations conducted in disease outbreaks. This makes it possible to establish potential responsibility in warranty issues and to tighten the biosecurity measures of pig farms.

Material and Methods

We analysed the course of an APP outbreak in 3 farms (A, B, C). The production processes of the farms were brought into connection with the spread of infection and the lesions found in the pigs at slaughter, with the antibiotic susceptibility testing and molecular (via omlA sequencing) study of APP cultured from dead and slaughtered animals. We determined the origin of infection for a given farm and ruled out the role of another suspected infection source.

Results

On Farm 'A', the infection was caused by an A. pleuropneumoniae biotype 1, serotype 2 strain, and the same strain occurred also in the herd of Farm 'B', causing chronic infection. The herd in Farm 'C' was infected by two different A. pleuropneumoniae strains at the same time: biotype 2, serotype 13 and a biotype 1, serotype 6–8 A. pleuropneumoniae strains could be detected simultaneously.

Discussion and Conclusion

We determined with high likelihood that the infection of a fattening farm free of A. pleuropneumoniae originated from the infected herd of a farm located at a distance of 450 metres. The most likely way of infection spread was airborne transmission or movement of personnel between the two farms. The use of the typing scheme presented for A. pleuropneumoniae may allow the creation of a Hungarian and an international database which may make it possible to determine the origin of the inter-herd transmission of A. pleuropneumoniae infection.

BBD-PP-45

IMPACT OF ETEC AND STEC E. COLI INFECTION ON GROWTH PERFORMANCE

J. Morales [1], M. Rodríguez [1], A. Manso [1], D. Sperling [2]
[1]*PigCHAMP Pro Europa*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Enterotoxigenic and Shigatoxigenic Escherichia coli (E. coli) (ETEC, STEC) are a major cause of illness and death in weaned pigs. In the present study, the impact of different ETEC/STEC strains colonization on growth rate of pigs was evaluated on a positive farm.

Material and Methods

A nursery-fattening farm was selected based on clinical history and laboratory examinations. At weaning (28 days of age; study day 0) 200 healthy piglets were selected, and were individually weighed on days 0, 35 (end nursery) and 130 (end fattening). Faeces from all pigs were sampled on study day 21 for isolation and typing of potential pathogenic E.coli. A multiplex PCR was performed to detect genes for F18 and F4 fimbriae, and different toxins (STa, STb and Stx2e). The average daily gain (ADG) was calculated in each phase by groups of pigs with presence of each type of virulence factor and compared with negative pigs to ETEC strains by the non-parametric Wilcoxon-Mann-Whitney test.

Results

No serious clinical signs of diarrhea and no signs of edema disease were observed during the experimental period. A total of 123 pigs were positive to ETEC strains, and their ADG was lower during the nursery (-6.3%; p=0.13) and the whole (-10.8%; p=0.02) periods compared with negative pigs. During the nursery period, the ADG was mainly affected in those pigs positive to F18 (9 pigs; -14.7%) and to Stx2e (-7.2%), but differences were only numerical (p>0.05). During the whole nursery & fattening period, the ADG was mainly affected (p<0.05) in pigs positive to F4 (12 pigs; -10.8%) and in those with presence of the toxins Sta and Stb (41 pigs; -8.5%) compared with ETEC negative pigs.

Discussion and Conclusion

Based on the present results, the infection with ETEC/STEC E.coli 2-3 weeks after weaning negatively affected growth rate in the nursery and fattening periods, compared to negative ones.

BBD-PP-46

LAWSONIA INTRACELLULARIS SCREENING STUDY IN SPANISH PIG FARMS

M. Marcos [1], R. Menjon [1], M. Jiménez [1], C. Llorente [1], M.L. Perez-Breña [1], A. Romero [1], J. Bollo [1], R. Del Pozo Sacristan [2]

[1]*MSD Animal Health*

[2]*MSD AH UK*

Background and Objectives

Lawsonia intracellularis (Li) is a pathogen whose presence has been demonstrated as relevant worldwide. The aim of this study is to determine the presence of Li in Spanish pig farms reporting enteric disease.

Material and Methods

Laboratory results coming from field cases reporting enteric disorders were collected during 2020, from unvaccinated rearing pigs against Li. In total, 31 farms were screened using the following tests: rt-PCR (VetMAX L.i; Adiavet Law RT; Taqman; ExoOne) and ELISA (SVANOVIR® L.intracellularis/Ileitis-Ab). Considering rt-PCR, 160 samples collected from different clinical cases (feces /intestinal swabs/intestinal tissues) were investigated, at individual (n=86) and pool level (n=74). In total 1,093 sera samples were collected from individual animals at different ages, at least 5 samples per age. Samples were allocated to 6 different age categories: W, at weaning (3-4 weeks of age (woa)); N, final nursery (8-10 woa); F, onset fattening period (10-12 woa); F+1, after first month in fattening unit; F+2, after second month; and F≥3, after three or more months in the fattening unit. These sera samples were investigated by ELISA test. Herd prevalence (farm considered positive when at least one sample tested positive) and the individual overall prevalence were calculated.

Results

On average, 27.9% (average Ct-value: 26.7) individual and 32.4% (average Ct-value: 26.8) pooled samples tested positive by rt-PCR. The herd seroprevalence (ELISA) at the different age categories was: W: 14%, N: 30%, F: 29%, F+1: 76%, F+2: 100%; F≥3: 100%. Thus, on overall, all farms showed seroconversion against Li. When analyzing individual seroprevalence the results were: W: 1%, N: 12%, F: 6%, F+1: 53%, F+2: 58%, F≥3: 70%.

Discussion and Conclusion

Under these study conditions, we can confirm the relevant presence of Li in Spanish herds with enteric disorders, showing a high prevalence in the fattening period.

BBD-PP-47

PREVALENCE OF CLOSTRIDIOIDES DIFFICILE IN DIARRHOEIC PIGLETS IN SPAIN

O. Boix [1], L. Domínguez Estallo [2], A.á. Benito Zuñiga [2], D. Martín [2]
[1]*HIPRA, Amer (Girona), Spain*
[2]*EXOPOL SL*

Background and Objectives

Clostridioides difficile (C.difficile) a spore-forming anaerobic bacteria causing enteric disease in one-week-old piglets[1]. The pathogenesis of C.difficile is associated with the cellular effects of toxins A and B and the damage caused by the overreactive immunologic response associated with these toxins[2]. The detection of encoding genes for both toxins are the pillar of the molecular diagnosis of the disease[3]. The aim of this study was to assess the prevalence of C.difficile and its correlation with the age of sampled piglets.

Material and Methods

A total of 1,606 reports from 718 farms were analysed by Exopol Laboratory (Zaragoza) from 2018 until June 2021 using an EXOone Clostridioides difficile Toxin B kit. The samples were divided between 3 groups, depending on the age of the piglets: 1-3 days, 3-7 days and >7 days. The samples were considered positive when toxin A and/or toxin B were present and evaluated individually using a logistic regression with Tukey Post-hoc test. Provinces with less than 5 samples were excluded from the trial.

Results

The overall positivity against C.difficile was 64.71% varying considerably between regions. Results showed more positivity in those samples coming from piglets younger than 7 days. These results coincide with the data obtained from the epidemiological patterns of C.difficile in other regions of the Europe.

Discussion and Conclusion

Neonatal diarrhoea is a multifactorial disease caused by many bacteria, viruses, and parasites. According to these results, C.difficile is a prevalent bacterium in young piglets causing neonatal diarrhoea and growth delay and consequently, its control could help swine producers to improve the animal welfare and productivity.

BBD-PP-48

SUBACUTE EDEMA DISEASE: ANALYSIS OF "SHIGATOXIN" STATUS IN SUSPECTED FRENCH FARMS.

S. Brilland [1], A. Jardin [1], P. Leneveu [1], N. Capdevielle [1]
[1]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*

Background and Objectives

Edema disease (ED), one of the major diseases in nursery pigs, is caused by Shigatoxin- Stx2e, produced by STEC (Shigatoxin producing Escherichia coli). Characteristic as an acute pathology, STEC colonization might be linked with negative effect on zootechnical performance as well. Leneveu et al., showed the suitability of the implementation of PCR specific for Stx2 on boot swab in order to identify the STEC status of the farms. Our study aimed to assess status of selected farms to evaluate potential colonization by STEC.

Material and Methods

In suspected farms, 6 boot swabs were used to collect faeces from the floor : 3 boot swabs per age groups (3 random pens/1 boot swab per pen) between 4 and 12 weeks of age. A qPCR targeting the Stx2 gene was directly performed from submitted samples (quantification threshold 3.10 ^ 3 CFU / g). Farm was considered as a positive one, if at least one sample was positive.

Results

Since the end of 2018, 375 analyzes have been carried out in 74 farms, each farm was included in analysis only once per year. Between 1 and 6 boot swabs (average = 5) were collected from 1 to 6 age groups or batches (average 1.7). A total of 129 different batches were investigated (average per farm: 1.7). 69% of the investigated farms (51/74) were positive, 60% of batches and half of farms had 1 batch positive. The percentage of batch positivity increases with the age of the piglets (54% for group 4-5-6 woa and 71% for group ≥9 woa ; chi-square test ; p= 0.03).

Discussion and Conclusion

When subacute ED can be suspected, the results of this survey show that the carrying of STECs is common in France. These results support the interest in considering ED in a subacute form in the differential diagnosis in farms where performances or loss rate are unsatisfactory.

BBD-PP-49

SUDDEN DEATHS IN SOWS DUE TO LAWSONIA INTRACELLULARIS-INFECTION – A CASE REPORT

M. Viehmann [1], A. Pausenberger [2]
[1]*Tierärztliche Praxis Viehmann, Schrozberg, Germany*
[2]*MSD Animal Health, Munich, Germany*

Background and Objectives

Lawsonia intracellularis (LI) is widespread in pig producing countries worldwide, though naïve herds do exist. In September 2020, 6 sows of a 170 sow-farrow-to-finishing farm suddenly died a few days after farrowing, showing paleness and reduced feed intake one to two days before passing. Black feces indicative for acute proliferative hemorrhagic enteropathy were visible in one case only. No other age group had any problems at that timepoint.

Material and Methods

Feces samples from different ages were investigated by qPCR (Nathues et al. 2009), serum by Svanovir LI-Elisa and tissue samples by histopathology at IVD GmbH (Seelze Letter). Notifiable diseases were ruled out by blood sample investigations.

Results

LI-infection was confirmed by fecal samples and histopathology. Fecal samples from fatteners were PCR-negative up to 60kg bodyweight, but positive at 90kg and 110kg bodyweight (4,58 and 8,71 log GE/g, respectively). Blood samples from different age groups were seronegative except one slightly positive result from the gilts group.

Discussion and Conclusion

In general, high seroprevalences can be expected for LI. However, when naïve herds get infected, LI-infection can have a considerable impact on performance, leading to enormous economic losses. In our case, three more sows died in the service unit within two weeks. Furthermore, 18 out of 20 sows of the last farrowing group turned out to be Not-in-Pig despite a positive ultrasound-result 3 weeks before.
Initially, all sows were treated with tiamulin. The complete sow herd was vaccinated with Porcilis Lawsonia® (MSD Animal Health) twice in a four-month interval, although the safety of this vaccine has not been established during pregnancy or lactation. Presumably the gilts, getting integrated directly, carried the infection into the sow herd. Preventing following infections, gilts are vaccinated further on at three weeks of age and before integration into the sow herd.
No more LI-problems have been observed in this herd since.

BBD-PP-50

CASE STUDY: WHAT IF IT WAS GLAESSERELLA PARASUIS?

R. Ossaer [1], F. Colin [2]
[1]*HYOVET, Carrefour de Penthièvre, 22640 Plestan, France*
[2]*ZOETIS, Bâtiment VIVA, 10 Rue Raymond David, 92240 Malakoff, France*

Background and Objectives

In France, Glaesserella parasuis is increasingly suspected as a contributory pathogen in the porcine respiratory disease complex (PRDC). In such cases, the pathognomonic polyserositis signs are blurred, and G. parasuis is rarely suspected from the start of the investigations. This case shows how repeated bacterial sampling, serology profiling and the implementation of specific vaccination may retrospectively confirm the importance of this pathogen.

Material and Methods

On a 200-sow farrow-to-finishing farm located in Eastern France, a severe PRDC outbreak took place at the end of the fattening period (June 2020), with high mortality – which recurred in each following batch. Necropsies were inconsistent; macroscopic lesions could not explain the deaths. Because some animals presented fibrinous lung deposits, and although repeated sampling failed to isolate G. parasuis, a serologic profile was performed, that suggested this pathogen contributed to the polyfactorial disease. The vaccination protocol at weaning was modified, to include the G. parasuis valence (Suvaxyn® RespiFend MH/HPS, Zoetis).

Results

From the first vaccinated batch onwards, no PRDC outbreak was noted. Wean-to-slaughter mortality rate recovered its initial level (5%), mean hot carcass weight increased by 12 kg over the period, lung scores dropped from 1.13 to 0.13, carcase condemnation rates fell, and costs of antibiotic and anti-inflammatory treatments fell from 2.24 € per pig produced before the use of Suvaxyn® RespiFend MH/HPS to 0.61 € /pig produced in the batches that received the new vaccination protocol.

Discussion and Conclusion

The effectiveness of the vaccination protocol, by adding the G. parasuis valence, retrospectively suggests this pathogen was pivotal in triggering PRDC. The reduction in curative antibiotic and anti-inflammatory treatment costs far exceeded the cost of the vaccine.

BBD-PP-51

PREVALENCE OF LUNG LESIONS IN SOWS IN A COMMERCIAL FARM IN POLAND

E. Michalik [1], P. Cybulski [1], P. Talaga [1], R. Kondratiuk [1], R. Lewko-Wojtowicz [2], K. Janeczko [3], R. Panek [2]
[1]Goodvalley Agro S.A., Przechlewo, Poland
[2]Ceva Animal Health Poland
[3]Ceva Animal Health Poland; Department of Reproduction and Clinic of Farm Animals, Faculty of Veterinary Medicine, Wroclaw University of Environmental and Life Sciences, Poland

Background and Objectives

Lung alterations caused by various factors are a well-recognised issue in modern swine industry. Even though respiratory diseases cause considerable economic loss and welfare issues in every pig producing area, the overwhelming majority of reports deal with the data collected from finishers. The epidemiological data regarding prevalence of lung lesion in sows are limited. The aim of the investigation was to estimate the prevalence of lung alterations in sows from a modern farm located in Poland, using the Ceva Lung Program (CLP).

Material and Methods

The prevalence of lung alterations in 100 DanBred sows culled in September and October 2021 was investigated. Before culling, the animals were reared in a commercial 8000 sows herd (Mycoplasma hyopneumoniae-positive, porcine reproductive and respiratory syndrome-negative, Actinobacillus pleuropneumoniae-negative, progressive atrophic rhinitis-negative). In order to perform the morphological qualification, the CLP method was adopted, with the focus on enzootic pneumonia (EP) - like lesions, and pleuropneumonia (APP) - like lesions.

Results

From a total number of 100 examined lungs, the incidence of EP-like lesions was 4%, whereas the percentage of affected surface in broncho-pneumonic lungs was 2%. The rate of cranio-ventral pleurisy was 40%. The share of affected lungs with dorso-caudal pleurisy was 15%. The APP- and EP index was 0.5 and 0.08, respectively. Pericarditis was observed in 9% of examined sows.

Discussion and Conclusion

In this study, practical usefulness of the CLP in culled sows was demonstrated. Even though the prevalence of alterations is relatively high, APP- and EP-indices are rather low, what indicates that lesions may be considered mild. Specific factors leading to such a picture, including the influence of sows' longevity and accompanying diseases, require further investigation.

BBD-PP-52

PROTECTION PROVIDED BY TWO DIFFERENT VACCINES AGAINST CHALLENGE INFECTION WITH A. PLEUROPNEUMONIAE SEROVAR 13

I. Kiss [1], B. Felföldi [1], E. Kovács [1], M. Albert [2], H. Smits [1], P. Mortensen [3]

[1]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[2]*Domestic Marketing, Ceva-Phylaxia, Budapest, Hungary*

[3]*Ceva Corporate Swine Team*

Background and Objectives

The distribution of Actinobacillus pleuropneumoniae (A.p.) serovars, the causative agent of porcine pleuropneumonia differs substantially among countries. Serovar 13 are prevalent in Southern Europe, possibly also other parts of the world. The aim of this study was to determine the efficacy of Coglapix® (Ceva), a toxoid+bacterin (serovar 1 and 2) vaccine, C-vaccine, and compare its efficacy to another widely used toxoid+bacterin (serovar 1, 2, 3, 4, 5, 7) vaccine, I-vaccine.

Material and Methods

Seven weeks old pigs vaccinated and then boosted ten weeks old, either with C-vaccine, I-vaccine and non-vaccinated positive controls were challenged with ~10^7 CFU/pig of the A.p.13 (Spain 2018) challenge bacterium suspended in PBS by aerosol route, 13 weeks old. 20 pigs each group, all DanBred, originating from the same farm, and all free of: Ap, PRRSV, Mycoplasma hyopneumoniae, atrophic rhinitis, swine dysentery, Leptospira and Brucella. After one week of observation the surviving pigs were euthanized and their lung and pleura lesions scored (LLS) according to severity and extension, and group means were compared. Pigs died during the trial were all necropsied and cause of death diagnosed, and it did not affect the evaluation of the trial results.

Results

The mortality rates were 10%, 25%, and 35% for C-vaccine, I-vaccine, and for the positive control, respectively. The group mean LLSs were 0.73 (+/-0.70) $^{\$}$, 1.03 (+/-0.77) $^{\alpha}$, and 1.53 (+/-0.87) $^{\alpha}$ for C-vaccine, I-vaccine, and the positive control group, respectively. Statistically significantly different groups (at 95% confidence level) indicated by differing symbols.

Discussion and Conclusion

The C-vaccine confirmed its superior efficacy even against the heterologous serovar 13 A.p. strain, which represented a prevalent strain of its geographic origin, offering a broad range of protection provided by this vaccine.

BBD-PP-53

ANTIBIOTIC RESISTANCE IN ENTEROTOXIGENIC (ETEC) AND NON-ENTEROTOXIGENIC ESCHERICHIA COLI FROM SUCKLING PIGLETS AND WEANED PIGLETS WITH DIARRHOEA

A. Backhans [1], F. Matti [2], M. Sjölund [1], M. Lindberg [3], K. Pedersen [1]
[1]*National Veterinary Institute (SVA), Uppsala, Sweden*
[2]*Farm & Animal Health, Vreta Kloster, Sweden*
[3]*Farm & Animal Health, Uppsala, Sweden*

Background and Objectives

Antibiotics are frequently used to treat neonatal- and post-weaning diarrhoea caused by E. coli but resistance to several antibiotics has increased and complicates treatment. Knowledge of the epidemiology of resistance on-farm is needed to optimise treatment strategies and control measures to prevent and reduce antibiotic resistance. The aim of the study was to analyse and compare antibiotic resistance in E. coli from diarrhoeic neonates and weaned pigs, and to correlate it to antibiotic use in the different age groups.

Material and Methods

In 50 herds from throughout Sweden, faecal samples were collected from untreated diarrhoea cases of one neonate ≤ 1 week and one recently weaned piglet per herd. A questionnaire on antibiotic use in neonates, weaners and sows was completed for each herd. Cultivation, PCR of one colony per sample to identify ETEC toxins, and antibiotic susceptibility testing using microdilution was performed. Resistance was defined by clinical breakpoints used by the National Veterinary Institute.

Results

Of 96 E. coli isolates, 32 were ETEC and 63 were non-ETEC. Resistance to ampicillin, trimethoprim-sulphonamide and tetracycline was 30%, 36% and 13% in isolates from neonates and 12%, 10% and 20% in isolates from weaners. Resistance in ETEC isolates was 16%, 22% and 28% and in non-ETEC isolates 24%, 24% and 10%. No isolates were resistant to colistin. Antibiotic treatments were most frequent in neonates (mean=13% treated) and sows (11%) and lowest in weaners (2,5%).

Discussion and Conclusion

Resistance was more common in isolates from neonates. Only tetracycline resistance was more common in weaned pig isolates. Antibiotic treatments were most common in neonates. The results indicate that resistance in E. coli correlates with the level of antibiotic use in each age group.

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BBD-PP-54

DETECTION OF LEPTOSPIRA SPP. BY PCR TECHNIQUE IN SAMPLES SUBMITTED DUE TO REPRODUCTIVE DISORDERS IN TWO SPANISH DIAGNOSTIC LABORATORIES

J. Miguel [1], I. Galé [1], D. Torrents [2], I. Ballarà [1], S. Del Caso [3], J.L. Arnal [3], D. Martín [3]
[1]*HIPRA HQ, Amer (Girona), Spain*
[2]*HIPRA Spain*
[3]*EXOPOL SL*

Background and Objectives

Epidemiology of leptospirosis is complicated since swine can be infected by different pathogenic serovars[1]. Serologic testing is the most used method for diagnosing, and MAT (OIE 2008) is the standard test[1]. MAT is an indirect and subjective technique; its results can vary between labs[2]. On the contrary, identification of leptospiral DNA by PCR should be the most sensitive method to detect Leptospira spp. in tissues and fluids since PCR is not viable organisms dependent[1]. The objective was to analyze the presence of Leptospira spp. in samples submitted from Spanish pig farms suffering reproductive problems.

Material and Methods

573 samples were obtained from 313 farms. 514 samples from 289 farms were analysed by Exopol Laboratory (Zaragoza) (2018-June 2021) using PCR EXOone Pathogenic Leptospira. 59 samples from 24 farms were analysed by Diagnos laboratory (Amer) (May 2020-November 2021), the PCR used was based on the LipL32 Gene[4]. The types of samples submitted were aborted foetuses, mummified piglets, placentas and, vaginal swabs from vulvar discharges.

Results

Of the 289 farms analysed by Exopol, 12.83% were positive on at least 1 sample and 9.13% of the samples were positive. Similar results were obtained by Diagnos laboratory, 8.3% of the farms had at least 1 positive sample, and 7% of the samples were positive.

Discussion and Conclusion

Confirmation of leptospires in samples of clinically affected animals gives a definitive diagnosis of acute clinical disease or, in foetuses, a diagnosis of abortion and probable chronic infection of its mother[1]. The results obtained in this study, based on PCR, show that Leptospira spp. is an etiologic agent of abortions but not as common as could be expected based on MAT serology results[3].
These are the first results published in Europe about the prevalence of Leptospirosis as a cause of abortion in farms suffering reproductive disorders using a direct diagnosis technique like PCR.

BBD-PP-55

EFFICACY OF A PENICILLIN AND DIHYDROSTREPTOMYCIN INJECTABLE COMBINATION IN THE TREATMENT OF SOWS URINARY TRACT INFECTIONS

E. Bousquet [2], A. Lebret [1], G. Boulbria [1], V. Normand [1], P. Berton [1], J. Jeusselin [1], F. Bouchet [1], M. Brissonnier [1], C. Teixeira-Costa [1], M. Lacreusette [2], J. Le Guennec [3]

[1]*PORC.SPECTIVE, Swine Vet practice, ZA de Gohélève, 56920 Noyal-Pontivy, France*

[2]*Virbac BP27 06511 Carros France*

[3]*LABOFARM, 4 Rue T Botrel, 22600, Loudéac, France*

Background and Objectives

Urinary tract infections (UTI) in sows have been associated with poor reproductive performances. Since the restriction of quinolones in animal health, 1st intention antimicrobials are required to treat UTI. This study was performed to assess the efficacy of a penicillin and dihydrostreptomycin one shot injectable combination (Shotapen®, Virbac) on sows UTI in 4 French sow farms.

Material and Methods

Sows urine samples were taken on D1 (during the third pregnancy part). Cloudy and/or nitrites positive urine samples were cultured for bacterial numeration and identification. Bacteriuric sows ($\geq 10^5$ cfu/ml) were randomly assigned to a treated (T) or untreated (C) group according to parity. The T sows received a single intramuscular injection on D4 of a suspension combining benzylpenicillin (13.1 mg/kg) and dihydrostreptomycin (16.4 mg/kg). A urine sample was taken again per sow on D8 for bacteriology. Reproductive performances were checked in the next parity. The 2 groups were compared by the Fisher's exact test for categorical data and by the t test for quantitative data.

Results

Among 51 included sows, the most frequent bacteria were E. coli and gram positive cocci (respectively 63% and 31% of cases). The rate of non bacteriuric sows on D8 was significantly higher in T (70.4%) than in C (8.3%) group. There were no significant differences on litter criteria between groups, though the rate of stillborn was numerically lower in T than in C group (respectively 8.7 ± 5.1% and 12.2 ± 5.7%).

Discussion and Conclusion

Higher rate of non bacteriuric sows after treatment may be due to urine elimination route of penicillin and dihydrostreptomycin, inducing high urinary concentrations as shown for this combination in pigs (unpublished data). As stillborn rate has been linked to UTI, larger size studies should be required to assess the possible effect of treatment on this criteria.

BBD-PP-56

ACTIVE LAWSONIA INTRACELLULARIS SURVEILLANCE ON VACCINATED AND NON-VACCINATED CANADIAN FARMS

L. Van De Weyer [1], J. Demare [2], B. Tully [2], R. Tenbergen [3], J. Angulo [4]
[1]*Zoetis Canada Inc, Kirkland, QC*
[2]*Swine Health Professionals Ltd, Steinbach, MB*
[3]*Demeter Veterinary Services PC Inc, Woodstock, ON*
[4]*Zoetis Inc, Parsippany, NJ, USA*

Background and Objectives

This study evaluated fecal vs oral fluids (OF) samples for **Lawsonia intracellularis** detection under field conditions.

Material and Methods

Forty Canadian finisher farms were enrolled in a prospective-observational study in 2021. Inclusion-criteria included ileitis-vaccination status and willingness to allow on-farm surveillance. Twenty farms used a commercial-inactivated-parenteral ileitis vaccine. Three pens/farm were selected with fixed-spatial-sampling and sampled at **mid-finishing** (15-17-woa) and **late-finishing** (20-22-woa). One OF and one 5:1-pooled fecal sample were collected per-pen for qPCR-analysis. Herd veterinarians completed a health-survey per-farm. A two-proportion-Z-test compared Lawsonia prevalence between groups.

Results

A total of 240 fecal (120 mid, 120 late-finisher) and 211 OF samples (91 mid, 120 late-finisher) were analyzed. In **non-vaccinated herds**, 20%-fecal, 29%-OF **mid-finisher**, and 9.3%-fecal, 15%-OF **late-finisher samples** were Lawsonia-positive. Median Ct-values for positive samples were: **mid-finisher** 29.6-(feces), 29.1-(OF) and **late-finisher** 34.5-(feces), 33.2-(OF). Water/feed-antimicrobial use was reported on 40% of non-vaccinated and 60% of vaccinated farms. Seven non-vaccinated farms reported finisher-diarrhea; 3 tested Lawsonia-positive. One vaccinated farm reported finisher-diarrhea and tested Lawsonia-positive. In **vaccinated herds**, 12%-fecal, 31%-OF **mid- finisher** and 23%-fecal, 32%-OF **late-finisher samples** were Lawsonia-positive. Median Ct-values for positive samples were: **mid-finisher** 30.3-(feces), 30.2-(OF), and **late-finisher** 28.4-(feces), 28.2-(OF). There were no differences in fecal vs OF Lawsonia-detection within herds of same vaccination-status. However, detection levels were different in **late-finishing** for **non-vaccinated vs vaccinated** herds: feces-(9.3% vs 23%, P=0.054), OF-(15% vs 32%, P=0.034).

Discussion and Conclusion

OF are a practical tool for Lawsonia surveillance. Vaccinated farms had higher Lawsonia-prevalence in late-finishing despite greater enteric-antimicrobial use than non-vaccinated farms. Vaccinated farms may have higher Lawsonia infection-pressure leading to vaccination and increased antimicrobial use. Additionally, vaccine duration-of-immunity may be insufficient to control shedding in late-finishing. Further research of Lawsonia dynamics in **late-finishing** is recommended.

BBD-PP-57

BORDETELLA BRONCHISEPTICA SCREENING IN SPANISH FARMS SHOWING RESPIRATORY PROBLEMS

L. Ruíz [1], I. Galé [1], D. Martín [2], S. Del Caso [2], L. Domínguez [2]
[1]*HIPRA HQ, Amer (Girona), Spain*
[2]*EXOPOL, San Mateo Gállego (Zaragoza), Spain*

Background and Objectives

Bordetella bronchiseptica (Bb) is a frequent agent involved in respiratory diseases and responsible of Non-Progressive Atrophic Rhinitis (NPAR) caused by Bb inducing delay in grow performance in nursery pigs. The aim of this study was to identify and evaluate the presence of Bb in different samples related to respiratory problems in farms located in Spain, through out two different local labs, Exopol (Zaragoza) and DIAGNOS (Girona).

Material and Methods

At Exopol, 693 samples from January-June 2021 were analyzed, corresponding to 572 farms. Microbiology in lung swabs and tissue was carried out in 591 samples to studied Bb correlation with other pathogens. 9 PCR from nasal swab pool, were also analyzed, and PCR in 47 oral fluid (OF) were also included in the study. Regarding DIAGNOS, a screening for Bb by OF-PCR (Rhinicheck technique) was performed in 103 Spanish farms from 2019 until June 2021.

Results

Of the microbiology samples, 8.38% of them were Bb positive, 3.4% Bb positive from nasal swab-PCR and 49% Bb positive coming from OF (descriptive analysis). In microbiology samples, a positive relation between the Bb and Glasserella parasuis positivity was seen (Chi-Sqared p-value ≤ 0.05). 68% of Rhinicheck samples were positive and an effect of the age was seen with positive (Logistic regression, p-value = 0.07).

Discussion and Conclusion

The presence of Bb, is pointing out that Bb must be one of the agents to be consider whenever a respiratory disease differential diagnosis is done under field conditions. The presence of several respiratory agents in most of the samples suggest that coinfections are more common that single ones. Moreover, the relation between Bb positivity and pigs age suggests that Bb is a bacterium with a huge capacity of dissemination from one pig to another over time, so the oldest the animal, the higher the Bb presence.

BBD-PP-58

FIELD DATA OF USE OF PORCILIS LAWSONIA IM AND ID VACCINATION ON A DUTCH CLOSED SOW HERD

N. Wertenbroek [1], J. Broere [1], H. Smit [2]
[1]*MSD AH NL, The Netherlands*
[2]*Diergeneeskundig Centrum Boven Veluwe*

Background and Objectives

Lawsonia intracellularis (LI) is causing disease and economic damage in pigs. Recently a new vaccine against LI was introduced. The case study describes the technical performance before and after the usage of this vaccine under field conditions.

Material and Methods

The 220-sow herd with 1600 finishing places had a history of using an oral Lawsonia vaccine to control Ileitis. In November 2019, the farmer started at 12 weeks of age with Porcilis© Lawsonia (PL) by IM injection, and going back till the 3 weeks of age vaccination. The farmer switched to PL ID with the IDAL device at 3 weeks, by dissolving the lyophilizate of PL in Porcilis© PCV ID. Monthly results: ADG, FCR, and mortality before – after were used for evaluation. The observed period was one year before first PL vaccinated pigs were slaughtered versus one year after. Statistical analysis was done by 2-sample t-Tests.

Results

Since PL vaccinated pigs were slaughtered, ADG improved by +51 gr/day (p=0.002), FCR by – 0.08 (p=0.035) and mortality by 0.4% (p=0.16). The antibiotic usage was lowered by 90 %: 12,9 DDD (2019) to 1,2 DDD (2020). The first PL IM vaccinated pigs were slaughtered mid-March 2020. Comparing the corresponding months of oral drinking water period vs IM period (April '19 – Aug'19 vs April'20 - Aug'20) the ADG were 865 vs 920 gr/day (p<0,05); FCR 2,75 vs 2,68 (p>0,05); and mortality 2,3 vs 1,9 % (p>0,05). Comparing the corresponding months of oral drinking water period vs ID period: ADG 908 vs 956 gr/day (p<0,05); FCR 2,79 vs 2,70 (p>0,05) and mortality 2,1 vs 1.7 % (p>0,05).

Discussion and Conclusion

This case shows the effect of the IM and ID vaccine under field conditions a whole year around. The gross margin for this farm is estimated on + €3,70 vs the oral vaccine protocol.

BBD-PP-59

IMMUNIZATION AGAINST ILEITIS IN SWINE: A FARM TO SLAUGHTERHOUSE PERFORMANCE STUDY

M. Kamoei [1], L. Massaferro [2], H. Luiz [2], M. Figueiredo [3], S. Pereira [4], B. Marques [5]
[1]*MSD Animal Health*
[2]*Grupo Santa Rosa*
[3]*MSD Animal Health, Peru*
[4]*Suiaves Comércio de Produtos Veterinários, Brazil*
[5]*MSD Animal Health, Brazil*

Background and Objectives

Ileitis is a high-impact intestinal disease in pig farming, caused by Lawsonia intracellularis (Li). Thus, it is important to monitor the disease and its impacts, using technical analysis and checking productive rates.

Material and Methods

Farm and slaughterhouse production rates were evaluated during a period before and after implementation of a vaccination protocol against Li. The study was carried out in Southern Est of Brazil, with animals from the same origin, genetics, nutrition, management and in the same period, to compare vaccinated (VAC; Porcilis®Ileitis, one 2ml dose at 28 days of age) and not vaccinated pigs (NVAC). Mann-Whitney test was conducted in GraphPad Prism version 9.0.0 to statistical analysis and p values <0,05 were considered to indicate statistical significance.

Results

There were significantly higher ($p<0,05$) productive rates in VAC animals (n=8 batches) compared to NVAC (6 batches): Feed Conversion, 2.32 (±0.12) vs 2.52 (±0.11); Average Daily Weight Gain 0.980kg/day (±0.018) vs 0.935kg/day (±0.035); and Mortality Rate, 1.66% (±0.63) vs 3.317% (0.39). At the slaughterhouse we observed a significant ($p<0,05$) higher Carcass Weight 100.3Kg (n= 407 carcasses; SD±10.25) vs 92.5kg (n=489 carcasses; SD±10.94) in VAC animals and not significant, but numerical increased: Yield of Casing Obtention, 19.60m of casing/intestine (n=3 slaughter batches; SD±0.63; CV3.22%) vs 17.44m/intestine (n=3 slaughter batches; SD±1.93; CV11.07%); and Yield of Sausage Fill, 0.773kg/meter of casing (n=3 bundles with 90 meters of casing; SD±0,03; CV4.8%) vs 0.691g/m (n=3 bundles with 90 meters of casing; SD±0.06; CV 8.43%).

Discussion and Conclusion

Pigs vaccinated intramuscularly against LI presented higher performance rates both at the farm and slaughterhouse, probably because protection against Li ensured a better intestinal health and integrity, consequently improving digestion process, nutrient absorption and muscle deposition.

BBD-PP-60

PERFORMANCE AFTER VACCINATION WITH AN INTRAMUSCULAR LAWSONIA INTRACELLULARIS VACCINE AT THE BEGINNING OF FATTENING IN A FATTENING FARM SUBCLINICALLY INFECTED WITH LAWSONIA

K. Von Brehm [1], C. Renken [2], F. Von Und Zur Mühlen [2], R. Tabeling [2]
[1]*Tierärzteteam Nord, Niesgrau*
[2]*Intervet Deutschland GmbH; MSD Animal Health, Unterschleißheim, Germany*

Background and Objectives

The efficacy of intramuscular Lawsonia intracellularis (LI) vaccination has been demonstrated. In practice, it is not always possible to vaccinate piglets against Lawsonia at young age. In these cases, vaccination at the beginning of fattening is an alternative.

Material and Methods

The field observation took place in a LI subclinical infected fattening farm in northern Germany with high performance and health level. Fattening pigs (vaccinated against PCV2) showed sporadic diarrhea and 20% were smaller and orally treated with Tylosin. Right after placement more than 50% of the animals showed LI-antibodies and excreted relevant LI amounts (PCR >log GE 6/g feces). Regardless, half of the piglets (appr. 30kg) of 4 consecutive batches were vaccinated with Porcilis® Lawsonia right after placement and compared to the parallel unvaccinated groups.

Results

LI vaccinated groups showed less diarrhea and reduced LI excretion (weak positive to log GE 4/g feces). Fewer suddenly dead bloated pigs occurred. Only single animals were treated by injection. ADWG increased by 10.2g, FCR improved by 0.1 to 2.83, losses decreased (-1.6%), same with veterinary costs (-0.07€/fattening pig; excl. vaccination). Economic advantage of Lawsonia vaccination was 2,84 €/fattening pig, even more in a better market situation (3.30 €/fattening pig).

Discussion and Conclusion

Despite pre-existing infection at the time of vaccination at placement of fattening piglets and only minor clinical problems in the fattening unit, Lawsonia vaccinated animals showed improved performance parameters compared to the non-vaccinated animals. This resulted in an economic advantage of 2.82€/fattening pig (better market situation 3.30€) in the vaccinated group.

BBD-PP-61

RESULTS OF PREVALENCE OF COLONIZATION TO MYCOPLASMA HYOPNEUMONIAE IN PIGLETS WHEN USING TWO DIFFERENT VACCINATION STRATEGIES: 1 WEEK OF AGE VS 3 WEEKS OF AGE.

I. De Miguel Rubio [1], D. Segura Garvin [1], A. Garrido Medina [1], E. Maiques Garcés [2]
[1]*JISAP*
[2]*ZOETIS*

Background and Objectives

The objective of this study was to evaluate the prevalence of Mycoplasma hyopneumoniae in piglets in order to find the best vaccination timing.

Material and Methods

In a multiplication farm, piglets were being vaccinated against Mycoplasma hyopneumoniae at three weeks of age, but a clinical respiratory disease around the second half fattening period was observed. In the first part of the study, twenty-one piglets from each sow parity (P1, P2 ,P3) were tested using laryngeal swabs in pooled samples by parity (1:3). Individual samples from sows were taken by bronchoalveolar lavage .Only one positive in P1-sows parity (1/6), three positives in P2-sows (3/6) and none in P3-sows (0/6). In 7 weeks old pigs, colonization was detected in 2 out of 16 pools. For the second part of the study, 270 offspring of 25 P2 sows were included. Each litter was divided into two groups, Group A and B, with piglets vaccinated at 7 and 21 days of age . Nasal and laryngeal swabs as well as individual serology sampling were performed on all piglets at 21, 42 and 56 days .

Results

Positive BAL 2/25 sows. Group A: no positive to PCR Mhyo. Seropositive of 66%, 24%, 8.5% at 3, 6 and 9 weeks . Group B: no positive to PCR Mhyo. Seropositive of 87%, 32% and 6% at 3, 6 and 9 weeks . Interestingly some serum from offspring pigs from Parity-2 were negative.

Discussion and Conclusion

In this study, some P2-sows didn´t transmit colostral antibodies to Mhyo to their piglets, probably because they lacked of previous Mhyo-exposure. Hence the importance of offering vaccine protection as early as possible in naïve piglets. This early vaccination in the second part of study reduced the percentage of positive piglets by laryngeal swabs at 3, 6 and 9 weeks of age in this farm.

BBD-PP-62

ASSOCIATON OF BORDETELLA BRONCHISEPTICA AND PASTEURELLA MULTOCIDA WITH AGE OF THE PIG AND PREVALENCE OF BORDETELLA BRONCHISEPTICA IN PNEUMONIC LUNGS IN BELGIAN FARMS.

A. Michiels [1], E. De Jong [1], E. Claeyé [1], E. Rolly [2], C. Bonckaert [2], I. Galé [3], D. Angelats [3]
[1]*HIPRA Benelux*
[2]*DGZ-Vlaanderen, Torhout, Belgium*
[3]*HIPRA HQ, Amer (Girona), Spain*

Background and Objectives

Next to Pasteurella multocida (P. multocida), the well-known cause of progressive atrophic rhinitis (PAR), Bordetella Bronchiseptica (B. bronchiseptica) is causing non PAR (NPAR). Data in Belgium regarding the age window of detection of both pathogens is scarcely available. Bordetella bronchiseptica is an underestimated agent in PRDC and may cause pneumonia. It predisposes the respiratory tract to P. multocida, Streptococcus suis and Glaesserella parasuis, and aggravates the pathogenesis of PRRSv and SIV. The aim of the study was to determine 1. if an association between the age of the pigs and the prevalence of B. bronchiseptica and P. multocida exists. 2. the prevalence of B. bronchiseptica in pneumonic lungs.

Material and Methods

From 2018 until 2021, a screening for B. bronchiseptica and P. multocida DNT was performed in 54 Belgian farms in different age categories, via PCR on OF (RHINICHECK), as part of a respiratory disease monitoring on-farm. Additionally, from 2014 to 2020 B. bronchiseptica was cultured from necropsied pigs with pneumonia (DGZ, Belgium).

Results

In total, 196 OF were collected in 54 farms. 66.7% and 11.1% of the farms tested positive on OF for respectively B. bronchiseptica and P. multocida DNT. A positive association was found between age of the pig and the positivity for the OF for B. bronchiseptica ($p=0.006$) and P. multocida ($p=0.021$). In total 2272 pneumonic lungs were collected (7152 necropsies, 1-5 pigs per necropsy). In 121 of the pneumonic lungs B. bronchiseptica was cultured.

Discussion and Conclusion

B. bronchiseptica was detected considerably more compared to P. multocida in Belgian farms. For both entities, the positivity in the farm rose when the age of the pigs increased. These results show that B. bronchiseptica, with the potential of causing NPAR, must not be underestimated and might be considered in the pathogenesis of PRDC, even in older pigs.

BBD-PP-63

ERYSIPELOTHRIX RHUSIOPATHIAE IN AN AUSTRIAN EXTENSIVE PIG HUSBANDRY – A CASE REPORT

V. Martin [1], C. Knecht [1], A. Gager [1], J. Spergser [2], R. Brunthaler [3], A. Ladinig [1], L. Schwarz [1]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[2]*Institute of Microbiology, University of Veterinary Medicine Vienna, Austria*
[3]*Institute of Pathology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Erysipelothrix rhusiopathiae is a gram-positive, aerobic and zoonotic bacterium. This ubiquitous microorganism is distributed worldwide. Infections can occur orally, via scratches of the skin or across the conjunctiva. Vaccination of sows against erysipelas is usually routinely done in Austria, therefore clinical cases are rarely seen.

Material and Methods

In an extensive pig husbandry in Austria with only one sow, kept for self–production of pork, three piglets died peracutely at 12 weeks of age. A necropsy was performed by the herd-attending veterinarian and enlarged mesenteric lymph nodes and hemorrhagic intestine were found. As a result, the remaining piglets and the sow were treated with marbofloxacin. However, four weeks later, another piglet died peracutely. This piglet was sent to the Vetmeduni for macroscopic and histopathological examination and further diagnostics.

Results

Histopathological examination revealed a septic, chronic purulent peri- and epicarditis and valvular endocarditis of the aortic and mitral valve as well as purulent myocarditis and focal encephalitis in the cerebellar region. In addition, fibrinous purulent polyarthritis and polyserositis were diagnosed. A bacteriological examination was performed and Erysipelothrix rhusiopathiae was detected in samples taken from the heart, brain, pericardium, serosa and synovia. Based on the results, treatment of all remaining animals with penicillin and a nonsteroidal anti-inflammatory drug was recommended. Prophylactically, regular vaccination of the sow against erysipelas was recommended.

Discussion and Conclusion

Erysipelothrix rhusiopathiae was detected in the heart, brain, pericardium, serosa, and synovia, suggesting that multiple clinical forms of erysipelas occurred simultaneously in this pig. Even though most pigs in Austria are vaccinated against Erysipelothrix rhusiopathiae, it has to be kept in mind, that there are still cases of erysipelas in individual animals, especially in pigs of extensive husbandry systems, which are not routinely vaccinated.

BBD-PP-64

PERFORMANCE AND ECONOMY OF PIGLETS DURING POSTWEANING PERIOD AT AN ORGANIC FARM BEFORE AND AFTER USING AN INTRAMUSCULAR LAWSONIA INTRACELLULARIS VACCINE

F. Von Und Zur Mühlen [1], R. Tabeling [1]
[1]*Intervet Deutschland GmbH; MSD Animal Health, Unterschleißheim, Germany*

Background and Objectives

Lawsonia intracellularis (LI) is one of the most important enteral infectants in pigs. Clinical signs often appear in the fattening period but can also start post-weaning. Chronical illness with reduction in performance up to severe bloody diarrhoea and acute losses are seen. Organic farms are limited in the use of antibiotics and therefore prophylaxis becomes the only way to prevent clinical outbreaks of the disease.

Material and Methods

The observation was made in an organic farrowing farm in North East Germany. Piglet vaccination protocol: intradermally against PCV and orally against Lawsonia. However, LI related symptoms like diarrhoea, runts and acute losses were still seen in the nursery period. LI Vaccination was changed to Porcilis® Lawsonia at 24 days of age. Performance data from nursery was collected and compared on farm base.

Results

Diarrhoea and losses in nursery were reduced with introducing the intramuscular LI vaccine. Group homogeneity was optimized. Performance data were enhanced by 34 g daily weight gain, an improved feed conversion ratio (-0,03) and reduction of mortality from 7.4 to 3.4%; leading to a calculated benefit of 5,03 €/piglet (vaccination costs excluded).

Discussion and Conclusion

Even early severe clinical disorders after weaning may occur in the context of Lawsonia intracellularis infection. The limited opportunities in using antibiotics can massively restrict the intervention options and can even become a problem of animal welfare. In this farm vaccination with an intramuscular LI vaccine ensured piglets health and performance and helped to deal with the enteric disease.

BBD-PP-65

PREVALENCE OF CLOSTRIDIUM DIFFICILE IN POLISH SOW FARMS AND ITS ASSOCIATION WITH HERD SIZE

P. Cybulski [1], A. Fórmanowski [2], R. Kondratiuk [1], P. Talaga [1], E. Michalik [1], O. Boix [3]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*HIPRA, Warsaw, Poland*
[3]*HIPRA, Amer, Spain*

Background and Objectives

Clostridium difficile is a gram-positive strict anaerobic enteropathogen causing neonatal necrotic enterotyphocolitis in piglets. Morbidity and mortality are variable, and macroscopic lesions are usually limited to cecum and colon. The aim of presented study was to investigate the prevalence of toxinogenic C. difficile (toxins A/B) in diarrhoeic piglets in selected Polish sow farms and evaluate its association with herd size.

Material and Methods

A total of 31 pig herds located in Poland were sampled in 2020/2021. Rectal swab samples were collected in each location from randomly selected 3 diarrhoeic suckling piglets (using FTA cards), and then analysed for the presence of toxinogenic C. difficile by PCR test. The smallest and the biggest herd was, 45 and 6000 sows, respectively. The average capacity was 1685 sows. For the purpose of statistical investigation, the farms were allocated into herds with <500 (13), and >500 sows (18 herds). Correlation between C. difficile prevalence and herd size was evaluated using proportion test. P-value below 0.05 was considered statistically significant.

Results

In total, toxinogenic C. difficile was identified in 83.4% (26/31) of sampled herds. Significantly higher incidence of positive samples was noticed in herds with a population exceeding 500 sows (P=0.02).

Discussion and Conclusion

Our report has confirmed that toxinogenic C. difficile is highly prevalent in Polish sow farms. Moreover, it can be concluded that big farms located in Poland (i.e. more than 500 sows) have significantly higher occurrence of toxinogenic C. difficile in diarrhoeic piglets. Further investigation and complete assessment of other variables would be needed to identify specific reasons of such an observation.

BBD-PP-66

PREVENTION STRATEGY FOR THE CONTROL OF LAWSONIA INTRACELLULARIS (L.I) TO IMPROVE PRODUCTION PARAMETERS IN HEAVY PIGS

L. Vallbona [1], C. Muñecas [1], M. Jiménez [2], M. Marcos [2], R. Menjon [2]
[1]*Porcino Teruel*
[2]*MSD Animal Health*

Background and Objectives

Proliferative enteropathy (PE), caused by Lawsonia intracellularis (L.i), is one of the important diseases in the pigs. A recent European study revealed that more than 90% of farms reporting enteric disorders showed presence of the bacteria either in faeces or serum (antibodies). The aim of this study was to test if an intramuscular vaccine could control outbreaks of PE in pigs marketed at heavy weights

Material and Methods

The study was conducted in a 2500 sow farm in Spain, where pigs are marketed at heavy weights (>=125 kg). The herd had a clinical outbreak of PE towards the end of the finisher phase (confirmed by PCR and Ab). Eight finisher-units were selected, with similar barns and n=19100 pigs, in each farm a barn was selected as treatment group (V) and another as control group (C), weekly batches were distributed through each barn and grouped (randomized, same-age). Vaccine was administered at 9 weeks of age (Porcilis® Lawsonia). Parameters monitored were conversion ratio (FC 20-100), mortality rate and ROI.

Results

Average FC: Group C 2.65 vs Group V 2.59 ($p=0.84$), mortality rate: Group C 4.7% vs Group V 3.6%) difference was significant. ($p<0.001$). There was no clinical disease in vaccinated groups. There was an extra profit in vaccinated pigs of 1.95€ and a ROI of 1,8

Discussion and Conclusion

In this field study, an inactivated intramuscular vaccine was proven to be effective in the control of clinical outbreaks of PE. The batches with vaccination strategy had an interesting ROI. A larger n > would be needed for greater power and to be able to see bigger differences in FC. Vaccination is an effective strategy for companies to improve their animals health and operation profitability

BBD-PP-67

A MULTIFACTORIAL APPROACH FOR THE CONTROL OF CLINICAL PLEUROPNEUMONIA IN LARGE-SCALE FARMS

A. Guardiola [1], G. Roger [1], M. Jiménez [2], M. Marcos [2], R. Menjon [2]
[1]*JISAP*
[2]*MSD Animal Health*

Background and Objectives

Actinobacillus pleuropneumoniae causes swine pneumonia. Sows transmit it to their litters, although clinical symptoms do not appear until growth phase due to maternal antibodies. It is difficult to control once it develops in a herd, since it can persist in the host's tonsils. This study aims to assess a control strategy for this disease in large-scale farms with vertical integration.

Material and Methods

The study was conducted in a PRRSv negative and App positive farm (2400 sows) between January 2019- June 2021. The acute App appeared between weeks 12-14 (Serotypes were 1,9,11) . Actions taken: Better internal biosecurity, gilt relocation, gilt segregation until farrowing, farrowing sows and piglets 10-14 days of age treated with marbofloxacin (the least resistant in MIC,s study,one treatment, 8 mg/kg BW) ,and vaccination (Porcilis APP®). Gilts vaccine were administered upon arrival and 4 weeks later. Piglet vaccination on weeks 6-7 and 9-10. Samples (piglets of different ages, gilts upon arrival), we used ELISA APP (ApxIV IDEXX, Apptoxins MSD AH) to review MAD and choose the vaccination schedule.We followed three groups: pre-problem-control (PP) from January 2019, problem (P) July 2019 to March 2020, treated (T) March 2020 to June 2021, monitoring production parameters and medication use.

Results

Mortality in finishers: 2.63% in PP, 5.38% in P, 3.49% in T, statistically significant differences ($p<0,05$) between PP and T vs. P. No statistically significant differences in ADG or in days to market. There were significant differences in medication costs per pig, 1.41€ in PP, 3.42€ in P and 1.94 € in T ($p=0,025$), there was no clinic in group T.

Discussion and Conclusion

Pleuropneumonia is difficult to control in large-scale farms, due to the large number of carriers and the different immunity subgroups. Multifactorial control strategies based on a vaccination schedule improved the financial impact and antibiotic use in this study.

BBD-PP-68

EPIDEMIOLOGICAL SURVEY OF THE LUNG LESIONS ASSOCIATED TO MYCOPLASMA HYOPNEUMONIAE AT THE SLAUGTHERHOUSE IN PIGS VACCINATED WITH DIFFERENT MHYO VACCINES IN SPAIN

I. Bernal [1], R. Jordà [1], J. Cantín [1], D. Torrents [1]
[1]*HIPRA, Amer, Spain*

Background and Objectives

The assessment of lung lesions compatible with Enzootic Pneumonia (EN) at the slaughterhouse is the reference technique for assessing the effectiveness of vaccines against Mycoplasma hyopneumoniae (Mhyo), however control of EN and so the result, may depend also on other factors like concomitant disease, environment conditions or management. The aim of the study was to assess the EN-like lesions from pigs coming from farms using different vaccination protocols.

Material and Methods

30 positive Mhyo farms from the North-east of Spain were selected. Total amounts of 6,119 lungs were checked individually at different slaughterhouses. 19 farms (3,677 lungs) using Mhyosphere® PCV ID (vaccine A), a new intradermal needle-free vaccine against Mhyo/PCV2 all in one, 6 farms (1,412 lungs) using vaccine B, intramuscular vaccine against Mhyo/PCV2 all in one, and 5 farms (1,030 lungs) using vaccine C, an intramuscular vaccine against Mhyo. The study was done simultaneously between September to December. All lungs were evaluated individually at the slaughterhouse following the MADEC modified method, with an observer-blinded system.For each farm, the incidence, disease index, lesion index, and % of lung surface affected was evaluated and compared statistically amongst different vaccines.

Results

The incidence of EN was statistically significantly lower in farms vaccinating with vaccine A (28.3%) compared to farms using vaccine B (50.4%, p=0.03) and vaccine C (52.7%, p=0.04). The disease index was significantly lower in farms vaccinating with vaccine A (0.46) compared to farms using vaccine B (0.91, p=0.03) and Vaccine C (1.15, p=0.05).

Discussion and Conclusion

The farms vaccinated with Mhyosphere® PCV ID had significant lower incidence and disease index of EN compared to farms using other commercial vaccines. This study may suggest stronger Mhyo control in farms using this vaccine; however, other factor like environment, concomitant diseases or management should be also considered in future studies.

BBD-PP-69

EARLY CHANGES IN STREPTOCOCCAL MENINGITIS FROM NATURALLY AFFECTED PIGS

L. Faba [1], K. Venrooij [1], R. Litjens [1], V. Aragon [2], M. Segura [3], M. Gottschalk [3], J. Doelman [1]
[1]*Trouw Nutrition R&D, the Netherlands*
[2]*IRTA, Centre de Recerca en Sanitat Animal (CReSA, IRTA-UAB), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain*
[3]*Research Group on Infectious Diseases in Production Animals (GREMIP) and Swine and Poultry Infectious Diseases Research Centre (CRIPA), Faculty of Veterinary Medicine, University of Montreal, Saint-Hyacinthe, Quebec, Canada.*

Background and Objectives

Based on outbreak diagnoses and clinics (arthitis, depression, and neurological signs), nursery pigs suspected of Streptococcus suis (SS) disease were studied and compared with healthy pen-mates (control).

Material and Methods

In our research facility, a total of 56 piglets were sampled, comprising 28 control and 28 sick including 20 with severe neurological signs. Monitoring of clinical signs was 3-4 times/day and sampling was conducted within 5 minutes after detection. Blood and sera were analyzed for gases and minerals. Tonsillar swabs were analyzed by qPCR for total bacteria, total SS, and SS serotypes 2 (and/or 1/2), 7, and 9. Data included litter siblings and ADG until 7 days after sampling. Case-by-case were not diagnosed, but the outbreaks and deaths were confirmed as SS2 by culture and/or PCR from meninges. Statistical analysis included ANOVA or binomial models.

Results

ADG declined by 29.8% ($P<0.02$) in severely sick pigs. A significant proportion of sibling piglets were diagnosed as sick ($P<0.02$). Sickness increased pH, sO2 and incidence of alkalosis but reduced pCO2, glucose, iCa, Ca, P, Mg, K, and Na in blood/serum compared to control ($P<0.05$). The prevalence of SS2 significantly ($P<0.04$) increased in severely sick pigs (81%) vs control (44%). The tonsillar load of SS9 in severely sick piglets was increased ($P<0.01$). Relative abundance of total SS was lower ($P=0.03$) in sick than control, while SS2 abundance tended ($P<0.10$) to increase.

Discussion and Conclusion

Observed respiratory alkalosis was likely related to cerebrospinal fluid acidification (lactate accumulation) from pleocytosis. Meningitis may cause cerebral salt wasting syndrome, disrupting the sympathetic system, diuresis, and renal function, explaining mineral loss in this study. In conclusion, streptococcal meningitis in naturally diseased piglets was associated with respiratory alkalosis, loss of minerals, increased SS2 (and/or 1/2) prevalence and relative abundance, total bacteria, and SS9 in tonsils but reduced relative abundance of total SS.

BBD-PP-70

EFFICACY OF DIETARY SELACID® GG MP AND WATER SUPPLEMENTATION OF SELKO®4HEALTH IN WEANED PIGS AGAINST S. SUIS SEROTYPE 9 CHALLENGE

L. Faba [1], X. Guan [2], F. Molist [2], M. Lingbeek [1], J. Doelman [1]
[1]*Trouw Nutrition R&D, the Netherlands*
[2]*Schothorst Feed Research, Lelystad 8218 NA, The Netherlands.*

Background and Objectives

A multifactorial approach combining biosecurity, autogenous vaccines, and feed interventions may present the best prevention against Streptococcus suis (S. suis). Organic and medium-chain fatty acids supplemented via feed or water were evaluated for S. suis serotype 9 (SS9) colonization in challenged pigs.

Material and Methods

Following 1-week adaptation post-weaning, 40 piglets (9.7±0.73 kg BW), were allocated (n = 2 pens/treatment) to a negative control not challenged (T1), control SS9-challenge (T2), SS9-challenge with Selko®4Health water supplementation at 1 kg/1000-liter (T3) and SS9-challenge with Selacid®GG at 4 kg/ton diet (T4) administered from day 0 to day 18, after which all pigs were humanly euthanized. On day 11, pigs from T2, T3 and T4 were transported to the challange facility, re-mixed, and inoculated orally and intra-nasally 3 mL 3.3 x 10^8 CFU/mL of SS9. Tonsil swabs were taken on days 0, 8, 12, 13, and 18, and ileum digesta on day 18 for SS9 qPCR analysis. Area under the curve (AUC) as SS9 load over time was calculated. Performance was measured.

Results

On day 8, T1 tended to have greater tonsillar SS9 load than T4 (P=0.07). From day 12 to 18, tonsillar SS9 decreased in unchallenged T1 (4.0 to 2.2 log10 CFU/mL), remained high for T2 and T3 (5.0 and 5.4 log10 CFU/mL, and 4.9 to 4.2 log10 CFU/mL, respectively), but was significantly (P<0.01) lower for T4 on day 18 vs. day 13 (3.9 vs. 5.4 log10 CFU/mL). Overall, the water supplement of T3 tended (P=0.096) to reduce tonsillar SS9 and total AUC from SS9 tonsil load. No other differences were observed.

Discussion and Conclusion

The challenge increased SS9 load vs T1. Seven days post-challenge, the dietary supplement of T4 reduced, and water T3 tended to reduce, tonsillar SS9 compared to control T2.

BBD-PP-71

HISTOPATHOLOGICAL LESIONS FOUND IN SPLEENS IN FINISHERS WITH JAUNDICE

P. Cybulski [1], A. Jabłoński [2], E. Michalik [1]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Center of Translational Medicine, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*

Background and Objectives

In an abattoir slaughtering 10 thousands finishers a week, up to 0.6% of carcasses were confiscated due to jaundice, with splenomegaly as the only accompanying macroscopic symptom. Analyses performed on yellowish fat samples (reactions by van den Bergh, and Lerche) confirmed presence of bilirubin and excluded influence of carotenoids. On farms investigation proved presence of Mycoplasma suis in blood samples (qPCR). Moreover, the herd was Mycoplasma hyopneumoniae-positive, porcine reproductive and respiratory syndrome-negative, Actinobacillus pleuropneumoniae-negative, progressive atrophic rhinitis-negative, Brachyspira hyodysenteriae-negative. The influence of porcine circovirus type 2 was excluded by in-situ hybridisation of altered spleens. The possible impact of feed contaminats was eliminated by strict quality control of purchased raw materials followed by a routine application of mycotoxin deactivator in a feed mill. The objective of our study was to report the case of haemolytic jaundice in finishers and present histopathological lesions found in affected spleens.

Material and Methods

Histopathological analyses of 3 samples collected from 3 spleens with fully developed macroscopic lesions (splenomegaly and jaundice, without any other alteratations) were carried out by 3 independent investigation teams (2 universities and 1 commercial laboratory).

Results

Histopathological examination of all the samples revealed venous stasis, infiltration of haemosiderophages, limited pulpous hyperplasia, multifocal locations of bilirubin, and accumulation of hemosiderin.

Discussion and Conclusion

Our report describes post slaughter jaundice possibly caused by M. suis infection. Multifocal granulomatous splenitis was identified in enlarged spleens collected from finishers with jaundice. Our results highlight practical usefulness of histopathological analysis in a modern-day veterinary practice and its role in completing a diagnose. Vaccines or strategies for M. suis eradication are not available yet; therefore, authors' recommendations included systematic changes in production practices, aimed at reducing a transmission: cessation of teeth clipping and surgical castration, introduction of needle-free injection systems, prevention of cannibalism by using an enriched environment and the best possible microclimate management.

BBD-PP-72

LUNG LESIONS EVALUATION, COMPARING 4 VACCINATION PROTOCOLS AGAINST MYCOPLASMA HYOPNEUMONIAE USING THE CEVA LUNG PROGRAM IN COLOMBIA

E. Vargas [1], J. Calveyra [2], R. Krejci [3]
[1]*Ceva Animal Health, Colombia*
[2]*Ceva Animal Health, Brazil*
[3]*Ceva Animal Health, France*

Background and Objectives

The evaluation of cranioventral lung lesions (CVLL) in pigs at the slaughterhouse is a good indicator to estimate the incidence of Enzootic Pneumonia in farms. A scoring method was previously described to assess lung lesions - Ceva Lung Program (CLP). This study aims to describe the prevalence of bronchopneumonia (Enzootic Pneumonia) in Colombia and to compare different protocols for the control of Enzootic Pneumonia.

Material and Methods

Between January 2020 and October 2021, 2,222 slaughter inspections were carried out (25 to 120 pigs per batch). In total, 107,194 lungs were scored from 227 farms distributed in the main swine producing regions of the country. All farms were vaccinated against M. hyopneumoniae at weaning (and 2 weeks later in the case of 2 doses) and used different vaccination protocols: Hyogen® (1 injection – 2 mL), Vac 2 (one injection – 1 mL), Vac 3 (two injections – 1 mL), Vac 4 (two injections - 2 mL). Lungs were analyzed by CLP and bronchopneumonia lesions were quantified. The season, a risk factor for respiratory disorders, declined for winter (rainy season - from April to June and September to November) and summer (drier season - from November to March and July to August). The results were analyzed by the ANOVA test.

Results

Animals vaccinated with Hyogen® had a lower prevalence of bronchopneumonia (45%)^{a} compared to Vac 2 (53%)^{b}, Vac 3 (48%)^{a}, and Vac 4 (53%)^{b} protocols. $P<0.05$. The statistical analysis demonstrated an absence of seasonality with no significant variation of the lung lesions scores between the seasons.

Discussion and Conclusion

The results of this study are similar to those reported in Other countries. The animals vaccinated with Hyogen® showed less respiratory lesions when compared to the one- and two-dose vaccines, demonstrating better respiratory condition and the advantage of the practicality of reduced handling in piglets.

BBD-PP-73

DEVELOPMENT OF PERFORMANCE PARAMETERS AFTER CHANGING FROM ORAL VACCINATION AGAINST LAWSONIA INTRACELLULARIS TO INTRAMUSCULAR VACCINATION IN COMBINATION WITH A PCV M HYO RTU VACCINE

P. Schmidt [1], C. Renken [2], F. Von Und Zur Mühlen [2], R. Tabeling [2]
[1]*Vet-Team Reken, Reken*
[2]*Intervet Deutschland GmbH; MSD Animal Health, Unterschleißheim, Germany*

Background and Objectives

Lawsonia intracellularis (LI) can be detected in a large proportion of pig herds (1). Various clinical courses are described: Besides fulminant acute presentation, chronic and subclinical disease known to reduced growth performance and play an important role (2).

Material and Methods

Pigs on the observed fattening farm (1400 places) previously were vaccinated with a PCV Mhyo RTU vaccine and against PRRSV (24th day of life). An oral Lawsonia vaccine was used at the same age. Farmer and vet classified the herd as subclinical LI-infected whereby losses due to LI were described in the finishing group. Homogeneity of the animals appeared inconspicuous and only individual animals were treated. Then, Lawsonia vaccination scheme was changed to Porcilis® Lawsonia in combination with Porcilis® PCV Mhyo. Performance data between both Lawsonia vaccination schemes was compared.

Results

Intramuscular vaccinated animals remained clinically inconspicuous. Performance parameters showed improvements in IM vaccinated group compared to oral vaccinated group (FCR -0.2 to 2.8, ADWG +44g to 826g/day, losses -1.7% to 0.5% total, veterinary costs -0.05 Euro/fattening pig). An economic advantage of 8.14 €/fattening was achieved (Vaccination costs not included).

Discussion and Conclusion

The use of the intramuscular Lawsonia vaccine in combination with a PCV Mhyo RTU vaccine resulted in an economic advantage. Overall, especially due to the improvement of FCR, additional 8.14 €/fattening pig in the intramuscular group compared to the orally vaccinated group were earned.

BBD-PP-74

PREVENTION OF CHRONIC LEPTOSPIROSIS INFECTIONS, REDUCING ANTIBIOTIC USE AND IMPROVING PRODUCTION PARAMETERS

A. Lopez [1], M. Jiménez [2], M. Marcos [2], R. Menjon [2]
[1]*JISAP*
[2]*MSD Animal Health*

Background and Objectives

Leptospirosis is one of the major swine reproductive diseases globally. In recent years, the frequency of clinical presentation has increased, in part due to sow group housing. The aim of this study is to assess whether vaccination can reduce antibiotic use and improve reproductive parameters in a herd with chronic Leptospira infection

Material and Methods

The study was performed in a commercial farm including 3500 sows, with a chronic reproductive failure (low farrowing rate, increased abortion rate and litter scatter). Diagnose was done using microscope agglutination test (MAT, Neiker Tecnalia), in sera from 20 problem sows (80% with titers >= 1/100 Bratislava serovar). Reproductive parameters [total born piglets/litter (TB), mummified fetuses/litter (M), ultrasound fertility (F), farrowing rate (FR), litter scatter (LS)] and antibiotic use were monitored from January to October 2019. In July a multivalent vaccine against Leptospira was introduced (Porcilis Ery+Parvo+Lepto®). Weekly data were used for analysis (n=42), including 2 periods: P (n=29) before vaccination and with antibiotics in feed (oxytetracycline), and after vaccination (n=13) V

Results

During P, antibiotic was used twice a month due to reproductive problems. During V no antibiotics were used. Statistically significant differences were detected for TB in primiparous (V:15.99; P:15.69; $p<0.05$); average mummified fetuses/sow (V:0.146; P:0.580; $p<0.001$); FR (V:91.14%; P:89,17%; $p<0.05$); and LS <9 piglets (V:6.70%; P:14.57%; $p<0.05$).

Discussion and Conclusion

In this field study we observed that control of chronic Leptospira infections by vaccination significantly reduced antibiotic use and improved reproduction performance in comparison with antibiotic treatment. Under the conditions of this study, vaccination significantly improved total live born piglets in primiparous and farrowing rate and reduced mummified fetuses/litter and litter scatter in a herd with Leptospira infection

BBD-PP-75

DETECTION OF VEROTOXIN-PRODUCING ESCHERICHIA COLI IN SELECTED POLISH WEANER FARMS

A. Fórmanowski [1], E. Barba-Vidal [2], P. Cybulski [3]
[1]*HIPRA, Warsaw, Poland*
[2]*HIPRA, Amer, Spain*
[3]*Goodvalley Agro S.A., Przechlewo, Poland*

Background and Objectives

Verotoxin-producing Escherichia coli (VTEC) is a causative agent of oedema disease. The disease can be considered multifactorial, with numerous nutritional, management, and other determinants inducing an outbreak. Sudden onset of the disease is usually observed in recently weaned pigs. The aim of presented research work was to investigate the occurence of VTEC in oral fluid samples collected from weaners in selected modern Polish farms.

Material and Methods

A total of 27 pig herds located in Poland were sampled. Oral fluid samples were collected from 2 age groups: recently weaned animals (i.e. up to 6 weeks of age) and older weaners (from 10 to 12 w.o.a). In each age group 2 cotton ropes were suspended for 25 minutes at pigs' shoulder heigh in 2 randomly selected pens. Collected oral fluids were applicated on FTA cards and then analysed for the presence of VTEC by qPCR test. The size of the sampled farms varied from 1200 to 40000 weaners. The statistical analysis was performed using a Chi square. P-value below 0.05 was considered statistically significant.

Results

VTEC was identified in 77.8% (21/27) of sampled farms. Although there was a numerical variation in the number of positive groups <6 w.o.a and 10 w.o.a, 51.9% (14/27) and 70.4% (19/27), respectively, the difference was not statistically significant (P=0.175).

Discussion and Conclusion

Our report has confirmed that VTEC is common in Polish weaner farms. Therefore, further research dealing with prevalence rate and potential role of subclinical VTEC infection in weaners would prove beneficial.

BBD-PP-76

COMPARISON OF TWO E. COLI VACCINES AND THEIR EFFECT ON DECREASING MORTALITY IN FARMS WITH S. SUIS CLINICAL DIAGNOSTIC

E. De Jong [1], A. Michiels [1], S. Van Poucke [3], J. Vrielinck [2], E. Barba-Vidal [4]
[1]*HIPRA Benelux*
[2]*veterinarian, Belgium*
[3]*Syn+ (Belgium)*
[4]*HIPRA HQ, Amer (Girona), Spain*

Background and Objectives

It has been widely proposed that co-infection with other pathogens can influence the severity of S. suis-associated diseases. Still, the association with verotoxigenic E.Coli has never been reported yet. The objective of this trial was to assess the impact of E.Coli or VT2E vaccination on growth, mortality and wasting of piglets in a farm with problems of S. suis.

Material and Methods

The trial was performed at a farrow-to-finish farm in Belgium, with clinical problems due to S. suis diagnosed by clinical signs (meningitis), necropsy and laboratory culture. Moreover, the presence of verotoxigenic E.Coli was confirmed, by qPCR testing on oral fluids. Piglets were randomly divided in 3 treatment groups: (1) V (n=1279): vaccination with Vepured®; (2) Col (n=1616): vaccination with Coliprotec®; (3) Con (n=475): no vaccination. Piglets were weighed at weaning and end of nursery and average daily weight gain (ADG) was calculated. Mortality was noted, as well as the suspected cause of death (necropsy or clinical signs). The differences were tested through ANOVA, and a post-hoc Tukey test in case of significance.

Results

Total mortality in nursery was significantly lower in the V-group (2,28%) compared to the Col- (5,15%; p=0,009) and Con-group (6,13%; p=0,044). The percentage of deaths with in-farm suspicion of S.suis was significantly lower in the V-group (9,5%) versus the Col- and the Con-group: 30,9% and 43,5% respectively (p=0,03). No significant differences were detected in ADG. The return on investment in the V-group was 421% compared to 312% in the Col-group.

Discussion and Conclusion

Vaccination against VT2E decreased total mortality and deaths suspected to be caused by S. Suis at a farm with clinical diagnostic of S. suis and known presence of VT2e producing E. coli. Clinical cases of edema disease and S. suis meningitis can be quite similar, and therefore require further laboratory tests to be distinguished.

IMM-PP-02

TWO APPROACHES FOR WARMING THE VACCINE BEFORE USE

M. Schyns [1], T. Cruijsen [1], S. Agten [1]
[1]*MSD AH Benelux, Boxmeer, the Netherlands*

Background and Objectives

It is common to observe post-vaccination side effects. Those can be reduced by bringing the vaccine to room temperature or even to body temperature before use. Some farmers use warm water to speed up the process and allow the vaccine to be administered at body temperature. This study aims to compare two methods for vaccine warming: placing the bottles outside the fridge versus heating them up in a bucket with warm water (± 40°C).

Material and Methods

Eight vials of Diluvac Forte© of 4 different sizes: (20, 50, 100 and 200ml) were used. All vials were made of glass, except the 200 ml was PET. Two vials of each format were placed in the fridge overnight before the trial. Temperature was recorded (Arduino with DS18B20 Digital-Temperature-Sensors). All eight vials had an individual temperature sensor, one was placed in the bucket of warm water and the other one was outside the bucket to measure the room temperature. Before the vials was taken out of the fridge, the measurement started, and this recording lasted up to 6h after removing them from the refrigerator. In total the measurement was done five times.

Results

It took 4-5h to get the vial to room temperature after removing it from the fridge. By placing the vials in warm water, all the bottles reached room temperature within 5 minutes. Glass-bottles were at body temperature within 10 minutes, the PET-bottle took 20 minutes.

Discussion and Conclusion

Bringing the vaccine to room temperature is essential in preventing post-vaccination side effects. The use of a bucket with warm water is a safe and practical way to heat up the vaccine. It takes less than 5 minutes to heat the vaccine to room temperature. Some farmers want to heat up the vaccine to body temperature, it will take at most 20 minutes.

IMM-PP-03

ASSESSMENT OF MICROBIAL CONTAMINATION IN INJECTION DEVICES AT FARM LEVEL IN PORTUGUESE SWINE FARMS

T.N. Nunes [1], J. Ceia [2], F. Costa [1], P. Mortensen [3]
[1]*Ceva Saúde Animal, Lda - Portugal*
[2]*Valsabor, S.A. - Alcanede (Portugal)*
[3]*Ceva Corporate Swine Team*

Background and Objectives

Injectable vaccines and antibiotics play a critical role for disease control in swine farms. These products are made and preserved under sterile conditions and supposed to be administered under sterile conditions. However, several authors found a variable degree of microbial contamination of injection devices at farm level (syringes and needle-free injection devices – NFID). The purpose of this study was to assess the level of contamination of injection devices in Portuguese swine farms and the benefit of using a disinfection protocol.

Material and Methods

21 injection devices were collected in 6 farms: 4 NFID and 18 syringes used to administer vaccines and antibiotics to sows, piglets and finishers. A swab was performed in each NFID in the spike that penetrates the vaccine bottles and the vaccine exit point. The syringes were rinsed with bi-distilled water. In Farm A the 4 tested syringes were then washed with a commercial dish detergent and submerged in a disinfectant solution for 1 hour (disinfectant with 4,5% of didecyldimethylammonium chloride diluted at 2%). After disinfection the syringes were rinsed again with bi-distilled water. All the collected swabs and the rinsed water were sent to lab and incubated in Plate Count Agar (rinsed water - 37ºC, swabs - 30ºC). UFC counting was used as a parameter to assess the contamination level.

Results

53% of the syringes and 100% of the NFID devices showed bacterial growth, with 24% of the syringes and 75% of the NFID presenting moderate to high levels of contamination (>10 UFC). In Farm A, 75% of the syringes were contaminated before disinfection (50% with moderate to high contamination) and 0% after disinfection.

Discussion and Conclusion

The results show that at farm level exists a relevant degree of contamination of injection devices (both syringes and NFID), and the application of a proper cleaning and disinfection protocol can significantly promote sterility of the devices.

IMM-PP-04

ASSESSMENT OF SIDE EFFECTS AFTER HETEROLOGOUS CHALLENGE WITH PRRSV-1 MLV IN PREGNANT GILTS AT THE LAST STAGE OF GESTATION

G. Papakonstantinou [2], E. Meletis [1], G. Christodoulopoulos [2], E. Tzika [3], P. Kostoulas [1], P. Tassis [3], V. Papatsiros [4]

[1]Laboratory of Epidemiology & Artificial Intelligence, Faculty of Public Health, School of Health Sciences, University of Thessaly, Karditsa, 43100, Greece

[2]Clinic of Medicine, Faculty of Veterinary Medicine, School of Health Sciences, University of Thessaly, Karditsa, 43100, Greece

[3]Farm Animals Clinic, School of Veterinary Medicine, Aristotle University of Thessaloniki, Greece

[4]Clinic of Medicine, Faculty of Veterinary Medicine, School of Health Sciences, University of Thessaly, Karditsa, Greece

Background and Objectives

Modified live virus (MLV) vaccines are considered as the key component to control the Porcine Reproductive and Respiratory Syndrome Virus (PRRSV). The majority of pig farms apply the 'mass' vaccination strategy in breeding female animals. However, this PRRS MLV vaccination protocol involves the risk of inoculation of sows in the last stage of gestation, resulting in possible infection of the fetus as the virus can efficiently cross the placenta during the last period of pregnancyvirus can efficiently cross the placenta during the last period of pregnancy.The objective of the present study was to evaluate the safety and the potential risks of the four commercial PRRS-1 MLV vaccines in pregnant gilts at the last stage of gestation under field conditions.

Material and Methods

The study was conducted in 4 pig farms, including 25 gilts from each farm (25*4 = 100 gilts), which were equally allocated to 5 different study groups. A PRRS-1 MLV vaccination was applied on the 100th day of their pregnancy with the different commercial vaccines that are available in the Greek market.

Results

The results indicated virus replication in piglets, and detection of PRRSV specific antibodies. The subsequent phylogenetic analyses revealed high percentages of similarity between the PRRSV-1 strain detected in infected litters and the PRRSV-1 vaccine strain to which the study gilts had been previously exposed to. Health status analyses of trial piglets resulted in differences between litters from vaccinated sows and litters from non-vaccinated sows as regards the number of weak born piglets, mummies, and piglets with splay-leg and/or respiratory symptoms.

Discussion and Conclusion

Our study demonstrates the ability of some PRRSV vaccine strains to act as an infectious strain (pathogenic) when PRRS MLV vaccination is applied in late gestation, but it also indicates an association with the health and immune status of newborn piglets.

IMM-PP-05

EVALUATION OF THE EFFICACY OF A CLOSTRIDIUM PERFRINGENS TYPE A/C TOXOID VACCINE FOR PIGS UNDER LABORATORY AND FIELD CONDITIONS

S. Springer [1], R. Fricke [1], O. Bastert [1], J. Finzel [1], T. Linder [1], T. Theuss [1], V. Florian [1], D. Sperling [2]
[1]*Ceva Santé Animale, Dessau-Rosslau, Germany*
[2]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*

Background and Objectives

The objective of the present trials was to test the efficacy of Clostridium perfringens type A (CpA) component of a licensed Clostridium perfringens type A/C toxoid vaccine under laboratory and field conditions.

Material and Methods

In a laboratory trial, 30 gilts were randomly assigned to vaccine and control group (both groups 15 gilts). In vaccine group- gilts were vaccinated twice (Enteroporc AC, Ceva Santé Animale, France) at an interval of 3 weeks during the last third of gestation. Piglets (2 days of age) were challenged intra-abdominally with an alpha and beta2 toxin containing supernatant of a heterologous CpA strain. As follow up of laboratory study, 12 basic immunized animals received a booster vaccination at two weeks before 2nd farrowing. In a field trial, piglets of 16 vaccinated and 18 control gilts were followed until 26 days of age.

Results

The vaccination elicited antibodies against both toxins, which were transferred to the offspring by colostrum intake. Piglets from vaccine group were significantly protected ($p<0.05$) from clinical signs and mortality after a challenge. None of the piglets from vaccinated gilts showed serious clinical symptoms, died or had to be euthanized vs. control: 11/20 piglets died or had to be euthanized. A 3rd vaccination at 2 weeks before 2nd farrowing further increased antibodies in colostrum ($p < 0.05$) and in serum of the piglets compared to basic vaccination.
Vaccination under field conditions led to increase of antibodies against alpha and beta2 toxins in the serum and colostrum of the gilts and resulted in a significant ($p < 0.05$) reduction of the incidence of diarrhea: in total 38.7 % of piglets (84/217) from vaccinated gilts with diarrhea vs. 62.6 % piglets (161/257) from control gilts.

Discussion and Conclusion

The efficacy of the vaccine was demonstrated by the toxin administration model in a challenge trial as well as under field conditions.

IMM-PP-06

IMPACTS OF QUARTERLY SOW MASS VACCINATION (SMV) AGAINST PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS TYPE 1 (PRRSV-1) IN TWO HERDS

K. Pedersen [1], C.S. Kristensen [1], L.K. Kvisgaard [2], L.E. Larsen [3]
[1]*SEGES Danish Pig Research Centre, Aarhus, Denmark*
[2]*University of Copenhagen, Dpt. of Veterinary and Animal Sciences, Frederiksberg C, Denmark*
[3]*University of Copenhagen, Dpt. of Veterinary and Animal Sciences, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark*

Background and Objectives

Vaccination of pregnant and lactating sows with MLV vaccine entails a risk of vertical or horizontal transmission to the fetus and/or piglets and sows. The aim of this study was to investigate the impact of quarterly SMV on PRRSV viremia and antibody levels in sows before and after vaccination.

Material and Methods

The study was performed as an observational prospective cohort of 120 sows in each of two commercial herds in a paired design. Blood samples, oral fluid and/or udder wipes were taken from sows and nursery pigs before and after SMV. Samples were tested for PRRSV-1 RNA by RT-qPCR, and the level antibodies was measured by two different assays. Serum negative in both assays were tested by virus neutralisation test (VNT). Virus positive samples were sequenced.

Results

PRRS virus was not detected in the sow herds, but the vaccine virus strain was detected in the nursery pigs. The prevalence of seronegative sows were 6–15% before vaccination and 1–4% after vaccination. Four sows tested negative for PRRSV-1 antibodies in both assays after vaccination, and three of these also tested negative for PRRSV-1 antibodies before SMV. One of the four seronegative samples after vaccination tested positive in VNT.

Discussion and Conclusion

One and four percent of the sows were antibody negative after vaccination despite repeated prior vaccinations. The explanation for this could be that they were mistakenly not vaccinated, false-negative test results or that they failed to respond to vaccination. The impact of these antibody negative animals for the control of PRRSV in herds remain speculative, but the presence of PRRS virus positive nursery pigs indicate that SMV did not result in virus-free nursery units. However, this may in part be explained by lack of compliance with basic rules for effective PRRSV control in the two herds.

IMM-PP-07

INCONSISTENT DETECTION OF PPV1-SPECIFIC ANTIBODIES IN SOWS VACCINATED WITH DIFFERENT PPV-VACCINES – TIME TO RECONSIDER VACCINATION REGIMES?

R. Renzhammer [2], U. Truyen [1], G. Baumgartner [2], M. Koch [2], A. Ladinig [2], C. Unterweger [2]
[1]*Institute for Animal Hygiene and Veterinary Public Health, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany*
[2]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Due to the frequent application of vaccines against the Porcine Parvovirus 1 (PPV1) clinical manifestations of PPV1-infections were widely reduced in the last decades. Enzyme-Linked-Immunosorbent-Assays (ELISA) for the detection of specific antibodies are used in routine diagnostic procedures. However, interpretation remains difficult due to little knowledge about detectable antibodies after vaccination.

Material and Methods

Serum samples were collected from 180 animals (60 gilts, 120 sows) in twelve different farms in Austria. Each four farms applied the same vaccine against PPV1 over the last five years. Included vaccines were Porcilis®Ery+Parvo (vaccine A), Parvoruvax® (vaccine B) and Eryseng®Parvo (vaccine C). Each serum sample was tested with Ingezim® PPV ELISA and hemagglutination inhibition test (HI-test) for PPV1-specific immunoglobulins (IgG).

Results

In farms using vaccine A, IgGs were detectable in all but one serum sample (n=60). In farms applying vaccine B and C 5/60 and 9/60 serum samples were ELISA negative, respectively. In a total of 17 ELISA-positive samples antibodies were not detectable in HI-test. Gilts had significantly higher HI-titers than sows, if they were vaccinated with vaccine B (p=0,005). In farms, where vaccine A or vaccine C was applied instead, sows had in average higher titers than gilts.

Discussion and Conclusion

Despite all sows were vaccinated against PPV1, specific antibodies were not detectable in all serum samples. Results show that interpretation of ELISA-assays is insufficient in vaccinated herds. In addition, possible infections of vaccinated sows might further aggravate interpretation. HI-test results indicate different heights of antibody titers depending on the applied vaccine and age. Thus, vaccination regime could be reconsidered depending on the age and the applied vaccine. Seronegative gilts emphasize lack of knowledge regarding duration of maternally derived antibodies in gilts.

IMM-PP-08

CO-ADMINISTRATION OF A MODIFIED LIVE PRRS VIRUS 1 VACCINE AND AN IMMUNOMODULATOR COMPOSED BY PROPIONIBACTERUM GRANULOSUM AND DETOXIFIED LPS ENHANCES VIRUS-SPECIFIC INTERFERON-GAMMA RESPONSES IN PIGLETS WITH MATERNALLY-DERIVED ANTIBODIES.

G. Martin-Valls [1], Y. Li [1], M. Cortey [1], E. Mateu [1], G. Pappaterra [2]

[1]*Department de Sanitat i Anatomia Animals, Facultat de Veterinària, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Spain*

[2]*Laboratorios Calier, S.A. Les Franqueses del Vallès 08520, Barcelona, Spain*

Background and Objectives

In previous studies it was shown that the administration of an immunomodulatory compound composed by Propionibacterum granulosum (PG) and detoxified LPS enhanced the humoral response of pigs vaccinated against pseudorabies virus in the presence of maternally-derived antibodies (MDA). In the present report the effect of that compound to enhance the immune response after vaccination against PRRS virus (PRRSV) was examined.

Material and Methods

The study was conducted using 4-week-old piglets with (A, n=32) or without MDA (B, 32) against PRRSV. Animals were distributed in four groups (A1, A2, B1, B2, n=16 each) and received IM a 2 ml dose of a commercial modified live PPRSV vaccine. Groups A2 and B2 received IM a 1 ml dose of the immunomodulatory compound. Each group was housed in physically separated rooms (no air space connection). Blood samples were taken at the moment of vaccination and weekly thereafter until 35 days post-vaccination (dpv). Development of PRRSV-specific antibodies was assessed using ELISA and the virus neutralization test and the virus-specific IFN-γ ELISPOT was performed at 28 and 35 dpv.

Results

In animals vaccinated in the presence of MDA, blocking affected more than 50% of the animals that still were seronegative by 35 dpv. No significant differences were observed with regards to the S/P ratios. Neutralization titres >1:4 were observed only by 35dpv but without significant differences between groups. In contrast, in the ELISPOT analysis, significant differences ($p<0.05$) were observed at 28 dpv. The seropositive animals receiving the immunomodulatory compound had higher IFN-γ-SC frequencies than animals receiving the vaccine alone (30.2±7.4 vs. 16.2±5.0 IFN-γ-SC per million PBMC, $p=0.0103$).

Discussion and Conclusion

The present results indicated that the imunomodulatory product helped to increase the IFN-γ-SC in seropositive animals, suggesting that it may contribute to better protection of the piglet when vaccinated in the presence of high levels of MDA.

IMM-PP-09

SEROLOGICAL RESPONSE AFTER DOUBLE VACCINATION WITH MHYOSPHERE PCV ID OF REPLACEMENT GILTS ON A BREEDING FARM UNSUSPECTED OF MYCOPLASMA HYOPNEUMONIAE INFECTIONS

K. Visscher [1], V. Thuring [1], L. Peeters [2], I. Bernal [3], M. Solé [3], D. Llopard [3], M. Wilhelm [2]
[1]*Coöperatie VARKENSARTSEN*
[2]*HIPRA Benelux*
[3]*HIPRA, Amer, Spain*

Background and Objectives

Health monitoring programs on breeding farms often involve serological monitoring of Mycoplasma hyopneumoniae (M.hyo) infections. Vaccination against M.hyo might influence the results of such programs. The objective of the current study is to evaluate the serological response after double M.hyo vaccination of replacement gilts on a M.hyo unsuspected breeding farm by two commercial ELISA tests for M.hyo antibodies.

Material and Methods

On a breeding farm, unsuspected of M.hyo infections, twenty-four young replacement gilts were allocated in 2 groups: a non-vaccinated control group (CON, n=9) and a group vaccinated with Mhyosphere PCV ID at 3 and 26 weeks of age (VACC, n=15). Individual blood samples were collected at 3, 8, 26 and 32 weeks of age. Blood samples were analyzed for the presence of M.hyo antibodies by CIVTEST SUIS MHYO (HIPRA, all age groups, value >35: positive) and MHYO IDEXX ELISA (GD, 8, 26 and 32 weeks of age, S/P-value >0.4: positive). The relation between both test was determined based on Pearson correlation.

Results

All pigs were serological negative for M.hyo antibodies before the first vaccination and the CON pigs remained serological negative throughout the study period. The percentage positive VACC pigs and mean values (±SD) in the HIPRA test were at 8, 26 and 32 weeks of age, 33% (mean: 37±32.9), 33% (mean: 37±23.9) and 87% (mean: 81±33.1). In the GD test, the percentage positive pigs and mean S/P values (±SD) were 0% (mean S/P: 0.09±0.10), 13% (mean S/P: 0.15±0.16) and 67% (mean S/P: 0.63±0.40) respectively. The correlation between both tests was high (R: 0.88, $p<0.001$).

Discussion and Conclusion

Double M.hyo vaccination in replacement gilts results in seropositivity on M.hyo unsuspected breeding farms. This needs to be taken into account when using serology-based health monitoring programs. Furthermore, the interpretation of serology results depends on the test used.

IMM-PP-10

FIELD EVALUATION OF THE INFECTION PRESSURE REDUCING EFFECT OF A PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS) MODIFIED LIVE VACCINE WHEN APPLIED TO PIGLETS IN EUROPEAN ENDEMICALLY INFECTED FARMS

L. De Lucas [1], A. Michiels [2], E. Claeyé [2], E. De Jong [2], D. Angelats [1], V.D. Azeitona Martins [3]
[1]*HIPRA HQ, Spain*
[2]*HIPRA Benelux*
[3]*HIPRA Portugal*

Background and Objectives

PRRS is still the most costly disease for the global swine industry. A successful vaccination strategy of piglets has demonstrated to lower the clinical impact of the disease. The objective of this trial was to analyse the benefits of PRRS vaccination by demonstrating the infection pressure reduction effect of a PRRS MLV vaccine applied to piglets in endemically infected farms.

Material and Methods

7 European PRRSv-positive farms started to vaccinate piglets at 2-3 weeks of age with Unistrain® PRRS during 2019-2020. 30 piglets were sampled at the end of the nursery phase. This sampling was done twice in each farm: before vaccination and 3 months after vaccination started. Serum samples were tested in 5 samples/pool by ORF7 RT-qPCR for PRRSV detection (samples are positive when Ct value <37) and ORF7 sequencing for PRRSV characterization.

Results

Taking into account all of the farms results, a decrease of positivity was detected, from 74% of positivity pre-vaccination to 57% of positivity 3 months after vaccination started. In addition, differences in high positive results (Ct value <25) were found between pre-vaccination data (13%) and post-vaccination data (0%) (p-value 0.02).

Discussion and Conclusion

Reduction of the PRRSv circulation and so lower probability of infection was demonstrated in Unistrain® PRRS vaccinated nurseries. However, as virus circulation is still present 3 months after vaccination, these results illustrate that a PRRS vaccination program in piglets should be implemented for a longer period of time to eliminate virus circulation in infected nurseries. Overall, PRRS piglet vaccination is a means of reducing PRRS infection pressure and can avoid costly economic losses associated with the disease.

IMM-PP-11

IMPROVED PIGLET PERFORMANCE AND REDUCED MORTALITY AND ANTIMICROBIAL USE FOLLOWING ORAL VACCINATION WITH A LIVE NON-PATHOGENIC E. COLI F4/F18 VACCINE AGAINST PWD

F. Vangroenweghe [1]
[1]*BU Swine & Ruminants, Elanco Benelux, Elanco Animal Health*

Background and Objectives

Post-weaning Escherichia coli (E. coli) diarrhea (PWD) remains a major cause of economic losses for the pig industry and typically causes mild to severe watery diarrhea between 5-10 days post-weaning and is caused by enterotoxigenic Escherichia coli (ETEC). The most common adhesins found on ETEC from PWD in pigs are fimbriae F4 and F18, while the predominant enterotoxins are heat-labile toxin (LT), heat-stable toxin a (STa), and heat-stable toxin b (STb). Therapy to combat PWD typically consists of antibiotic treatment. Objective was to analyse field data of 10 trials using an oral live bivalent E. coli F4/F18 vaccine (Coliprotec® F4/F18; Elanco) which reduces the impact of PWD provoked by F4-ETEC and F18-ETEC.

Material and Methods

Oral vaccination of suckling piglets using a live bivalent non-pathogenic E. coli F4/F18 vaccine was performed in 10 farrow-to-finish sow farms to prevent against PWD due to F4-enterotoxigenic E. coli (ETEC) or F18-ETEC. The vaccination strategy was compared to the standard therapeutic approach in each farm. Following data were collected during the post-weaning period: ADWG, FCR, mortality rate and TI_{100}.

Results

Vaccine-treated groups demonstrated a significant improvement in FCR (-4.2%), mortality rate (-57.1%) and TI_{100} (-84.9%) as compared to the Control group. The ADWG only marginally and non-significantly improved (+2.3%) in the Vaccine-treated group.

Discussion and Conclusion

The present study demonstrated efficacy of an oral live non-pathogenic E. coli F4/F18 vaccine for active immunization of piglets against PWD due to F4-ETEC and F18-ETEC under field conditions. For several economically important performance parameters, such as FCR, mortality rate and TI_{100}, E. coli vaccination performed significantly better as compared to the standard therapeutic approach. Therefore, vaccination against PWD using an oral live non-pathogenic E. coli F4/F18 vaccine should be considered a good alternative to consolidate post-weaning piglet performance results.

IMM-PP-12

INTRADERMAL AND INTRAMUSCULAR VACCINATION AGAINST PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME WITH MODIFIED LIVE VACCINE CONFER SIMILAR IMMUNE RESPONSE IN PRESENCE OF MATERNALLY-DERIVED ANTIBODIES

L. Aguirre [1], Y. Li [1], M. Baratelli [2], G. Martín-Valls [1], M. Cortey [1], J. Miranda [2], M. Martín [1], E. Mateu [1]
[1]Departament de Sanitat i Anatomia Animals, Universitat Autònoma de Barcelona (UAB), 08193 Cerdanyola del Vallès, Spain
[2]HIPRA, Amer (Girona), Spain

Background and Objectives

Maternally-derived antibodies (MDA) protect piglets against infectious agents during the first weeks of life; however, MDA may also interfere with vaccinations. The present study aimed at the assessment of the development of the immune response against PRRS after the vaccination by either the intradermal (ID) or the intramuscular (IM) route in piglets with high MDA levels.

Material and Methods

Twenty-six piglets having the highest levels of MDA against PRRSV of a farrowing batch but not showing viremia were recruited for the study from a commercial farm and moved to experimental facilities. These were distributed into 2 groups of 13 animals each and vaccinated at weaning with UNISTRAIN® PRRS by the IM or the ID (Hipradermic® 3.0) route (average S/P values at vaccination 1.22-1.16, respectively). Animals were followed for the next 6 weeks for the development of PRRSV-specific antibodies (ELISA and viral neutralization test) and interferon-γ cells (ELISPOT).

Results

Despite the presence of high MDA levels, vaccination produced a significant increase of the antibody levels by 14 dpv (average S/P IM: 2.10 ID: 2.13) which were high until the end of the study (average S/P IM: 2.76 ID: 2.94). Both groups developed neutralizing antibodies by 28 dpv that increased by 35 dpv (IM: 4.6±2.8 and ID: 3.9±3.4 Log_2). IFN-γ responses were detected by 21 dpv (IM: 122 and ID: 148 secreting cells/10^6 PBCMs) and further increased by 42 dpv (159-189 cells/10^6 PBCMs). The comparison of results between groups was non-significant (Kruskal-Wallis, $p>0.05$).

Discussion and Conclusion

Results suggested UNISTRAIN® PRRS was able to produce an immune response in piglets despite the presence of high MDA. Notably, this response was consistent with previous studies in which the vaccinated animals were not having MDA. Moreover, this study suggested that, under these circumstances, intramuscular and intradermal routes of administration produce similar immune responses.

IMM-PP-13

EFFECT OF THE ADJUVANT OF A COMMERCIAL MYCOPLASMA HYOPNEUMONIAE VACCINE ON THE INNATE IMMUNE RESPONSE

L. Beuckelaere [2], M. Haspeslagh [1], E. Biebaut [2], R. Krejci [3], F. Boyen [4], F. Haesebrouck [4], B. Devriendt [5], D. Maes [2]

[1]*Department of Large Animal Surgery, Anaesthesia and Orthopaedics, Faculty of Veterinary Medicine, Ghent University, Belgium*

[2]*Department of Internal Medicine, Reproduction and Population Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*

[3]*Ceva Animal Health, France*

[4]*Department of Pathobiology, Pharmacology and Zoological Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*

[5]*Department of Translational Physiology, Infectiology and Public Health, Faculty of Veterinary Medicine, Ghent University, Belgium*

Background and Objectives

The protection obtained after vaccination against Mycoplasma hyopneumoniae, the primary agent of enzootic pneumonia, is incomplete and varies between pigs and herds. Therefore, the present study investigated the effect of the adjuvant of a commercial vaccine on the capacity of monocytes to produce anti- and pro-inflammatory cytokines upon in vitro stimulation.

Material and Methods

To this end, 36 4-week-old M. hyopneumoniae-free piglets were allocated randomly to one of three groups: commercial M. hyopneumoniae vaccine (Hyogen®) (V1, n=12), same commercial vaccine without antigen (V2, n=12) and non-vaccinated (NV, n=12). Pigs were intramuscularly injected on D0 with the vaccine (V1, V2) or physiological saline solution (NV). Unclotted blood taken on D0, D7 and D21 was used to isolate monocytes. These monocytes were stimulated with LPS (1 µg/2.5 million cells) and subsequently anti-inflammatory (IL-10) and pro-inflammatory (IFN-γ, IL-6 and IL-1β) cytokine concentrations in the cell culture supernatant were measured.

Results

The mean IL-10 production (pg/ml) of LPS stimulated monocytes on D7 differed significantly: V1 2281^{a} ± 1265, V2 1935^{a} ± 2006, PC 4970^{b} ± 2076 ($p<0.05$), while on D0 and D21 no differences in IL-10 production were observed. The concentrations of IFN-γ, IL-6 and IL-1β in cell culture supernatant of stimulated monocytes were not significantly different between the groups.

Discussion and Conclusion

Stimulated blood monocytes from V1 and V2 produced less IL-10 than stimulated monocytes from the control group, while the levels of the pro-inflammatory cytokine were unaffected. These data might suggest that blood monocytes were primed by the vaccine/adjuvant in order to react in a less anti-inflammatory way, which might be beneficial to trigger protective immune responses. Further research including more parameters related to innate immune responses may elucidate the importance of the adjuvant in vaccines against M. hyopneumoniae.

IMM-PP-14

NON-INFERIORITY TRIAL EVALUATING THE EFFICACY OF A TRIVALENT VACCINE CONTAINING PORCINE CIRCOVIRUS TYPES 2A/2B AND MYCOPLASMA HYOPNEUMONIAE COMPARING THE ADMINISTRATIONS BY CONVENTIONAL NEEDLE-SYRINGE AND TWO DIFFERENT NEEDLE-FREE INJECTORS

C.K. Mah [1], S. Yang [2], C. Chae [2]

[1]*Zoetis Dublin, Ireland D18 T3Y1*

[2]*Department of Veterinary Pathology, College of Veterinary Medicine, Seoul National University, Gwanak-ro 1, Gwanak-gu, Seoul 08826, Korea*

Background and Objectives

This field setting study compared the use of conventional needle-syringe versus two types of needle-free injectors during the vaccination of pigs with a trivalent vaccine in a herd diagnosed with subclinical PCV2d and Mycoplasma hyopneumoniae (M.hyo) infection.

Material and Methods

A total of 240, 21-day-old pigs were randomly assigned to four treatment groups (30 males and 30 females per group). Three groups were intramuscularly vaccinated with a 2.0 mL dose of Circomax Myco, respectively, T01 = conventional needle-syringe, T02 = Pulse FX™ and T03 = Frevax EPIG™ . T04 received a 2.0 mL of PBS via conventional needle-syringe administration. Pigs were visually scored for injection site reactions (ISR). Blood and laryngeal swabs were collected at 0,28,49 and 91 days post-vaccination. The ADWG was analyzed over 21-175 days of age. The non-inferiority tests were conducted at a one-sided 2.5% significance level, and a non-inferiority delta of 10% of the least squares mean of T02 and T03 with T01 for ADWG, M.hyo and PCV2 ELISA, and real-time PCR PCV2d and M.hyo DNA quantification results

Results

The ISR were minimal for all groups. Pigs from T02 and T03 groups showed reduced levels of PCV2d viremia and M.hyo loads in the larynx equally compared to T01. The results of ADWG, immune response against PCV2 and M.hyo as well as the amount of PCV2d load in serum at 49 and 91 dpv from T02 and T03 were non-inferior to T01. Pigs from T01, T02 and T03 had significantly lower PCV2d viremia and mycoplasma laryngeal shedding than from T04 ($p<0.05$).

Discussion and Conclusion

The protection conferred by CircoMax Myco via two types of needle-free administrations against subclinical PCV2d and Mhyo infections in this study was non-inferior to via the conventional needle-syringe administration based on the result analyzed for growth performance, immune response against PCV2 and M.hyo, and reduction of PCV2 viremia.

IMM-PP-15

PERFORMANCE OF VACCINATION AGAINST LAWSONIA INTRACELLULARIS IN IBERIAN GENETIC PIGS: BEYOND THE DOI

M. Marcos [1], M. Jiménez [1], R. Menjon [1], E. Pérez [2], J.M. Hernández [2], R. García Gayo [2]
[1]*MSD Animal Health*
[2]*Ibéricos de Arauzo. Madrid, España*

Background and Objectives

Plenty of results have been presented about convenience of Lawsonia intracellularis (Li) vaccination. Iberian pig genetics final products are featured because of their pork quality. For that, certain government specifications are mandatory. Apart from specific genetic lines and feeding, it is mandatory to wait until at least 10 months of age until abattoir. The aim of this study is to demonstrate efficacy in terms of production parameters, to control active infection of Li beyond the registered DOI of the intramuscular vaccine administered.

Material and Methods

Iberian genetics Spanish pig farm was selected due to Li diagnosed problems. 21 production batches were involved in the study: 10 consecutives not vaccinated as controls (C), and 11 vaccinated (V) (1,400 animals each). Pigs were vaccinated at 4 weeks of age with the one-shot combination of Porcilis® PCV M Hyo + Porcilis® Lawsonia (MSD Animal Health). Key parameters were compiled in the fattening units (entry weight (EW, kg), weight at slaughter (SW, kg), days at fattening units (D), conversion rate (CR), average daily weight gain (ADWG, gr), % of casualties (%L)), and statistically compared with ANOVA, Breslow and Chi-square.

Results

No statistical differences were found in terms of EW, V=19.7 C=20.7; and SW, V=159.0 C=161.7. Nevertheless, statistical differences ($p<0.02$) in favor of vaccinated group were found in key production parameters such as CR: C=4.060 vs. V=3.849; ADWG: C=613 vs. V=625; D: C= 230 vs. V=223. On the contrary, differences in terms of %L were found in favor of control group ($p=0.016$) C=3.3% vs. V=3.8%

Discussion and Conclusion

Despite being in the fattening barns 1 week less, performance of vaccinated animals was better. The DOI of the vaccine is registered for 21 weeks, but in this trial, pigs were reared for more than 31 weeks, so further studies are needed to determine the exact vaccine DOI.

IMM-PP-16

SAFETY AND EFFICACY OF PCV2 AND M.HYO VACCINES MIXED TOGETHER IN THE PROTECTION AGAINST EXPERIMENTAL INFECTIONS

M. Sno [1], L. Bodnar [1], N. Palmai [1], T. Szalai [1], P. Trampus [1], A. Toth [1], R. Krejci [2]
[1]*Ceva Phylaxia, Budapest, Hungary*
[2]*Ceva Sante Animale, France*

Background and Objectives

PCVD (Porcine Circovirus Diseases) and enzootic pneumonia (EP) remain a major health problem in most swine farms. Different vaccines are available on the market. The aim of the study was to assess the safety and efficacy of PCV2a and M.hyo vaccines mixed prior to use against PCV2 and M.hyo experimental infections.

Material and Methods

Circovac® (Ceva) and Hyogen® (Ceva), one dose each, were mixed in one vial (DUO) before the administration. In the laboratory safety study, 10 piglets were vaccinated with 2.5ml of DUO and 10 piglets with PBS. Local and systemic reactions were observed for 14 days. In efficacy studies piglets were vaccinated with DUO at 3 weeks of age (WOA) or not vaccinated (controls). Animals were infected at 26WOA with either PCV2a isolate or with M.hyo strain. Pigs were necropsied 4 weeks post infections. PCV2 virus loads by qPCR and M. hyo lung lesion (LLS) (European Pharmacopoeia) were measured to assess the efficacy.

Results

Safety: no piglet had a fever and the average body temperature was 40.0 °C in vaccinates and 38.9°C in controls. Slight and transient reactions occurred in some piglets on the day of vaccination, such as swelling, mild pain and lethargy, which resolved spontaneously in two days. No significant difference in ADG(0.32 vs 0.33kg/day vaccinates vs controls) were found. Efficacy: The mean PCV2 viral loads (log10copies/ml) in different lymphnodes were 2.5-3.1 for group DUO and 4.3-5.3 for controls($p<0.05$). The mean weighted LLS were 33.2 for DUO group and 72.3 for the control ($p<0.05$).

Discussion and Conclusion

This study confirmed that those two vaccines mixed together were safe for piglets. The duration of protection after vaccination for 23weeks was demonstrated against experimental infections with PCV2 and M.hyo. These vaccines proved to be a safe and highly efficient in the protection against PCVD and EP.

IMM-PP-17

SEROLOGICAL MONITORING OF MYCOPLASMA HYOPNEUMONIAE VACCINATION UPTAKE USING A NEW ELISA KIT

R. Krejci [1], F. Donnet [2], L. Comtet [2], I. Kiss [3], H. Smits [3]
[1]*Ceva Sante Animale, France*
[2]*IDvet – Innovative Diagnostics, Grabels, France*
[3]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

Background and Objectives

Mycoplasma hyopneumoniae (Mhyo) is the primary pathogen of Enzootic pneumonia in pigs. Humoral response to the infection can be measured by different available types of ELISA. The aim of this study was to assess the potency of different Mhyo vaccines using serology and propose the optimal sample testing for semi-quantitative evaluation

Material and Methods

In total, 250 samples from pigs vaccinated with Hyogen® (H), (Ceva) or vaccines A and B were analyzed using the ID Screen® Mycoplasma hyopneumoniae Competition ELISA (cELISA) test (IDvet).
Several serial dilutions of positive vaccinated sample were tested. Standardized values were calculated and the percentage of positive samples for each dilution was compared among differently vaccinated groups of pigs. Positivity at dilutions 1:1 and 1:5 (out of positives in dilution 1:1) were evaluated to better objectivate seroconversion.

Results

With only two dilutions per sample, it is possible to assess a semiquantitative interpretation. The first dilution (1:1) measures the overall immune response in a population, and the second dilution (1:5) determines the strength of the immune response. Analysis with the Mhyo cELISA allows to measure the seroconversion with pigs' samples vaccinated with vaccine H (79% and 54% positivity in dilutions 1:1 and 1:5). Such strong seroconversion is not observed with other commercial vaccines (45%, 32% in dilution 1:1 and 16%, 0% in dilution 1:5 for vaccines A and B).

Discussion and Conclusion

Based on available results analyzing blood serum samples in dilutions 1:1 and 1:5 can be proposed. This allows not only to define the prevalence of true positive responders but also to estimate the magnitude of the humoral immune response. In this study Hyogen® provided stronger serological response than other tested vaccines. The IDvet Mhyo cELISA can be potentially used for this vaccine uptake monitoring.

IMM-PP-18

CONTROL OF A 27-A LIKE PORCINE PARVOVIRUS (PPV) STRAIN IN A FRENCH HERD

E. Beneteau [1], I. Messager [2], R. Jagu [2]
[1]*BE VETS+, 23 rue de Bel Air, 35150 Janzé, France*
[2]*Boehringer Ingelheim Animal Health France, 16 rue Louis Pasteur, 44119 Treillières, France*

Background and Objectives

Recently, new PPV strains, have emerged in Europe. They are closely related to PPV 27-a strain which has shown to be more virulent than historical strains. The objective of this case report is to describe the control of this strain in a French herd using a PPV 27-a strain-based vaccine, Reprocyc® ParvoFLEX.

Material and Methods

After a severe PPV outbreak due to PPV 27-a like strain in a farrow to finish farm, mass vaccination with Reprocyc® ParvoFLEX was implemented, every 12 weeks (2ml, IM route). The reproductive performances were analyzed considering 5 periods: (1) period before outbreak; (2) period of outbreak; (3) period following outbreak but before the implementation of the vaccine; (4) intermediate period with partial effect of the vaccine; (5) period with "whole effect" of the vaccine. The percentages of small litters (<11 piglets) were compared using a chi-square test.

Results

The live born numbers were: 14.40, 13.70, 15.03, 15.49 and 15.41 in period 1, 2, 3, 4 and 5 respectively.The number of mummies increased from 0.36 to 1.03 between the period 1 and 2 and decreased progressively to 0.32 in period 5. The percentage of small litters was 12.5% in period 1, increased to 20.6% in period 2 and decreased to 11.7%, 8.1% and 7,6% in period 3, 4 and 5 respectively. The difference between period 1 and 5 was statistically significant ($p<0,001$).

Discussion and Conclusion

In this herd, the PPV 27-a like strain affected severely the reproductive performances. After the outbreak, the performances improved without any specific control measures probably due to the natural immunity triggered by this strain. Nevertheless, following the implementation of Reprocyc® ParvoFLEX vaccination, the reproductive performances went back at least to baseline. Moreover, a significant reduction of the number of small litters was observed which is consistent with published data.

IMM-PP-19

CAN THE TREATMENT OF SOWS DURING LACTATION HELP IN THE PPE CONTROL? A CASE REPORT.

J.M. Flores Barriga [1], A. Rastrojo Ortigosa [1], G. Abella Falcó [2], E. Sanchez Tarifa [2], V. Rodríguez-Vega [2]
[1]*Inga food Extremadura. Almendralejo, Spain*
[2]*Boehringer Ingelheim Animal Health España*

Background and Objectives

Porcine Proliferative Enteropathy (PPE) caused by Lawsonia intracellularis is one of the most prevalent enteric diseases. There is lack of information about the antibiotic treatment of sows combined with vaccination of the piglets for the control of PPE. The objective of this study was to evaluate the impact of this combination.

Material and Methods

This study was conducted in an Iberian sows farm. Pigs at fattening were suffering from subclinical Ileitis confirmed by qPCR in faeces. A cohort of 60 dams received Lincomycin (110 ppm) in the feed during the lactation period while 120 dams were non-treated. Pigs from the treated dams were vaccinated with Enterisol Ileitis or left unvaccinated. A total of 240 randomized pigs split in three groups were included in the study and weighed at weaning. 16 pigs lost the ear tag or died and 224 were weight at 28 WOA: Non-treated dams/Non-vaccinated pigs (No Treat-Novac,=70), Non-Treated dams/Vaccinated pigs (No Treat+Vac,=83), Treated dams/Vaccinated pigs (Treat-Vact,=71).

Results

The weight at weaning was: NoTreat-NoVac 7.57±1.74^{a}; NoTreat-Vac 6.17±1.01^{b}; Treat+Vac 6.29±1.31^{c} ($p<0.0001$).The weight at 28 WOA was: NoTreat-NoVac 71.14±6.88^{a}; NoTreat-Vac 78.31±6.19^{b}; Vac+Trat 74.65±6.17^{c} ($p<0.05$).The ADG fron born to 28 WOA was: Notreat-NoVac 400.41±51^{a}; Notreat-Vac 418.35±36^{b}; Trat+Vac 412.74±40^{a} ($p<0.05$).

Discussion and Conclusion

Weight and ADG were usual for the iberian pig breed and L.i. vaccination of piglets led to a greater ADG from weaning to 28 WOA Furthermore, in spite of the treatment of dams during lactation, this practice does not seem to have a positive impact on the ADG of pigs. Indeed, the microbiota of piglets mirrors that of their dam, and a negative impact of antibiotics on microbiota has been described. Therefore, this could be the reason why Treat+Vac pigs didn´t grow better.

IMM-PP-20

COMPARATIVE PCV2 HUMORAL IMMUNE RESPONSE TO TWO INTRADERMAL PCV2 VACCINES

M. Jiménez [1], R. Menjon [1], M. Marcos [1], C. Llorente [1], E. Revilla [2], T. Tejedor [3], H. Swam [4]
[1]*MSD Animal Health*
[2]*ALBET SA, Spain*
[3]*Universidad de Zaragoza, Spain*
[4]*Center for Diagnostic Solutions, MSD AH Boxmeer, The Netherlands*

Background and Objectives

Serology can be used to measure humoral response after vaccination. The aim of this trial was to compare the level of PCV2-antibodies induced by two commercial intradermal PCV2 vaccines.

Material and Methods

The trial was conducted in a PRRS negative, commercial farm. A total of 50 piglets of 21 days of age were randomly allocated into two groups:G1: Porcilis® PCV ID; G2: Mhysophere® PCV ID. All piglets were individually ear-tagged and vaccinated intradermally at 21 days of age, and bled at 3, 6, 9, 13, 17 and 21 weeks of age. Sera samples were analyzed using alphaLISA (an in-house titration test, based on total antibodies, CDS laboratory, Boxmeer, MSD AH). The results are expressed in $\log_2$ values, ranging from 4.3 to 16.0 $\log_2$ (titres <4.3 are considered qualitatively as negative and quantitatively as 0). All sera were tested by qPCR to check for the presence of PCV2 DNA. Statistical analysis was done using mixed ANOVA test.

Results

No PCV2 was detected by qPCR in sera at any age, indicating that the antibody response observed after 6w of age was uniquely due to vaccination.At 3w of age PCV2 titres were similar in both groups (G1 4.63$\log_2$ vs G2 5.09$\log_2$).In terms of quantitative results, PCV2 titres were statistical higher ($P<0.05$) in G1 at all other ages.The percentage of positivity of G1 was above 80% at all ages, except 21w, when it declined to 44%. For G2, the percentage of positivity never exceeded 80%; maximum values were at 6w and 9w (73.9% and 72.7%) and rapidly decreased to 23%, 14% and 0% at 13, 17 and 21w, respectively.

Discussion and Conclusion

Under the conditions studied, clear differences between commercial vaccines in terms of total antibody induction were observed. It would be of interest to investigate the correlation between these differences in antibody level and clinical protection.

IMM-PP-21

EFFECT OF VACCINATION ON TEST OUTCOME IN DIFFERENT DIAGNOSTIC ELISAS FOR ACTINOBACILLUS PLEUROPNEUMONIAE

K. Visscher [1], V. Thuring [1], K. Koenders [2], S. Kars-Hendriksen [3], T. Cruijsen [4]
[1]*Coöperatie VARKENSARTSEN*
[2]*Topigs Norsvin The Netherlands*
[3]*Ceva Santé Animale, Naaldwijk, the Netherlands*
[4]*MSD Animal Health Nederland*

Background and Objectives

Serotype specific serological tests are used to identify Actinobacillus pleuropneumoniae infected farms. However, the effect of vaccination on test results is unknown. This study evaluates the effect of vaccination on serological test results.

Material and Methods

On a farm without clinical problems with A. pleuropneumoniae, 14-weeks old pigs were selected and divided in three groups (10 per group). Group 1: negative control, group 2: vaccinated with Coglapix® (Ceva Santé Animale) and group 3: vaccinated with Porcilis APP® (MSD Animal Health). Animals were vaccinated on day 1 and 29. Bloodsamples from day 57 were tested in the Swinecheck® APP 1-9-11 ELISA, Swinecheck® APP 2 ELISA and Swinecheck® APP 5a,5b ELISA (Biovet) for serotyping) and the APP-ApxIV Ab Test (IDEXX)

Results

In group 1 on day 57 5/10 animals tested positive in the ApxIV ELISA and all 10 animals tested negative in the three Biovet ELISA's. In group 2 on day 57 3/10 tested positive in the ApxIV ELISA, 6/10 in the serotype 1-9-11 Elisa and 0/10 in the serotype 2- and serotype 5a,5b Elisa. In group 3 on day 57 6/10 tested positive in the ApxIV Elisa, 10/10 in the serotype 1-9-11 Elisa, 3/10 in the serotype 2 Elisa and 0/10 in the serotype 5a,5b Elisa.

Discussion and Conclusion

The herd was A. pleuropneumoniae positive: all three groups contained some ApxIV positive animals. All unvaccinated animals tested negative in serotype specific tests whereas several vaccinated animals developed antibody responses in some tests. Surprisingly, more animals tested positive in de Porcilis App (subunit) group than in de Coglapix groep (bacterin). Likely this is due to an immunological reaction on vaccine compounds. The effect of the prevalent A. pleuropneumoniae remains unclear but vaccination likely influences serology. We conclude that serotype specific ELISA's are not useful as confirmation tests in vaccinated animals.

IMM-PP-22

EFFICACY OF DIFFERENT PCV2 AND MHYO COMBINED VACCINES AGAINST PCV2 OR MYCOPLASMA HYOPNEUMONIAE EXPERIMENTAL INFECTIONS

I. Kiss [4], K. Szigeti [1], E. Kovács [1], F. Balázs [2], M. Albert [3], H. Smits [4], R. Krejci [5]

[1]*Ceva Phylaxia, Budapest, Hungary*

[2]*Ceva, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[3]*Domestic Marketing, Ceva-Phylaxia, Budapest, Hungary*

[4]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[5]*Ceva Sante Animale, France*

Background and Objectives

Vaccination against Mycoplasma hyopneumoniae and PCV2 helps reducing their clinical manifestation and corresponding losses. Several commercial mono-or bi-valent vaccines are available. The aim of this study was to evaluate the efficacy of different PCV2 and M.hyo vaccines in experimental challenge models

Material and Methods

In two different experiments piglets were vaccinated either with Circovac® with Hyogen® (DUO)-both Ceva mixed as RTM or other PCV2/M.hyoRTM vaccine or a PCV2a/b+M.hyo RTU vaccine. In trial1) vaccinated and positive control pigs were challenged at 9 weeks of age (WOA) with the PCV2d strain. In trial2) vaccinated and positive control pigs were challenged at 8 WOA with M.hyo. Pigs were always euthanized 28 days post infection (DPI) and either PCV2 loads in lymph nodes (Lnn) (trial1) or lung lesions scores (LLS) according to the Eu Pharmacopoeia (trial2) were measured.

Results

In the trial 1) viremia at 28DPI was 0.55, 0.54 and 0.28 and 3.41 logcopy#/microL for DUO, PCV2/MhyoRTM, PCV2a/b+MhyoRTU and positive control-respectively ($p<0,05$ control vs others). The PCV2 loads in mesenterial and inguinal Lnn were 5.28, 4.94, 4.84,7.68 log copy#/microL and 4.80, 4.40, 4.26 and 6.49 log copy#/microL for DUO, PCV2/MhyoRTM, PCV2a/b+MhyoRTU and positive control, respectively ($p<0,05$ control vs others). In trial2) the mean LLS were 0.23, 0.81, 0.50 and 0.72 for DUO, PCV2/MhyoRTM, PCV2a/b+MhyoRTU and positive control, respectively ($p<0,05$ for DUO vs any other groups). Only DUO differed significantly from the positive control

Discussion and Conclusion

This study demonstrated that DUO provided equal PCV2 protection as PCV2/MhyoRTM and PCV2a/b+MhyoRTU. DUO however outperformed both PCV2/MhyoRTM and PCV2a/b+MhyoRTU vaccines in protection against M.hyo. Some of the combined PCV2/M.hyo vaccines may provide in such a model insufficient protection against M.hyo infection.

IMM-PP-23

MONITORING OF ANTIGEN QUANTIFICATION IN THE RECONSTITUTED AND MIXED PCV/M.HYO PRODUCT.

H. Smits [1], M. Ivok [2], R. Krejci [3], P. Mazerolles [4]

[1]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[2]*Ceva Phylaxia, Budapest, Hungary*

[3]*Ceva*

[4]*Ceva Sante Animale, Libourne, France*

Background and Objectives

Porcine circovirus diseases (PCVD) and Enzootic pneumonia (EP) represent for the global swine production the most widely spread complex of syndromes due to PCV2 and M.hyo. Correspondingly, vaccines against PCV2 and M.hyo are the most frequently used biologicals in the pig health control. Circovac® and Hyogen® (both Ceva) are vaccines licensed for ready-to-mix use in piglets. Before vaccination the products have to be re-constituted and mixed together and used immediately. To address the request concerning the antigen quantity after mixing, the antigen content in the reconstituted vaccine was measured.

Material and Methods

Vaccines were reconstituted and mixed according to the manufacturer's instructions. During the trial the reconstituted vaccine was stored at 2-8°C. At fixed moments and after careful mixing the PCV2 or M.hyo antigen level was measured using an in-house PCV2 and M.hyo antigen quantification assays, always in 2 replicates. At following times, the samples were measured: 0, 3, 6, 52, 76, 172 hrs post mixing.

Results

The quantities of the antigen at each sample point were compared to the initial values measured immediately after the reconstitution. The values are expressed as the % of recovery relative to time 0. All measured values were within the variability of the test which is 10%. There were found no deviations of the values beyond this range which could suggest the decrease or increase of the amount of antigen in the course of the study.

Discussion and Conclusion

This study confirms the invariable concentrations of the antigens in the mixture for at least 7 days after the reconstitution, when kept at 2- 8°C.

IMM-PP-24

THE IMPACT OF DIETARY POTASSIUM DIFORMATE IN THE LACTATION DIET OF SOWS ON THE SUPPLY OF MILK-IGA TO SUCKLING PIGLETS

C. Lückstädt [1], S. Petrovic [1]
[1]*ADDCON*

Background and Objectives

Optimising the growth rate of suckling piglets is a key requirement for success in pig production systems. Organic acids have been reported by many experts to enhance growth performance in swine production sustainably. Potassium diformate (FORMI, hereafter referred to as KDF), a double salt of formic acid, has been registered in the EU as zootechnical additive for sows, thus improving their performance. A recent study (Lückstädt and Petrovic, 2021) assessed the milk yield of KDF-fed sows during lactation. However, data on the equally important immunoglobulin IgA-supply via the milk to the piglets are still missing.

Material and Methods

To estimate the impact of feeding KDF in the lactation diet of sows on their milk IgA-supply, a meta-analysis was performed. The final dataset contained the results of 5 studies with KDF-inclusion in the lactation diet, ranging from 0.8% to 1.2%. Including KDF in the sow diet lasted from one week before farrowing until piglets were weaned (28 days). The average dietary KDF level included across the dataset was 0.96%. Daily milk production and IgA-level were calculated with the equations of Noblet and Etienne (1989) as well as Hurley (2015). Data were analysed and a confidence level of 95% defined.

Results

KDF-fed sows had a significantly increased milk production ($P<0.01$) of more than 5.3% from 9.1 kg/d to 9.6 kg/d versus the negatively controlled sows, while the IgA supply to the suckling piglets via the milk rose consequently from 35.3 to 37.2 g/d ($P=0.003$) throughout the whole lactation period.

Discussion and Conclusion

It is therefore concluded, that FORMI in the lactation diet of sows can improve conditions during the suckling period, when it comes to the supply of their piglets with milk and the major immunoglobulin, thus strengthening their first line of defence in the resistance against infection, via inhibiting bacterial and viral adhesion.

IMM-PP-25

ACUTE-PHASE PROTEINS IN RESPONSE TO SALMONELLA TYPHIMURIUM CHALLENGE IN VACCINATED PIGLETS

F.A. Moreira Petri [1], C.H. Turco [1], D. Gomes Da Silva [1], E.A. Goncalves De Oliveira Moura [1], H. Meiroz De Souza Almeida [1], G.Y. Storino [1], K. Sonalio [1], M. Lopes Mechler-Dreibi [1], L.G. De Oliveira [1]
[1]*São Paulo State University (Unesp), School of Agricultural and Veterinarian Sciences, Jaboticabal, Brazil*

Background and Objectives

Salmonella Typhimurium recently became the most common serovar isolated from pigs in Europe, the United States, and Brazil. Its prevention is necessary since the colonization in the intestinal tissue leads to intense production losses. This study aimed to compare the acute phase proteins in piglets submitted to an inactivated S. Typhimurium vaccine commercially available, followed by an experimental challenge with S. Typhimurium.

Material and Methods

Twenty piglets were divided into two groups (n=10), as follows: (G1) were immunized subcutaneously with two doses (21-day interval) of an inactivated vaccine against swine pneumoenteritis, containing strains of Salmonella Choleraesuis, Pasteurella multocida, and Salmonella Typhimurium; (G2) were not immunized. All animals were challenged at 65 days of age (D0) with 5 mL of culture medium containing 10^8 CFU/mL of S. Typhimurium. Collection of blood samples and rectal swabs was performed before the vaccination (D42 and D21), and before the inoculation (D0) and after that, the samples were collected on D3, D6, and D9 to determine the serum concentration of total proteins and acute phase proteins by SDS-PAGE.

Results

Serum concentration of α1-acid-glycoprotein, ceruloplasmin, and α1-antitrypsin was lower in G1 than G2, evidencing the vaccine efficacy due to stimulation of the immune system. Transferrin was higher in G1 than G2, which may indicate a less intense inflammatory process after challenge. Additionally, albumin was higher in G1 at D9 and monocytes were higher in G1 at D3 and D6, which had a less severe clinical presentation of the infection.

Discussion and Conclusion

The inactivated vaccine was capable of decreasing the shedding and colonization of S. Typhimurium (Moura et al., 2021) and stimulated the innate immune system to an inflammatory response conferred by vaccine protection, which minimizes the effects of infection.

IMM-PP-26

COMPARISON OF THE PROTECTION AGAINST PCV2 OR MYCOPLASMA HYOPNEUMONIAE EXPERIMENTAL INFECTIONS WITH INJECTABLE OR INTRADERMAL PCV2/M.HYO VACCINES

I. Kiss [1], K. Szigeti [2], E. Kovács [1], F. Balázs [3], M. Albert [4], H. Smits [1], R. Krejci [5]

[1]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[2]*Ceva Phylaxia, Budapest, Hungary*

[3]*Ceva, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[4]*Domestic Marketing, Ceva-Phylaxia, Budapest, Hungary*

[5]*Ceva Sante Animale, France*

Background and Objectives

PCV2 and Mycoplasma hyopneumoniae(M.hyo) are major infections affecting swine herds. Vaccination against those two pathogens helps reducing their clinical manifestation. Several commercial mono- or bi-valent vaccines are available. The aim of this study was to compare the efficacy of injectable PCV2 and M.hyo RTM vaccines with the intradermal(ID) PCV2/M.hyo RTU product.

Material and Methods

Piglets were vaccinated either with Circovac® mixed with Hyogen®(DUO)- Ceva or an ID vaccine containing inactivated recombinant M.hyo expressing cpPCV2(Mhyo/PCVID) at 3 weeks of age(WOA). Vaccinated and positive control pigs were challenged at 7(WOA) either with the PCV2d strain or with M.hyo culture. Serum samples were collected prior to vaccination, challenge, and slaughter and measured by ELISA. Pigs were always euthanized 28 days post infection (DPI) and either PCV2 loads in lymph nodes(Lnn) or lung lesions scores(LLS) were measured to assess the efficacy.

Results

The PCV2 viremia at 28DPI was 0.93 and 0.69 log copy#/microL for DUO and Mhyo/PCVID respectively($p>0,05$). The PCV2 loads in mediastinal, mesenterial Lnn and tonsillar swabs were 5.99, 5.19 and 2.80 log copy#/microL for DUO and 6.02, 5.05 and 2.59 log copy#/microL for Mhyo/PCVID respectively($p>0,05$). DUO induced M.hyo seroconversion before the challenge (97% seropositivity), while Mhyo/PCVID did not(0%) and those pigs became seropositive only after M.hyo infection. Mean LLS were 0.63 and 0.86 for DUO and Mhyo/PCV ID respectively ($p<0,05$ for DUO vs any other groups). Only DUO differed significantly from the positive non-vaccinated control in LLS.

Discussion and Conclusion

This study demonstrated that whole virus and bacterin based injectable vaccine provided equal PCV2 protection as Mhyo/PCVID. DUO however significantly outperformed the recombinant intradermal vaccine in the potency to induce strong immune response and in the protection against the development of specific lung lesions.

IMM-PP-27

CONVENIENCE AND ECONOMIC BENEFIT OF EARLY ONE-SHOT MYCOPLASMA HYOPNEUMONIAE VACCINATION AT 3 DAYS OF AGE IN A COMMERCIAL SOW FARM

F. Vangroenweghe [1]

[1]*BU Swine & Ruminants, Elanco Benelux, Elanco Animal Health*

Background and Objectives

Mycoplasma hyopneumoniae (M. hyopneumoniae) is the primary pathogen of enzootic pneumonia, a chronic respiratory disease in pigs. Vaccination of piglets to protect against M. hyopneumoniae can be performed at several ages, depending on product label specifications. Objective was to compare convenience and economic benefits of M. hyopneumoniae vaccination in piglets of 3, 7 and 14 days of age.

Material and Methods

The study was performed on a 2000-sow unit. Each study groupincluded 20 sows and their respective suckling piglets. At 3 days, piglets were vaccinated during the regular processing activity, whereas at 7 and 14 days, piglets had to be vaccinated during a dedicated vaccination moment. Total time to vaccinate the litter was recorded, including number of piglets per litter. Duration of vaccination per piglet at each specific vaccination moment was calculated. An economic calculation of vaccination cost at each age was performed.

Results

Duration of piglet vaccination at 3 days was significantly ($P < 0.05$) shorter (2.64 ± 0.08 seconds) as compared to 7 days (4.90 ± 0.18 seconds) and 14 days (6.04 ± 0.22 seconds). Economic calculation in a 1000-sow unit demonstrated that although total number of piglets vaccinated was lower (-443 and -838 at 7 and 14 days of age, respectively) at a later vaccination age, the related increase in vaccine cost in the early vaccination group (3 days) was largely compensated by the decrease in cost of overall vaccination time (€1,115.61 and €1,461.00 lower at 3 days as compared to 7 and 14 days, respectively).

Discussion and Conclusion

Mycoplasma hyopneumoniae vaccination at 3 days of age has several advantages over later vaccination at 7 or 14 days of age. Besides the benefits in convenience of piglet handling at that age, we could also demonstrate economic benefits of early M. hyopneumoniae vaccination.

IMM-PP-28

EFFECT OF IMMUNIZATION AGAINST GONADOTROPIN-RELEASING FACTOR (GNRF) ON GROWTH PERFORMANCE AND CARCASS GRADE IN HEAVIER FATTENING GILTS

W. Navasakuljinda [1], P. Wongchanapai [1], J. Thongkaew [1], N. Saikaew [1], R. Tapaopong [1], C.K. Mah [2]
[1]*Zoetis (Thailand) Limited, Bangkok 10500, Thailand*
[2]*Zoetis Dublin, Ireland D18 T3Y1*

Background and Objectives

There is a trend nowadays in Thailand to rear pigs to heavier weights in commercial farms. Immunization against GnRF using Improvac® vaccine (IM) has been approved by Thai regulatory agency to temporary suppress ovarian activity in heavier fattening gilts so that estrus-related aggressive behavior and unwanted pregnancy can be avoided where these gilts are co-housed with entire males. The objectives of this study were to investigate the effect of growth performance including, average daily gain (ADG), final liveweight (FLW) and carcass grade between IM and unvaccinated fattening gilts.

Material and Methods

There were 226 crossbred gilts with an average initial weight of 21.60 kg at 10 weeks old were divided into 2 experimental groups (T01 & T02). A total of 95 fattening gilts in T01 were administered with Improvac® subcutaneously at 11 and 15 weeks old (2 ml per dose). 131 fattening gilts in T02 were unvaccinated. Similar diets were fed ad libitum over the course of study. Their final liveweights were obtained on farm at 27 weeks of age. At the slaughterhouse, the carcasses of fattening gilts from both groups were graded according to Lenden-Speck-Quotient (LSQ) calculation.

Results

T01 had significantly higher ADG by 54.80 gram/day as compared to those in T02 (782.86 grams/day and 728.06 grams/day respectively, $p<0.001$). Average FLW in T01 is 6.52 kg heavier than those in T02 (114.76 kg and 108.24 kg respectively, $p<0.001$). The carcass of fattening gilts in both groups were graded as “A” although T02 had significantly lower score in LSQ than those in T01 by 0.025 ($p = 0.007$).

Discussion and Conclusion

Feed intake has been shown to be higher after IM in fattening gilts, resulting in both increased growth and increased carcass fat which affected the LSQ score. However, the carcass grade in both experimental groups in this study were the same.

IMM-PP-29

EFFICACY OF PCV2A VACCINES ADMINISTERED SEPARATELY OR MIXED WITH M.HYO COMPONENT IN THE PROTECTION AGAINST AN EXPERIMENTAL PCV2D INFECTION

I. Kiss [1], K. Szigeti [2], Z. Homonnay [1], H. Smits [1], R. Krejci [3]

[1]*Ceva Sante Animale, Scientific Support and Investigation Unit, Ceva-Phylaxia Ltd., Budapest, Hungary*

[2]*Ceva Phylaxia, Budapest, Hungary*

[3]*Ceva*

Background and Objectives

PCVD (Porcine Circovirus Diseases) remain a common problem in most of swine farms. Strains of different genotypes of PCV2 are circulating in the herds. The PCV2d seems predominating particularly in farms with clinical PCVD problems. Different mono-valent or combined vaccines are available on the market. The aim of the study was to compare the efficacy of PCV2a vaccines against PCV2d infection

Material and Methods

Conventional weaned piglets (20 per group) were vaccinated at 3 weeks of age (WOA) either with Circovac® 0.5ml (PCV2a vaccine, Ceva) separately (Group C) or mixed (Group DUO) with Hyogen® 2ml (M.hyo vaccine, Ceva) or with a PCV2a Vaccine 1ml mixed with a M.hyo vaccine 1ml (Group RTMA), a group of non- vaccinated pigs served as controls. All were challenged at 12 WOA (D0) with a PCV2d isolate. Pigs were sampled weekly and sacrified 4 weeks (D28) post-challenge (pch). Virus loads were measured by qPCR for efficacy evaluation.

Results

Viremia at 28DPI was 1,1; 1,3; 1,7 and 3,49 log10 copy#/µl for groups C, DUO, RTMA and positive control, respectively ($p<0,05$ control vs others). The PCV2 loads in mesenterial were 5,8; 5,5; 5,5 and 7,98 log10 copy#/µl for groups C, DUO, RTMA and control, respectively ($p<0,05$ control vs others). The loads in mediastinal lymph nodes were 3,8; 3,5; 4,4 and 6.21 log10 copy#/µl for groups C, DUO, RTMA and control respectively ($p<0,05$ control vs others).

Discussion and Conclusion

This study demonstrated that the above mentioned PCV2 vaccine administrated separately or mixed with a corresponding M.hyo vaccine provided equal protection against the epidemiologically most important genotype of PCV2. The reduction of viremia and viral loads in lymphoid tissues were also very similar to the other PCV2/M.hyo RTM products. These results confirm it's convenience being used in the control of PCVD single or together with M.hyo.

IMM-PP-30

ACUTE PHASE PROTEINS IN RESPONSE TO MYCOPLASMA HYOPNEUMONIAE CHALLENGE IN PIGLETS WITH DIFFERENT IMMUNIZATION PROTOCOLS

T.V. Carnevalli Sanches [1], M. Lopes Mechler-Dreibi [1], H. Meiroz De Souza Almeida [1], G.Y. Storino [1], K. Sonalio [1], F.A. Moreira Petri [1], T. Da Silva Martins [2], H.J. Montassier [1], O.A. Sant'Anna [3], M. Carvalho De Abreu Fantini [4], L.C. Cides Da Silva [4], L.G. De Oliveira [1]

[1]São Paulo State University (Unesp), School of Agricultural and Veterinarian Sciences, Jaboticabal, Brazil

[2]Department of Chemistry, Federal University of São Paulo (UNIFESP), Diadema, SP, Brazil

[3]Butantan Institute, São Paulo, Brazil.

[4]University of São Paulo (USP), Physics Institute, São Paulo, Brazil.

Background and Objectives

Mycoplasma hyopneumoniae is the main cause of porcine enzootic pneumonia, a chronic respiratory disease prevalent worldwide. Its prevention is necessary, since its colonization in the lung tissue leads to intense production losses. This study aimed to compare the acute phase proteins in piglets submitted to two immunization protocols - an oral vaccine (OV) using a mesopporous silica (SBA-15) used as adjuvant; and a commercially available vaccine - followed by experimental challenge with M. hyopneumoniae.

Material and Methods

Thirty piglets were divided into six groups (n=6), as follows: 1) piglets vaccinated with the CV at 24 days of age (doa); 2) piglets vaccinated with the OV at 24 doa; 3) piglets vaccinated with CV at 24 doa and a booster with OV at 55 doa; 4) piglets vaccinated with the OV at 24 and 55 doa; 5) control (CONT). All animals were intratracheally challenged at 70 doa with 5 mL of culture medium containing 10^6 CCU/mL of M. hyopneumoniae 232. Blood samples were collected at the vaccination day, 1 and 7 days-post-infection to determine the serum concentration of total proteins and APP by SDS-PAGE.

Results

Serum concentration of α1-antitrypsin and α1-acid-glycoprotein was lower in all vaccinated groups, validating the effectiveness of the vaccine due to stimulation of the immune system prior to the challenge. Transferrin was higher in vaccinated groups than CONT, which may indicate a less intense inflammatory process after challenge. Conversely, albumin was lower in CONT, which had a more severe clinical presentation of the infection.

Discussion and Conclusion

Both the oral and the injectable vaccine were capable of stimulating the innate immune system to a milder inflammatory response conferred by vaccine protection (Mechler-Dreibi et al., 2021), minimizing the effects of M. hyopneumoniae infection.

IMM-PP-31

CASE REPORT: SUCCESSFUL CONTROL OF PCV2 CLINICAL INFECTION WITH A NEW INTRADERMAL MHYO/PCV2 VACCINE ON A NON-VACCINATED FARM

O. Romanov [1], L. Dudar [2], A. Vasyliv [1], I. Serdiuk [3], D. Angelats [4], I.B. Orozco [5]
[1]*Technical Services Manager Swine Business Unit HIPRA CIS*
[2]*Regional Technical Services manager in CIS, HIPRA*
[3]*Technical Services Manager Swine Business Unit HIPRA Ukraine*
[4]*HIPRA, Amer, Spain*
[5]*Corporate Brand Manager, HIPRA, Amer, Spain*

Background and Objectives

PCV2 vaccination is the main tool for controlling both clinical and subclinical PCV2 infection. Most of the farms include PCV2 vaccines on their vaccine protocols, but there are some farms that still don't use it. The following investigation shows the efficacy of a new ready-to-use, one-shot Mhyo/PCV2 ID vaccine to control PCV2 "like" infection in nursery and fattening units.

Material and Methods

The herd responsible veterinarian reported about 5% rate of runts and poor health piglets during the nursery and growing period in the Ukrainian farrow-to-finish farm (550 sows). PCV2 infection was suspected, and serum samples (61 days old and 92 days old n=10 each age) were tested by ELISA Biochek PCV-2. The farm started vaccinating 21 day old piglets with Mhyosphere® PCV ID – Group A (n=2,986). The results were compared with unvaccinated Group B (n=3,101).

Results

30% of samples from 61 day old pigs were positive with ELISA Biochek PCV-2. At the same time 100% from 92 day old pigs were positive with ELISA Biochek PCV-2, so. contact and active circulation field PCV2 was confirmed. ADWG during the nursery period was significantly higher in group A (454,65g) compared to group B (426,01g; p=0.018). Mortality level was statistically lower in group A (3,18%) compared to group B (5,68%; p=0.00089). ADWG in the first quarter of the fattening period was significantly higher in group A (910,22g) compared to group B (827,54g; p=0.027). Mortality level was statistically lower in group A (2,04%) compared to group B (4,25%; p=0.00089).

Discussion and Conclusion

In this field trial, intradermal vaccination of piglets with Mhyosphere® PCV ID, significantly improved ADWG and reduced mortality level in the nursery and growing period by control of PCV2 infection on the farm.

IMM-PP-32

IMPROVEMENT OF THE IMMUNE RESPONSE TO MESOMYCOPLASMA HYOPNEUMONIAE VACCINATION IN PIGLETS AFTER IMMUNIZING SOWS AGAINST PANDEMIC INFLUENZA

V. Cvjetkovic [1], T. Nicolaisen [2], S. Fischer [3], M. Köchling [4]
[1]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf - Germany*
[2]*Vet-Team-Schleswig-Holstein GmbH, Alte Dorfstraße 41, 24327 Kaköhl – Germany*
[3]*Innovative Veterinary Diagnostics (IVD) GmbH, Albert-Einstein-Str. 5, 30926 Seelze-Letter – Germany*
[4]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*

Background and Objectives

Numerous factors can influence vaccine efficacy in pigs, either related to the vaccination process or to animal status. Latter can be diminished in case of fever, viral infections, mycotoxins and maternal antibodies. Present case shows how an infection with Swine Influenza A virus (swIAV) might diminish vaccine response in piglets.

Material and Methods

A 400 farrow-to-finish sow herd reported coughing and weight heterogeneity at the end of the finishing phase. Animals were then cross-sampled for Mesomycoplasma hyopneumoniae (ID Screen® M. hyopneumoniae Competition ELISA). Slaughter lungs were examined by a defined methodology (Ceva Lung Program). Within the next batch, we further analysed nose swabs for swIAV (multiplex subtyping real-time PCR (qPCR)) in clinically inapparent suckling and nursery pigs.

Results

Slaughter lungs revealed a high prevalence of scars (37%) and enzootic pneumonia-like lesions (68%), in addition to a rise in M. hyopneumoniae antibodies at the end of fattening. In nursery, a minority seroconverted after M.hyopneumoniae vaccination (approx. 35%). In two-week-old suckling piglets swIAV subtype H1pdmN1 was detected. After these results, an inactivated pandemic influenza vaccine was administered to the sow herd. This subsequently led to a higher seroconversion rate in weaners after M. hyopneumoniae vaccination (85%) and stabilized the clinical picture during fattening.

Discussion and Conclusion

Here we report a case of respiratory disease at the end of fattening, primarily caused by M. hyopneumoniae. The origin of this disorder can probably be found at weaning, since piglets sampled around the time point of M. hyopneumoniae vaccination were positive for pandemic influenza. We postulate that the vaccination of sows with Respiporc FLUpan H1N1® reduced horizontal swIAV-transmission to piglets, reinforced general immune response through swIAV-related maternal immunity, thus establishing a more robust immune answer to Hyogen®. This led to higher humoral immunity (85% seroconversion), in similarity to previous reports (75%) and stabilized the clinical picture in older animals.

IMM-PP-33

INFLUENCE OF SACCHAROMYCES CEREVISIAE BOULARDII CNCM I-1079 ON IGA PRODUCING CELLS NUMBER AFTER VACCINATION AGAINST ACTINOBACILLUS PLEUROPNEUMONIAE

G. Ramis [1], B. Gonzalez-Guijarro [1], F. Pallarés-Martínez [2], E. Chevaux [3], M. Castex [3], P. Lebreton [3], D. Saornil [3], F. Bravo De Laguna [3]

[1]*Departamento de Producción Animal. Universidad de Murcia*

[2]*Department of Anatomy and Comparative Pathology and Toxicology, Faculty of Veterinary Medicine, University of Córdoba, Córdoba, Spain*

[3]*Lallemand SAS, Blagnac, France*

Background and Objectives

The usage of probiotics may affect humoral and cell mediated immunity, and therefore improve the health of pigs. The objective of this work was to assess the interaction between the live yeast Saccharomyces cerevisiae boulardii CNCM-I 1079 (LSB; Levucell®SB; Lallemand SAS, France) supplementation to sows and piglets and the response of the piglets to vaccination against Actinobacillus pleuropneumoniae (APP).

Material and Methods

Seventy-two mixed parity sows were supplemented (LSB) or not (CON) with 2×10^9 colony forming units (CFU)/kg of LSB from 1 week before the expected farrowing day until weaning. At weaning, piglets from the same group were allotted to 2 diets: control (CON) and LSB (CON + $2x10^9$ CFU/kg and $1x10^9$ CFU/kg in phases 1 and 2), resulting 4 treatments during post-weaning: CONCON, CONLSB, LSBCON, LSBLSB. The piglets were vaccinated against APP (Coglapix, Ceva Santé Animale, France) on days 26 and 49 post-weaning. Samples from lungs, mediastinal lymphnodes and jejunum were taken from 15 pigs/treatment 3 weeks after the second vaccination, and IgA producing cells were counted in each compartment.

Results

There was a trend to a low number of IgA producing cells in the lymphnode of the LSBLSB pigs (CONCON=7.08^{a}; CONLSB=5.43^{a}, LSBCON=4.55^{ab}, LSBLSB=3.66^{b}; p=0.059). Besides, we observed a lower number of cells in the lymphnode of pigs from LSB-fed sows (CON=6.28, LSB=4.14, p=0.039).

Discussion and Conclusion

Mucosal immunity is based on IgA, and becomes active in response to a challenge. Additionally, respiratory and gastrointestinal tracts share a mucosal immune system, and are connected by the gut-lung axis. Piglets in the LSBLSB group and piglets from LSB-fed sows could have been in less contact with an immune stimulating organism in the gut due to the probiotic effect. It is concluded that supplementing sows with Saccharomyces cerevisiae boulardii has a beneficial effect on mucosal protection of post-weaning piglets.

IMM-PP-34

REDUCTION ON LAWSONIA INTRACELLULARIS FAECAL SHEDDING IN PIGS CHRONICALLY INFECTED AFTER INTRAMUSCULAR VACCINATION AGAINST LAWSONIA INTRACELLULARIS

R. Del Pozo Sacristan [1], J. Lunt [2], D. Berkshire [2]
[1]*MSD AH UK*
[2]*Bishopton Veterinary Group*

Background and Objectives

Lawsonia intracellularis is the aetiological agent of Ileitis, an enteric disease in pigs causing economic losses to pig industry. Faecal shedding is correlated with severity of intestinal lesions and growth reduction. This study aims to quantify the faecal shedding of L. intracellularis at pen level in pigs vaccinated intramuscularly in comparison with non-vaccinated pigs.

Material and Methods

A British herd with history of chronic ileitis was selected. In total, 2200 pigs from 5 consecutive batches were included in this study. In each batch, half of the pigs were vaccinated with Porcilis®Lawsonia at 21 days of age (Group-V) and half remained non-vaccinated (Group-NV). Pigs from different groups shared the same compartment, but different pens. Longitudinal sampling was performed at six sampling points (6/9/12/15/18/21 weeks of age). A minimum of 5 fresh faecal samples were collected from the floor in each pen and pooled in groups of five. Faecal shedding was quantified by qPCR (Ingenetix®). The AUC of the qPCR data was calculated as a measure of total bacterial load over time. Kruskal-Wallis test was performed.

Results

Average AUC values from 6 to 21wk of age were 15.43 and 7.78 log10 copies/µl, for controls and vaccinates, respectively ($P<0.05$). AUC was lower in vaccinates from all five batches investigated. No bacterial shedding was detected at 6-9wk of age. The average bacterial load (log10 copies/µl) was lower in vaccinated pens at 12 (NV:0.79; V:0.05; $P<0.01$), 15 (NV:0.98; V:0.43; $P=0.08$), 18 (NV:2.56; V:1.48; $P<0.01$) and 21 (NV:2.02; V:1.73; $P>0.05$) wk. The percentage of PCR+ pens was also lower in vaccinates from all age groups.

Discussion and Conclusion

Under the conditions of this study, L. intracellularis intramuscular vaccination reduced faecal shedding and bacterial load in growers/finishers chronically infected. Further research is warranted to elucidate the impact on performance.

IMM-PP-35

REGULATION OF THE GUT INTEGRITY AND MICROBIAL PROFILE OF POST-WEANING PIGS WITH THE ADMINISTRATION OF ETEC F4/F18 BIVALENT VACCINE

P. Trevisi [1], D. Luise [1], F. Correa [1], L. Amatucci [2], S. Virdis [2], C. Negrini [2], P.J. Sanchez [3], M. Mazzoni [4], M. Vecchi [3], P. Bosi [1]

[1]Department of Agricultural and Food Sciences, Bologna University, Bologna (Italy)

[2]Department of Agricultural and Food Sciences, University of Bologna, Viale G. Fanin 46, Bologna, 40127, Italy

[3]Elanco Animal Health, Italy

[4]Department of Veterinary Medical Sciences, University of Bologna, Via. Tolara di Sopra 50, 40064 Ozzano Emilia, Italy

Background and Objectives

Post-weaning diarrhoea caused by enterotoxigenic Escherichia coli (ETEC) F4 and F18 remains a major issue in the pig industry. This study aims to determine the effect of the administration of the oral bivalent vaccine for ETEC F4/F18 on the gut homeostasis, growth performance and health of healthy post-weaning piglets.

Material and Methods

96 healthy piglets, selected from a farm where the tested vaccine was not used and where ETEC F4 and/or F18 were previously isolated, were weaned (23.30 ± 1.85 days; 7334.3 ± 1038.6 g, d0) and divided into 2 groups (16 replicates/group; 3 piglets/replicate) as follow: 1) Control (CO), fed with a standard diet; 2) Treated (TRT): as CO but vaccinated with Coliprotec F4/F18® at d0. Piglets were weighed at d0 and weekly until d35. The faecal score was recorded during the trial. At d10 and d35, jejunum and colon samples were collected for morphometric and immunohistochemistry analysis and microbial profile, respectively.

Results

From d0 to d14, the average daily gain tended to be higher in the TRT group (P=0.08) and the average daily feed intake was higher in the TRT group (P=0.022). Feed to gain ratio tended to be higher in the TRT group from d0 to d35 (P=0.070). From d7 to d14, the TRT group had a lower diarrhoea index (P<0.001). The crypt depth was higher in the CO group (P=0.04) at d10. The jejunal protein expression of Claudin-4 was higher in the TRT group at d10 (P<0.0001) and d35 (P=0.0004). Vaccination did not affect the microbial diversity indices but promoted the cecal colonization by beneficial bacteria including Prevotella and Eubacterium at d10.

Discussion and Conclusion

The ETEC bivalent vaccine can promote the gut health of post-weaning pigs modulating the gut microbiota and promoting the gut barrier integrity, resulting in lower diarrhoea index and better growth performance.

IMM-PP-36

SUBACUTE EDEMA DISEASE: POSITIVE EFFECT OF THE VACCINATION AGAINST SHIGATOXIN STX2E ON PERFORMANCES.

S. Brilland [4], L. Daniel [1], D. Descamps [1], C. Demoitié [2], J. Morin [3], N. Capdevielle [4], A. Jardin [4]
[1]*Vet'Sphère, ZI de Tirpen, 56140 Malestroit, France*
[2]*Hyovet, 5 Parc d'Activités Carrefour de Penthièvre, 22640 Plestan, France*
[3]*Selas Vétérinaire du Gouessant, 3 Rue de la Jeannaie Maroué, 22400 Lamballe, France*
[4]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*

Background and Objectives

Edema disease (ED), one of the major diseases in pigs during nursery, is caused by Shigatoxin-Stx2e, produced by STEC (Shiga Toxin producing Escherichia coli). Mainly described as an acute pathology, STEC colonization might be linked with negative effect on zootechnical performance. The objective of this study was to evaluate the evolution of zootechnical performance on farms affected by a subacute form and having implemented vaccination.

Material and Methods

Four farms confirmed as being positive for presence of Stx2 STEC by cultivation, typisation and qPCR were included. Selected farms didn't use any edema vaccine and didn't express any clinical signs and outbreaks of the ED. Ecoporc Shiga® vaccination was implemented and piglets were vaccinated between 4 and 7 days of life. Performance parameters (ADG – average daily gain as well % of mortality) in periods before and after (minimum 4 batches – min 300 piglets per batch) implementation of vaccination was compared.

Results

In farms A,B,D growth performances between weaning and slaughtering improved (ADG increased respectively by 3g, 39g ($p<0.05$) and 13g). In farm C, the ADG in post-weaning significantly increased by 51 grams. In farms A,B the implementation of the vaccine resulted into a significant decrease of mortality in post-weaning period (respectively of 2 and 2.4 points) raising less than 1% ; in farms C,D, it remains stable.

Discussion and Conclusion

Results of this study confirmed outcomes of previous works and offering interesting prospects in improving the performance of farms implementing Ecoporc Shiga® vaccination where subacute edema disease is suspected (frequency estimated at nearly 70%). Further studies are needed in order to confirm the positive effect of vaccination in STEC positive farms.

IMM-PP-37

A STUDY OF POSTVACCINATION ANTIBODY RESPONSE AGAINST LEPTOSPIRA USING MICROSCOPIC AGGLUTINATION TEST (MAT)

A. Ortega [1], I. Perez [1], M. Jiménez [2], M. Marcos [2], C. Llorente [2], R. Menjon [2]
[1]*Agropecuaria Obanos*
[2]*MSD Animal Health*

Background and Objectives

Leptospirosis is a zoonotic disease; pigs are one of the main reservoirs for some Leptospira serovars. Group housing and reduced antibiotic use have led to an increased prevalence. Inactivated vaccines against different serovars are used for prevention. They may generate different antibody levels. The aim of this study is to monitor antibody response in a group of gilts from initial vaccination to first

Material and Methods

Forty 180-days-old gilts from a 2100 sow farm (10 from each weekly batch) were selected from October 2020 to June 2021. Gilts were individually identified and Leptospira MAT titers for serovars Bratislava, Pomona and Icterohaemorrhagiae were monitored from acclimatization to weaning. Gilts were vaccinated against leptospirosis with a multivalent vaccine: (Porcilis® Ery+Parvo+Lepto) at 185 days (d) and revaccinated at 215d. Gilts were bred at 250d.Age at blood sampling (1) 180d, (2) 236d, (3) 280d (1st month of gestation) and (4) 387d (at weaning)

Results

The % of positive tests [and mean antibody MAT titers] at different sampling times for the following serovars were:
Brat. (n=34), (1) 2.5% [1.5], (2) 90% [508], (3) 80% [283], (4) 37% [50], highly significant seroconversion differences between samplings ($p<0.001$)
Pomo.(n=30), (1) 0% [0], (2) 20.5% [23], (3) 11% [13], (4) 8% [8.3], ($p= 0.148$)
Icte.(n=30), (1) 0% [0], (2) 61% [71], (3) 69% [78], (4) 81% [68], significant differences between (1) and remaining samplings ($p<0.05$)

Discussion and Conclusion

In this study MAT shows vaccination under these field conditions clearly induces seroconversion in negative gilts, but there are different results for different serovars. Most gilts seroconvert and develop high MAT titers against Bratislava and Icterohaemorrhagiae. MAT can be a useful technique for monitoring proper vaccine mediated immunization. Additional studies will be needed to understand what happens in other farms and in infected animals

IMM-PP-38

ASSESSMENT OF PORCINE LUNG LESIONS AT SLAUGHTER FROM BATCHES VACCINATED WITH TWO DIFFERENT COMMERCIAL MYCOPLASMA HYOPNEUMONIAE VACCINES

C. Söckler [1], K. Golacz [1], P. Eulitz [2], M. Lisgara [3], R. Krejci [4], C. Waehner [1]
[1]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*
[2]*Ceva Tiergesundheit GmbH Kanzlerstr. 4, 40472 Düsseldorf - Deutschland*
[3]*Ceva Hellas LLC, 15, Ag. Nikolaou street, 174 55 Alimos (Attiki) Greece*
[4]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Enzootic pneumonia, which is primarily caused by Mycoplasma hyopneumoniae (M. hyo), can be effectively controlled by vaccination. Among the available vaccination protocols, there is the single shot vaccination with a monovalent vaccine. The aim of this study was to examine the possible association of lung lesions at slaughter with two different single shot commercial vaccines against M. hyo.

Material and Methods

From December 2019 until September 2021, in total, 5867 slaughter lungs from German and Austrian farms were evaluated according to the Ceva Lung Program methodology. The two most commonly used single shot M. hyo vaccines were Hyogen® (vaccine A), with 29 batches of 1572 lungs in total, belonging to 23 different farms and vaccine B, with 13 batches of 972 lungs in total, belonging to 12 different farms. At least 30 lungs were evaluated per batch. Lung lesion scores were analysed on the batch level. The frequency of bronchopneumonic lungs (BP) and the percentage of affected lung surface in both vaccination groups were compared statistically. The results were adjusted for the possible "season" effect ("warm period": October – March, "cold period": April - September).

Results

Median (range) frequency of BP was 41% (3-85%) for vaccine A and 57% (17-88%) for vaccine B. Regarding the severity of bronchopneumonic lesions, the median (range) of the percentage of affected lung surface was 4% (0.06-12%) and 5% (1-11%) for vaccines A and B, respectively. Pigs which were vaccinated with vaccine A had on average 23% less ($p<0.001$; Mixed-effects linear regression model with sampling weights) affected lungs compared to pigs which were vaccinated with vaccine B.

Discussion and Conclusion

In this cross-sectional study, frequency of BP was negatively associated with the use of vaccine A compared to the other single shot vaccine.

IMM-PP-39

PERFORMANCE AND ROI AFTER INTRAMUSCULAR LAWSONIA INTRACELLULARIS VACCINATION COMPARED TO ORAL VACCINATION

R. Del Pozo Sacristan [1], T. Allen [2], C. Blackstone [2], J. James [3], M. Wood [3]
[1]*MSD AH UK*
[2]*North Stoke Farm, UK*
[3]*Larkmead Vets, UK*

Background and Objectives

Lawsonia intracellularis is the aetiological agent of Ileitis, an enteric disease in pig causing economic losses to pig industry. This study aims to evaluate the performance of an intramuscular vaccination against L. intracellularis in a herd with chronic ileitis and to compare it with oral vaccination.

Material and Methods

A wean-to-finish commercial herd with history of chronic ileitis was selected. In total, 9293 pigs from 22 consecutive batches were included in this study. The first 11 batches were orally vaccinated at weaning with Enterisol®Ileitis (historical control; Group-C; Jul-Sep2020; n=4656). The subsequent 11 batches were vaccinated intramuscularly with Porcilis®Lawsonia at weaning (Group-L; Sep-Dec2020; n=4637). Due to ethical reasons no negative control was included. Therefore, the historical vaccination program (Group-C) was used as historical control for comparison. Weight was recorded at pen level at weaning, entrance into growing unit, entrance into finishing unit and prior slaughter. ADG, FCR and percentage of runts sold before full market value were calculated. ANOVA and Kruskal-Wallis tests were performed. An economic model developed by Holtkamp 2019 was run to calculate benefit of intramuscular vaccination and ROI.

Results

Weigh-in at weaning (C:9.2±0.7kg; L:9.3±0.6kg; $P>0.05$) and at growing (C:21.7±1.7kg; L:21.8±1.3kg; $P>0.05$) were similar, whereas weigh-in at finishing (C:45.7±3.3kg; L:48.8±2.8kg; $P<0.05$) and weigh-out at slaughter (C:106.8±2.8kg; L:113.2±2.5kg; $P<0.05$) were significantly higher in pigs vaccinated intramuscularly. ADG (C:914±86; L:934±40; $P>0.05$) and FCR (C:3.1±0.4; L:2.9±0.2; $P>0.05$) were numerically improved and %runts sold (C:8±5; L:1.5±0.8; $P<0.05$) significantly reduced after intramuscular vaccination.

Discussion and Conclusion

Under the conditions of this study, L. intracellularis intramuscular vaccination increased performance (+6.4kg liveweight at slaughter, +6 full-market pigs/100 marketed pigs) when compared with oral vaccination, leading to a valuable economic benefit (+£2.88 per pig placed; benefit:cost ratio 4.44) and ROI (344%).

IMM-PP-40

REPETITIVE MYCOFLEX VACCINATION RESULTS IN ANTIBODY SEROCONVERSION

K. Visscher [1], V. Thuring [1], M. Steenaert [2], R. Jansen [3]
[1]*Coöperatie Varkensartsen*
[2]*Boehringer Ingelheim Animal Health Netherlands bv*
[3]*Boehringer Ingelheim Vetmedica GmbH*

Background and Objectives

On a Mycoplasma hyopneumoniae SPF breeding herd the vaccination protocol for the F1-gilts changed from a single mycoplasma vaccination (21 days) to a double vaccination (21 days and at 6 months; MycoFLEX, Boehringer Ingelheim (MF)). The involved animals showed seroconversion after the second vaccination, without any clinical symptoms of a mycoplasma outbreak.
The objective of this study was to assess the effect of multiple dosing of MF and how this will influence the test outcome of commercial Mycoplasma antibody tests.

Material and Methods

In total 31 animals were followed longitudinal, with in total three treatment groups: CON (not vaccinated; #10), MF2 (vaccinated at 21 and 112 days age; #11, MF 3 (vaccinated at 21, 112 and 152 days age; #10). Pigs were bled at the age of 112 days, 152 and 194 days. Pigs were comingled and group housed together. Serum was submitted to the GD Deventer for mycoplasma antibody testing (indirect Elisa and second confirmation by blocking Elisa).

Results

At the age of 112 days all pigs remained seronegative by the Indirect Elisa although there was a significant difference between CON and MF2/3 (-0.02 vs 0.06 $p<0.01$). This changed after the second vaccination at the age of 152 days (CON #0 pos, 0.02; MF2 #5 pos, 0.44; MF3 #9 pos, 0.68; $p<0.001$) and for the confirmation test (CON #1; MF2 #10, MF 3 #10). After the third vaccination a further rise in antibodies was seen in the MF3 group (CON 0.16; MF2 0.38; MF3 0.83 $p<0.001$).

Discussion and Conclusion

Single administration does not lead to a positive antibody outcome. Multiple administration of MF shows a dose response effect. The second vaccination response could be used as a compliance marker.
Positive Mhyo antibody outcome after a second injection must be taken in account when the health status of a Mho-free SPF herd is assessed.

IMM-PP-42

ASSESSMENT OF ANTIBODY LEVELS IN HYPERPROLIFIC SOWS RECEIVING DIFFERENT VACCINATION PROTOCOLS AGAINST NEONATAL PIGLET DIARRHEA CAUSED BY ENTEROTOXIC ESCHERICHIA COLI (ETEC)

J. Grandia Anso [1], M. Jiménez [2], M. Marcos [2], R. Menjon [2]
[1]*ANDRIMNER Spain*
[2]*MSD Animal Health*

Background and Objectives

Neonatal diarrhea (ND) caused by ETEC is one of the most common diseases in farrowing, causing morbidity and major economic losses. The most effective prevention is through passive colostral and lactogenic immunity. The aim of this study is the assessment of several vaccination programs, measuring antibody levels obtained to identify the most appropriate prevention strategy

Material and Methods

The study was carried out in a commercial Spanish farm with hyperprolific genetics. Two commercial vaccines were used (vaccine A, Porcilis ColiClos®; vaccine B, Colidex®) to assess antibody concentrations against the most prevalent virulence factor in ND (F4ab, F4ac, F5, F6 and LT), using in-house ELISA tests from MSD AH. 75 sows were selected (1st and 2nd parity) divided into 5 groups with 2 different vaccination schedules; Groups 1 (1st parity) and 3 (2nd parity) (vaccine A), groups 2 (1st parity) and 5 (2nd parity) (vaccine B), vaccination 6 and 4 weeks before farrowing, group 4 (2nd parity, vaccine A) vaccination 4 weeks before farrowing. Piglet blood samples were taken 24h after farrowing, after 7-10d and at weaning, and from all sows on weeks 6, 4 and 2 before farrowing.

Results

Piglets in groups 1 and 3, had higher antibody titers than those of groups 2 and 4 on days 1 and 7-10 after farrowing ($p<0.001$). Sow antibody titers, 2 weeks before farrowing, were highest in 2-dose schedules on second parity ($p< 0.05$), and highest in all animals in vaccine A groups versus vaccine B groups ($p<0.05$).

Discussion and Conclusion

Availability of colostrum with high antibody levels is crucial, given the large numbers of piglets born in hyperprolific litters. In this study, differences between the vaccination programs used were demonstrated, with higher antibody levels from 2-dose programs in 2nd parity sows too, which can help improve control of ND

IMM-PP-43

COMPARATIVE EFFICACY STUDY OF THREE COMMERCIAL PRRS-1 MLV VACCINATION AT 21 DAYS OF AGE AGAINST CHALLENGE WITH A EUROPEAN PRRSV ISOLATE IN PIGS

C.K. Mah [1], J. Angulo [3], E. Scott-Baird [2], L. Hancox [5], A. Aldaz [3], M. Balasch [4], G. Rivero [5]

[1]*Zoetis Dublin, Ireland D18 T3Y1*

[2]*Drayton Animal Health, Warwickshire, CV37 9RQ, UK*

[3]*Zoetis Inc, Parsippany, NJ, USA*

[4]*Zoetis Manufacturing&Research Spain S.L., Ctra. Camprodon s/n, La Riba, 17813 Vall de Bianya (Girona), Spain*

[5]*Zoetis UK Ltd, Leatherhead KT22 7LP, UK*

Background and Objectives

The study aimed at comparing the efficacies among three commercial PRRS-1 MLV vaccines (T02 = Ingelvac PRRSFlex, T03 = Porcilis PRRS, and T04 = Suvaxyn PRRS) and in comparison with an unvaccinated-challenged group (T01 = negative control), by assessing lung lesions, viremia levels in serum and nasal virus excretion post artificial challenge.

Material and Methods

Sixty-four pigs at 21 days of age in good health and body condition, were randomly assigned to four treatment groups with equal numbers in sex. T01 served as a negative control group, while pigs in T02, T03, T04 were intramuscularly vaccinated on study Day 0. On study Day 28, all pigs were challenged with 2ml of PRRS-1, subtype 1, strain Olot/91 P6 via intranasal route. The serum and nasal swab samples were collected for PRRS antibody assay by IDEXX ELISA and for PRRS virus analysis by PCR. All pigs were humanely euthanized for lung scoring on study Day 40. Non-inferiority (5% margin) and significance test at two-sided 5% alpha level were performed on the viremia and nasal virus shedding data among three vaccinated groups and in comparison, with the unvaccinated-challenged group, respectively.

Results

Lung lesion evaluation showed pigs in T01 had significantly greater percentage total lung lesions than those of the three vaccinated groups. The non-inferiority viremia and nasal virus shedding results among three vaccinated groups were inferred, moreover, a significantly less viremia and nasal virus shedding were found for T04 as compared to groups T02 and T03.

Discussion and Conclusion

Results presented in this study indicate the overall performance on the viremia and nasal virus shedding for the individual days and for the % days viremic of Suvaxyn PRRS vaccine was not inferior, but greater efficacy than Ingelvac PRRSFlex and Porcilis PRRS. Efficacy was demonstrated for all three vaccines when compared to the negative control.

IMM-PP-44

EXPLORATORY FIELD STUDY ON THE EFFECTS OF SOW VACCINATION AGAINST PRRSV USING COMBINED PROTOCOLS ON PIGLET VIRAEMIA AT WEANING

C. Agüero [1], S. Mesonero-Escuredo [2], D. Espigares [2], L. Garza [2]
[1]*UVESA, Valladolid, España*
[2]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

Porcine reproductive and respiratory syndrome virus (PRRSv) is one of the most economically important pathogens in the swine industry worldwide. Vaccination protocols against PRRSv based on the combination of modified live (MLV) and killed (KV) vaccines in sows are used to maintain the PRRS immunity and stability within herds. However, information on the effect of those combined protocols on piglet's viraemia is limited. This study aimed to describe the efficacy of a mixed vaccination program consisting of the combination of modified live (MLV) and inactivated (KV) vaccines in sows for controlling PRRSV.

Material and Methods

This study was carried out in a PRRS instable two-site farm with 2,800 sows, experiencing a PRRSv outbreak. Initially, whole herd was vaccinated with MLV and four weeks later, with KV (Progressis®, Ceva). Afterwards, sows were vaccinated with KV at 4 weeks pre-farrowing (wpf). Blood samples (BS) from 30 piglets at weaning were taken every 6 weeks (n=210). These samples were tested using 5 samples/pool by PRRSV RT-PCR (LSI VetMax PRRSV EU/NA, Thermo Fisher Scientific).

Results

A total of 210 piglets were monitored at weaning. Piglets were PRRSV positive during the outbreak (B-1: 6/6, 100%) and in the following batch (B0: 2/6, 33%). First batch of PRRS negative piglets at weaning coincided with the first batch of piglets from vaccinated sows with KV vaccine in cycle. All piglets from subsequent six batches sampled monthly were PCR negative to PRRS, confirming PRRSV stability in this farm.

Discussion and Conclusion

Obtained results indicated that vaccination schedule based on the combination of MLV and KV vaccines could be a useful strategy for PRRS stabilization on a commercial swine farm.

IMM-PP-45

THE ROLE OF ANTIGEN-SPECIFIC T CELLS IN PARASITE DISTRIBUTION AND PREDISPOSITION TO ASCARIS SUUM IN PIGS

L. Oser [1], F. Ebner [1], S. Hartmann [1]
[1]*Institute of Immunology, Centre for Infection Medicine, Department of Veterinary Medicine, Freie Universität Berlin, Berlin*

Background and Objectives

The large roundworms Ascaris lumbricoides and Ascaris suum are amongst the most prevalent soil-transmitted helminths infecting humans and pigs worldwide. Well known is the phenomenon of parasite overdispersion in a host population. While a small number of hosts harbor large worm burdens, the majority of individuals harbor low worm burdens. We propose to study the pig and its roundworm Ascaris suum as an outbred parasite-host-system to address antigen-specific CD4+ T cells.

Material and Methods

Our lab has recently established a flow cytometric assay that is based on the magnetic enrichment of these rare adaptive immune cells in swine. The antigen-reactive T cell enrichment (ARTE) allows the detection of antigen-specific CD4+ T cells via the early activation marker CD154 (CD40L). Pre-enriched cells can then be analyzed according to their cytokine expression. Currently, we investigate the kinetics of Ascaris-specific T cell responses following the larval invasion, migration, and maturation of the nematode.

Results

Our initial studies indicate that systemic antigen-specific CD4+ T helper cell levels vary during the different life stages of the parasite, peaking in frequency at 5-6 weeks post-infection. Furthermore, we phenotypically characterized these cells as potent IL-4 producers co-expressing TNFa and, to some extent, also IFNg. The results suggest that IL-4 producing T cells are selectively reduced during the chronic phase of infection while IFNg-secreting cells retain their levels. Moreover, we observed that systemic levels of antigen-specific CD4+ T helper cells positively correlate with parasite burden during primary infection.

Discussion and Conclusion

Thus, we propose to further investigate the role of these specific T helper cells in pigs. In this manner, a potential new diagnostic tool could be developed for monitoring Ascariasis in pig herds. Additionally, we suggest expanding the use of antigen-specific T helper cells to monitor infection/vaccine response in swine.

IMM-PP-46

FIELD ASSESSMENT OF TWO PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS) MODIFIED-LIVE VACCINES BASED ON MEASUREMENTS OF SEROLOGIC RESPONSE AND REPRODUCTIVE OUTCOMES IN VACCINATED SOWS

W. Navasakuljinda [1], S. Chitmankwanyuen [1], S. Nantakhruea [1], P. Wongchanapai [1], C. Muangpaisarn [1], C.K. Mah [2]

[1]*Zoetis (Thailand) Limited, Bangkok 10500, Thailand*

[2]*Zoetis*

Background and Objectives

Due to the recurrent reproductive issues, a 2,200-sows, farrow-to-finish farm in Thailand decided to switch their PRRS mass vaccination program in sows from Prime Pac® PRRS to Fostera PRRS®. The objective of this study was to assess the effect of these two vaccines by measuring the serologic response and reproductive outcomes in vaccinated sows.

Material and Methods

A total of 76 sows from mixed parities were randomly enrolled into two groups seven weeks before breeding. Group 1 (T01, n=38) received a single 2 mL dose by intramuscular injection of Prime Pac® PRRS and the second group (T02, n=38) received a single 2 mL dose of Fostera PRRS®. Sows were observed daily until farrowing for clinical signs of PRRS. Blood samples were collected from all animals four weeks post-vaccination. Colostrum samples were collected from 27 sows which farrowed at the same day: 18 and 9 samples from T01 and T02, respectively. Both samples were assessed for neutralizing antibody titers by serum neutralization (SN) assay. At farrowing, piglets that were born alive or dead were recorded.

Results

T01 sows had numerically higher rates of inappetence and respiratory distress versus T02 sows (13.16% vs 2.65%). The mean SN titer from serum samples of T01 and T02 was 3.105 log2 and 4.710 log2 respectively (P= 0.002), while the mean SN titer from colostrum samples of T01 and T02 were 1.222 log2 and 2.889 log2 respectively (P = 0.008). At farrowing, 93.17 % of the piglets from T02 sows were born viable versus 87.13% of piglets born alive from T01 sows.

Discussion and Conclusion

T02 sows had signficantly higher neutralizing antibody levels, fewer PRRS related clinical signs and farrowed more viable litters than T01 sows. These results indicated that the new PRRS vaccine is capable to improve the overall reproductive performance in the affected sows and their offspring.

IMM-PP-47

COMPARISON OF THE EFFICACY AGAINST MYCOPLASMA HYOPNEUMONIAE (MHYO) AND PORCINE CIRCOVIRUS TYPE 2 (PCV2) OF TWO DIFFERENT VACCINE PROTOCOLS: CIRCOVAC® AND HYOGEN® VERSUS INTRADERMAL PCV2 AND M.HYO VACCINES.

A. Lemistre [1], A. Urquia [1], N. Chevreul [2], P. Leneveu [2], A. Jardin [2], S. Brilland [2]

[1]*Chêne vert - Conseil Vétérinaire, 2 Rue Pierre Harel, 35133 Lécousse, France*

[2]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*

Background and Objectives

Both Porcine Circovirus type 2 (PCV2) and Mycoplasma hyopneumoniae (Mhyo) are worldwide, potentially severe loss-causing pathogens. Vaccination around weaning is commonly used to control and prevent clinical signs and is considered as an efficient tool to control these diseases. The aim of this trial was to compare the efficacy of intradermal PCV2 and M.hyo vaccines (strategy A) with Circovac® and Hyogen® (strategy B) both combinations administered simultaneously.

Material and Methods

In a French commercial post-weaning and fattening farm, with a history of enzootic pneumonia (EP) and PCV2-associated disease (PCVD), 4 consecutive batches were included in the trial. The first 2 batches B1-B2 (Group A = 852 pigs) were vaccinated with strategy A vaccines and the 2 others B3-B4 (Group B = 863 pigs) with strategy B vaccines one week after weaning (28 doa). Clinical signs, mortality, weight gain and EP-like lung lesions (using Ceva Lung Program method) were examined and compared.

Results

Mortality (3.2% vs 3.9%, p=0.19) and growth performances (ADG inclusion-slaughter 725g vs 720g, p=0.15) didn't differ significantly between GA and GB. The average lung lesion scores (0.9 vs 0.5, p<0.001) and the percentage of healthy pigs (62% vs 72% respectively, p<0.001) were significantly lower in GB than GA. Acute swine influenza syndrome occurred during the trial (identification of H1avN2). Only B2 (GA) was treated at 7.5 woa with paracetamol and amoxicillin orally. B4 (GB) was also affected by respiratory disorders in post-weaning but the batch remained untreated. No histopathology was carried out.

Discussion and Conclusion

In this study, in a context of flu H1avN2 outbreak, both protocols provided very low lungs scores at slauhgterhouse (even though not pathognomonic of Mhyo) and so efficient protection against Mhyo and PCV2 infection. On top of that, strategy B vaccination was significantly better in reduction of EP-like lung lesions, than the intradermal vaccines.

IMM-PP-48

QUALITY OF THE EMULSION AFTER MIXING PCV2 AND M.HYO INACTIVATED VACCINES

K. Toth [1], L. Naszalyi-Nagy [1], R. Krejci [2], P. Mazerolles [3]
[1]*Ceva Phylaxia, Budapest, Hungary*
[2]*Ceva Sante Animale, France*
[3]*Ceva Sante Animale, Libourne, France*

Background and Objectives

Porcine circovirus diseases (PCVD) and Enzootic pneumonia (EP) remain the most widely spread diseases in swine industry due to PCV2 and M.hyo. Vaccines against PCV2 and M.hyo are the most frequently used biologicals for pigs. Circovac® (C) and Hyogen® (H) (both Ceva) are vaccines licensed for ready-to-mix use in piglets. Mixing them prior to the administration facilitates one shot injection of both antigens. The aim of the study was to assess and present the physical properties of the mixed emulsion ready to be injected.

Material and Methods

Vaccines were reconstituted and mixed according to the manufacturer's instructions. The distribution of particle size was measured by Malvern Mastersizer 3000. Viscosity was measured by Brookfield viscosimeter. Syringeability was determined by measuring the flow-out time of 10 ml vaccine pressed through a 21G needle under the vertically acting force of 3,3 kg a weight.

Results

Particle size distribution of mixed emulsion showed a narrow profile very similar to the profile of each particular vaccines before mixing. There was no population of big particle size. The characteristics of the mixture remain unchanged after 7 days. The viscosity of the final emulsion was 2,1 compared to 5,2 and 2,0 for C and H vaccines respectively (all values in centipoise). Time to pass 10ml of C, H and DUO vaccines through the needle was 6,2; 4,8 and 4,9 sec.

Discussion and Conclusion

Mixing those two vaccines together in the recommended ratio provides a homogenous, smooth and stable emulsion. The physical properties demonstrated that DUO is easy to be used for the injectable administration also in the field condition for the mass vaccination of piglets.

IMM-PP-49

EVALUATION OF TWO VACCINATION PROTOCOLS AGAINST PCV2 AND MYCOPLASMA HYOPNEUMONIAE COMPARING GROWTH PERFORMANCE DATA

F. Rolandi [1], D. Gerbaldo [1], E. Loustaunau [1], J. Calveyra [2], D. Sperling [3]
[1]*Ceva Animal Health, Argentina*
[2]*Ceva Animal Health, Brazil*
[3]*Ceva Animal Health, France*

Background and Objectives

Mycoplasma hyopneumoniae (Mhyo) and Porcine circovirus type 2 (PCV2) are two important pathogens and result in considerable economic loss to the swine industry worldwide. Vaccination is considered the most effective method to control these two pathogens. To assess the effectiveness of vaccination protocols, batch data performance can be used. The aim of this study was to evaluate two vaccination protocols against Mhyo and PCV2 in a commercial herd in Argentina.

Material and Methods

The evaluation was carried out in a commercial farm of 4000 sows located in the Santa Fe region, in Argentina. Three batches were vaccinated with Circovac® and Hyogen® at 3 WOA (group G1) and 7 batches were vaccinated with Mhyo and PCV2 - vaccine A - at 3 and 6 WOA (group G2). Each batch had approximately 1000 animals. Pigs' growth performance was recorded, and the relevant economic impact was calculated by using Respinomics™.

Results

The performance data of the evaluated batches showed that G1 presented 14 grams higher ADG (G1 = 1006 g Vs G2 = 992 g, p>0.05), 0.2 better feed conversion (G1 = 2.52 Vs G2 = 2.72) and 0.4% lower mortality (G1 = 1.59% Vs G2 = 2.03% p>0.05) compared to G2. The economic benefit was calculated, resulting in a gain of 1.05 euros / G1 vaccinated animal.

Discussion and Conclusion

The study farm already had a history of good performance results. Even so, the batches vaccinated with G1 Group showed greater profitability, due to the better performance of the animals. Similar results were also found in comparative studies with different vaccination protocols. Through these field trials, many farms have adopted this protocol as a tool to control these two important swine pathogens.

IMM-PP-50

POSITIVE IMPACT ON HEALTH CONDITION AND BIOLOGICAL PERFORMANCE OF SOWS AND PIGLETS AFTER IMPLEMENTATION OF AN INACTIVATED PANDEMIC INFLUENZA VACCINE

V. Cvjetković [1], S. Egen [2], S. Fischer [3], M. Köchling [1]
[1]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*
[2]*Veterinary Practice Dr. Stephan Egen. Lindenstraße 62, 47623 Kevelaer - Germany*
[3]*Innovative Veterinary Diagnostics (IVD) GmbH, Albert-Einstein-Str. 5, 30926 Seelze-Letter – Germany*

Background and Objectives

Swine Influenza A Virus (swIAV) can typically cause respiratory and reproductive disorders, however it´s immunosuppressive effect is often underestimated. We present a herd affected by pandemic swIAV and leading to secondary disorders, most of which were reduced by vaccination.

Material and Methods

A 170 farrow-to-finish sow herd has struggled with multiple disorders: febrile sows around farrowing as well as respiratory distress and diarrhoea in nursery and finisher pigs. Among others, faeces from latter groups were submitted to a Rotavirus (RV) Type A + C - duplex real-time PCR (qPCR), Brachyspira hyodesenteriae (B. hyodesenteriae) + Lawsonia intracellularis (L. intracellularis) - single qPCR respectively. Lung tissue from nursery and finisher pigs was screened (PCR-screening/ single qPCR´s) for respiratory pathogens. As sows were vaccinated with a trivalent influenza vaccine (H1N1, H1N2, H3N2), diagnosis was then extended to pandemic swIAV. Antibody detection by hemagglutination-inhibition (HI) test was carried out in sows and a multiplex subtyping qPCR in nose swabs of clinically inapparent weaners.

Results

Feces from the nursery were positive for both types of RV. Finisher pigs excreted L. intracellularis (qPCR cycle threshold 20). In lungs, Glaeserella parasuis serotype 4 was detected in nursery pigs and Mesomycoplasma hyopneumoniae (low amounts) in finisher pigs. Macroscopically, latter lungs were affected by fibrinous pleurisy, purulent pneumonia respectively. HI testing was not clearly indicative for an involvement of a pandemic subtype. However, weaners were tested positive for a pandemic swIAV subtype (H1pdmN2). Respiporc FLUpan H1N1® was subsequently administered to sows and nursery pigs, reducing all previously mentioned symptoms considerably.

Discussion and Conclusion

As mentioned in previous works, swIAV can have a detrimental effect on swine immunity. Symptoms might appear quite uncommon. Vaccination has shown to be a useful tool for tackling pandemic influenza. In severe cases it can be helpful to include nursery pigs during the “first waves” of immunization.

IMM-PP-51

EVALUATION OF DIFFERENT VACCINATION STRATEGIES FOR SOWS AND THEIR PIGLETS.

D. Carrascón [1], M. Valero [1], T. Ermoshina [2], A. Blasco [3], A. Morillo [1]
[1]*Tests and Trials S.L.U, 22400, Monzón, Huesca, Spain.*
[2]*Veterinarian independent*
[3]*GEICAM, 28703, San Sebastián de los Reyes, Madrid*

Background and Objectives

Describing the stabilization of a PRRS outbreak using two different vaccination strategies and comparing both.

Material and Methods

It is done in an industrial three-site farm in Russia with a population of about 10 000 pigs. It consists in an implementation and comparison of different vaccination strategies of sows, using only modified live vaccine (MLV) or combination of MLV with an inactivated vaccine (IV) PROGRESSIS, with or without piglet vaccination. T1 group: sows were vaccinated with a MLV, one mass vaccination and another three months later. Piglets without any vaccination.
T2 Group: a MLV at 60 days of gestation with revaccination by PROGRESSIS (IV) at 90 days of gestation. Piglets from the T2 group were vaccinated at 34 days of life using PROGRESSIS. The parameters used to compare the vaccination strategies were average daily gain (ADG) and mortality rate obtained in the post-weaning of 17 (T1) and 26 (T2) batches of piglets weaned between September 2019 and June 2020. Results were analysed by means of an ANCOVA model including ADG or %mortality as independent variables, entrance weight as covariate, treatment and technician as factors.

Results

Our results show that the mean body weight at entrance and the technician were not significant parameters considering both ADG and % mortality as response variable. Our results show that the only significant parameter playing a role, both in ADG and mortality of piglets, was the treatment (vaccination strategy).
ADG (g/d) results (mean±SD) were: 258±72.9, 390±33.3 for T1 and T2 respectively. α= 0.05, $p<0.001$.
Mortality (%) results (mean±SD) were: 19.8±8.71, 5.91±3.48 for T1 and T2 respectively. α= 0.05, $p<0.001$.

Discussion and Conclusion

The use of PROGRESSIS both in sows and piglets led to a significant increase of ADG and mortality ($p<0.001$). It could obey to the combined effect of a better colostral immunity and the effect of piglet vaccination.

IMM-PP-52

SAFETY COMPARISON AFTER ADMINISTRATION OF TWO SWINE ERYSIPELAS MONOVALENT VACCINES IN FATTENING PIGS

J. Miguel [1], D. Torrents [2], J.R. Pérez De Vargas [2], M. Solé [1], S. Milán [3]
[1]*HIPRA HQ, Amer (Girona), Spain*
[2]*HIPRA Spain*
[3]*Sergio Milán Servicios Veterinarios*

Background and Objectives

Swine Erysipelas (SE), is an economically significant disease capable of affecting all stages of production. The greatest losses are cases of sudden death and acute septicemia in grow-finish pigs[1]. Vaccination is the best option to prevent SE problems in fatteners[1]. The objective of this study was to compare the safety of two commercial vaccines against SE in fattening pigs.

Material and Methods

The study took place in a 180 iberian sow farm in Salamanca (Spain). 30 12 week old pigs (crossbred Iberian-Duroc), were divided into 3 groups, n=10. Group 1 (G1) vaccinated with ERYSENG®. Group 2 (G2), new vaccine with an adjuvant containing mineral oil (W/O). Group 3 (G3) control group, not-vaccinated. Rectal temperatures (T) and local reactions (LR) were measured at 0, +6 and, +24 hours post-vaccination.

Results

There were no differences in T at the moment of vaccination (p=0.5). At +6h, T in G2 was higher (41.51±0.42 ˚C), than G1 and G3, 40.86±0.40 and 40.64±0.42 respectively, being statistically different (p<0.001). The increase of T between 0 to +6h showed +0.29 ˚C in G1, +0.88ºC in G2 and -0.17 ˚C in G3, G2 being statistically significant compared to G1 and G3 ($p < 0.001$). At +24h, no differences were observed (p=0.46). No local reactions were observed in any group or moment of the study.

Discussion and Conclusion

Based on these results ERYSENG® is a safer vaccine compared to the one used in G2, as no significant increment in T was recorded compared to the control group. The increase of T in G2, compared to G1 and G3 could be explained by the content of mineral oil in its adjuvant, as it has been referenced in previous studies it can provoke side effects, as the one observed in this study, that could cause anorexia[2].

IMM-PP-53

CLINICAL CASE WITH DIFFERENTIAL DIAGNOSIS OF PCV2 AND SALMONELLA IN A BRAZILIAN FARM

M. Souza [2], W. Costa [2], R. Krejci [1], J. Calveyra [2]
[1]*Ceva Animal Health, France*
[2]*Ceva Animal Health, Brazil*

Background and Objectives

The correct diagnosis allows the use of more adequate control and prevention tools, reducing economic losses in swine farming. Therefore, the aim of this study is to report a case of suspected circovirus infection that was fought in the laboratory.

Material and Methods

The clinical case was reported in a closed system farm with 800 sows, in Brazil. The farm had a history of culling and severe diarrhea in animals between 90 and 110 days of age. The animals were vaccinated against Mycoplasma - 2 ml and Circovirus - 0.5 ml at weaning. Necropsy and collection of organs from 8 animals were performed for histopathology and bacterial isolation. Blood was collected from animals of 4 different ages for PCRq analysis for PCV2: 50, 75, 95 and 112 days of age, 15 samples, with 3 pools per age.

Results

On histopathology, diffuse necrosis lesions were found in crypt and surface enterocytes, with the presence of macrophages and lymphocytes in the lamina propria and submucosa. There was no depletion of lymphocytes in the lymphoid tissue or the presence of viruses in this organ. Two samples of ileum, cecum and colon from animals with 107 DOA were positive in the isolation of Salmonella Typhimurium. The qPCR results found show titers of up to 10^4 viral copies.

Discussion and Conclusion

Some studies, which used real-time PCR to detect PCV2 in serum, have shown differentiation of subclinical and clinical circovirus, proposing a genome-wide limit of > 10^7 PCV2 / mL of serum as indicative of clinically significant PCV2 infection. Thus, with the microscopic findings, absence of viral in lymphoid tissues and low viremia, the diagnosis of PCV2 infection was ruled out.
In the reported clinical case, the final diagnosis was Salmonella Typhimurium, associating different tools for the correct diagnosis.These results corroborate the increasing number of cases of Salmonellosis in the country.

IMM-PP-54

VACCINATION WITH A NEW MYCOPLASMA HYOPNEUMONIAE AND PCV2 INTRADERMAL VACCINE IN LARGE UKRAINIAN FARM

O. Romanov [1], L. Dudar [2], A. Vasyliv [1], I. Serdiuk [3], D. Angelats [4], I.B. Orozco [5]
[1]*Technical Services Manager Swine Business Unit HIPRA CIS*
[2]*Regional Technical Services manager in CIS, HIPRA*
[3]*Technical Services Manager Swine Business Unit HIPRA Ukraine*
[4]*HIPRA, Amer, Spain*
[5]*Corporate Brand Manager, HIPRA, Amer, Spain*

Background and Objectives

Vaccination against Mycoplasma hyopneumoniae (M.hyo) and Porcine Circovirus type 2 (PCV2) is a common practice in farms worldwide. The objective of the present study was to assess efficacy of the novel Mhyosphere® PCV ID, treatment 2 (T2), an intradermal needle-free vaccine against M.hyo and PCV2, compared to the results previously recorded using two intramuscular monovalent vaccines for M,hyo and PCV2 combined, treatment 1 (T1) at the time of vaccination.

Material and Methods

This "before and after" field trial was done in a farrow-to-fattening 1,180 sow farm in a central region of Ukraine.The herd had a good health status and was PRRS negative. T1 group included 35,679 piglets as "before stage" (May 20 – Feb 21), and T2 group included 21,140 piglets in "after stage" (Mar 21 – Aug 21), with monthly data per group. All piglets were vaccinated at 21 days of age, and efficacy parameters measured were mortality, average daily weight gain (ADWG) in nursery, days on feed, average daily feed intake (ADFI), and feed conversion rate (FCR). The statistical analysis was done with R software and the test used was t-test.

Results

ADWG during nursery period (from 4 to 10 weeks old) was significantly higher in T2 (446.33g) compared to T1 (408.5g; p=0.015). Mortality level was statistically higher in T2 (0.8%) compared to T1 (0.61%; p=0.034). The ADFI were also significantly higher in T2 (0.79kg) compared to T1 (0.73kg; p=0.063), while the FCR was slightly lower in the T2 (1.772) compared to T1 (1.765; p=0.87).

Discussion and Conclusion

Vaccination with new ready-to-use, one-shot PCV2/M.hyo ID vaccine effectively improved ADWG, ADFI and FCR under field conditions. However, mortality was higher with T2, and this will require further studies. As a limitation of the trial, seasonal effect may have influenced the outcome, so further studies should be done to clarify this point.

IMM-PP-55

COMPARATIVE PARALLEL FIELD TRIAL OF A NEW INTRADERMAL M.HYO/PCV2 VACCINE IN UKRAINE

O. Romanov [1], L. Dudar [2], A. Vasyliv [1], I. Serdiuk [3], D. Angelats [4], I.B. Orozco [5]
[1]*Technical Services Manager Swine Business Unit HIPRA CIS*
[2]*Regional Technical Services manager in CIS, HIPRA*
[3]*Technical Services Manager Swine Business Unit HIPRA Ukraine*
[4]*HIPRA, Amer, Spain*
[5]*Corporate Brand Manager, HIPRA, Amer, Spain*

Background and Objectives

Vaccination against Porcine Circovirus type 2 is an efficient tool to control and reduce productivity losses. The aim of the study was to compare the efficacy of Mhyosphere® PCV ID – new ready-to-use, one-shot intradermal M.hyo/PCV2 vaccine with another monovalent PCV2 intradermal vaccine.

Material and Methods

The field trial was done on a farrow-to-finish herd with 1,280 sows and a weekly production system in Ukraine. The herd had a good health status and were negative for PRRS and Mycoplasma hyopneumoniae (Mhyo). In total 1,411 pigs were divided in two groups. Group A was treated with monovalent PCV2 ID vaccine (n=756), and Group B with Mhyo/PCV2 ID vaccine (n=655). Both groups were vaccinated at 3 weeks of age. Serum samples were taken at the start of fattening (n=9 from each group) and the middle of fattening (n=9 from each group). The samples were tested by ELISA, and quantitative PCR. Productivity parameters such as mortality, ADWG, and FCR were evaluated during the fattening period. The statistical analysis was done with R software and the test used was t-test.

Results

ADWG was significantly higher in group B (1.03kg) compared to group A (0.99kg; p=0.039) while mortality level was higher in group B (2.29%) compared to group A (0.93%), and FCR was lower in group B (2.30) compared to group A(2.66). Both groups showed the same levels of viremia at the start of fattening period (group B, 3 pools: $4.0*10^5$, $6.7*10^4$, $1,3*10^4$ copies/ml; group A, 2 pools: $4.6*10^6$, $2.0*10^4$ copies/ml).

Discussion and Conclusion

The new intradermal Mhyo/PCV2 vaccine has demonstrated good field efficacy and performance in this study. Nodifferences were found in the serological response or viremia control within both groups. As a limitation of the study, no PCR was done to confirm Mhyo negative status of the farm.

IMM-PP-56

FIELD OBSERVATION ON THE IMMUNIZATION EFFECT OF A TRIVALENT VACCINE CONTAINING PORCINE CIRCOVIRUS TYPE 2A2B AND MYCOPLASMA HYOPNEUMONIAE IN 3 FARMS IN PHILIPPINES

A.V. Macasaet [1], J. Alivio [1], C.K. Mah [2]
[1]*Zoetis Philippines, Taguig City 1634, Philippines*
[2]*Zoetis Dublin, Ireland D18 T3Y1*

Background and Objectives

The aim of this field observation was to evaluate the immunization effect of a new trivalent vaccine containing PCV2a2b and Mycoplasma hyopneumoniae (MH) for nursery pigs, compared with three existing commercial bivalent PCV2a/MH vaccines, under Philippine conditions. Three farms were selected on the basis of their natural challenge of PCV2d and MH in herds.

Material and Methods

200 pigs from each farm of three were randomly allocated into 2 treatment groups (total 600 pigs). All pigs were subsequently vaccinated at 21 days of age (Day 0) using either the farm existing bivalent vaccine (Control) or the trivalent vaccine (Treatment). All vaccinated pigs were evaluated for presence of any acute adverse reactions (AR), and the injection site swelling (ISS) within 7 days post-vaccination. 10 pigs / group were pre-selected for the blood collection at Day 0-, 21- and 49-days post-vaccination for ELISA (PCV2 and MH) and PCV2 qPCR assay. Average daily gain (ADG) and respiratory-related mortalities were computed and compared between groups throughout the observation period (Day 49).

Results

There was no acute AR nor visible ISS, as well as no significant difference in respiratory-related mortalities were recorded in all treatment groups. Also, no significant difference in MH serological titers and S/P ratio trends among groups. However, there were statically significant higher mean PCV2 S/P values ($P<0.05$) and lower viremia level at 6 weeks of age in the trivalent vaccine immunized pigs compared to the control groups. These pigs also showed significantly better ADG when compared with the mixable bivalent vaccine ($P<0.05$), while at par with other two ready-to-use bivalent vaccines.

Discussion and Conclusion

In comparison with pigs received respectively one of the three existing bivalent vaccines, pigs immunized with the trivalent PCV2a2bMH vaccine were observed to perform better in terms of immunological response on PCV2 seroconversion, lower PCV2 viremia and ADG improvement at nursery.

IMM-PP-57

CLINICAL CASE REPORT: DIFFERENTIAL DIAGNOSIS TO CONFIRM CLINICAL SUSPICION IN THE SALMONELLA AND PCV2 INFECTION ON A COLOMBIA'S FARM

E. Vargas [1], J. Calveyra [2], R. Krejci [3]
[1]*Ceva Animal Health, Colombia*
[2]*Ceva Animal Health, Brazil*
[3]*Ceva Animal Health, France*

Background and Objectives

Gastrointestinal and systemic disorders in nursery and fattening pigs can occur due to several factors and the correct diagnosis is the key to successful treatment and control of infectious pathogens. The objective of this study is to report a clinical case with initial suspicion of PCV2 and/or Salmonella confirmed by laboratory techniques.

Material and Methods

The study was carried out on a farrow to finish farm, located in the Antioquia region. The region is endemic to PCV2 and Mycoplasma hyopneumoniae (Mhyo). The animals in the study farm were vaccinated for both etiologic agents at weaning (0.5 mL and 2 mL respectively). After 18 months with this protocol, the animals showed clinical signs compatible with PCVD and/or Salmonellosis (diarrhea, cull rate increase and skin lesions). Tissue fragments (liver, spleen, kidney, lymph node and intestine) were collected from animals in nursery phase, for histopathology and bacterial isolation in order to obtain confirmatory information for the correct diagnosis.

Results

Histopathology described moderate diffuse lymphohistiocytic enteritis, mild diffuse mixed peritonitis, with evidence of an acute systemic process in the liver. There was no depletion of lymphocytes in the lymphoid tissue or the presence of viruses in this organ. The samples were cultured for bacterial growth, resulting in the isolation of Salmonella Typhimurium. From the isolated colonies, an antibiogram was performed with sensitivity to Ciprofloxacin, Trimethoprim sulfamethoxazole, Neomycin and Phosfomycin.

Discussion and Conclusion

From the antibiogram, Trimethoprim sulfamethoxazole was administered in the feed, in which the animals responded to the therapeutic treatment in a satisfactory way. These results confirm previous studies, pointing out the importance and necessity of combining specific laboratory techniques to complete the presumptive diagnosis performed on the farm.

AWN-PP-01

ALGORITHM-BASED AUTOMATIZED DETECTION OF THE EFFECTS OF RYE-BASED DIETS ON BEHAVIOURAL PARAMETERS OF INTACT BOARS

V. Wilke [1], J. Schmidt-Mosig [2], J. Kamphues [4], A. Von Felde [3], C. Visscher [5]
[1]*University of veterinary medicine Hannover, Institute for animal nutrition*
[2]*VetVise GmbH, Hanover*
[3]*KWS Lochow GmbH*
[4]*University of Veterinary Medicine Hannover - Institute of Animal Nutrition*
[5]*University of Veterinary Medicine Hannover, Foundation, Institute for Animal Nutrition*

Background and Objectives

Current challenges in livestock farming include public and politically demanded improvements in animal welfare. Studies suggest that rye, rich in functional carbohydrates, might have a positive impact on the behaviour and with this animal welfare in pigs. AI-supported technology might be a solution in better understanding animal behaviour and make animal welfare a measurable parameter.

Material and Methods

The study (two trials) was performed in two identical barns (six compartments each, equipped with cameras), with intact boars (n=288) over entire fattening periods (2 x 16 weeks, changing of barns between trials). The animals received either wheat- (W) or rye- (R) based diets and were filmed during the entire time. The video material was evaluated by a software, based on a machine learning algorithm, for determining the activity by recording the position and posture of every animal in the stable twice in a second (centroid-based animal activity, CAA). In addition, the temperature and air quality was measured and the animals were scored according to KTBL-guidelines every two weeks.

Results

With comparable results for air quality, temperature und KTBL-Scorings in both groups/stables the activity of the animals was significantly higher in the group fed wheat-based diets in the first trial (W: 0.156±0.014a; R: 0.133±0.014b CAA). In trial 2, a significant effect of the feed could not be shown statistically (W: 0.123±0.013; R: 0.137±0.013 CAA). In both trails, it was possible to prove identical behavioural patterns.

Discussion and Conclusion

An effect of the rye-based diets on the behaviour is likely, but a certain barn-effect cannot be ruled out either. It was possible to monitor the activity permantently and accurately. Besides the potential for early detection of behavioural changes (diseases/tail-biting), the method used and the data obtained can help to make animal welfare a more measurable parameter.

AWN-PP-02

A WEANER DIET OPTIMIZED WITH FOCUS ON AVOIDING POST WEANING DIARRHOEA IN VERY SMALL PIGLETS AFTER WEANING.

D. Carlson [1], J. Callesen [1], B. Knudsen [1], J. Korneliussen [1], J.F. Katholm [1], N.O. Nielsen [1]
[1]*SvineRaadgivningen (Danish Pig Advisory Center)*

Background and Objectives

There is general consensus, that not one single ingredient can replace medical zinc in post weaning diets. The objective of this study was to formulate a diet (SR-Elite) combining highly digestible feed stuffs and additives that promote digestion and intestinal health to keep post weaning diarrhea and performance at least at the same level as a diet containing medical doses of zinc (Control).

Material and Methods

Piglets were allocated in either a Control (n=538) or SR-Elite group (n=534) averaging 4.2 kg body weight and divided in 5 blocks of 2 rooms. Control group was fed a control diet containing 3000 ppm of ZnO, SR-Elite was fed a highly digestible reformulated diet supplemented with milk powder, heat treated wheat and barley, soy protein concentrate, porcine plasma powder, cellulose fibers, a Bacillus sp. PB6 (ATCC PTA-6737), organic bound iron and zinc, high vitamin- and amino acid dosing and a microencapsulated source of formic acid, citric acid, and phytomolecules. An acid blend was given in the drinking water. Diarrhea was scored, body weights and feed intake were recorded throughout the study. Average daily gain (ADG) and Feed Conversion Ratio (FCR) were calculated.

Results

No difference was observed in diarrhea scores between both groups ($P > 0.05$). During the first two weeks, the SR-Elite group had a numerically higher ADG (198 vs. 173 g/d ($P>0.05$)) and an improved feed utilization (1.78 vs. 1.96 FUp/kg gain ($P<0.05$)) compared with the Control. FCR was also improved in the SR Elite group during the overall 43 day test period (1.38 vs. 1.44 kg feed/kg gain).

Discussion and Conclusion

The SR-Elite diet may be a viable alternative to high doses of ZnO, with piglets receiving this diet having similar levels of diarrhea, similar growth, whilst improving feed efficiency. The SR-Elite diet may be particularly beneficial to the smaller piglets.

AWN-PP-03

APPLICATION OF HEMICELL HT™ – A β-MANNANASE ENZYME – RETAINS PERFORMANCE AND IMPROVES HEALTH IN THE PRESENCE OF CHALLENGING PROTEIN SOURCES

F. Vangroenweghe [1]
[1]*BU Swine & Ruminants, Elanco Benelux, Elanco Animal Health*

Background and Objectives

β-Mannans are strongly anti-nutritive polysaccharide fibres found in most vegetable feed ingredients. Estimated content of soluble β-mannans in common fattening diets is 0.25-0.35%, and in vitro studies have demonstrated that as little as 0.05% soluble β-mannan in feed can elicit a strong innate immune response. This innate response is referred to as a feed induced immune response (FIIR), which suppresses growth to protect the liver and reserve energy/nutrients for high priority immune functions. Hemicell™ HT (Elanco) is a β-mannanase enzyme for animal feeds breaking down β-mannans, thereby preventing economic losses from this wasteful immune response to β-mannans. Objective was to evaluate finishing performance in control and reformulated diet containing higher levels of PKE combined with Hemicell™ HT inclusion.

Material and Methods

Trial including 599 pigs was conducted in 4 compartments. Standard three-phase control diets were compared to similar iso-nutritive diets with 300 g/tonne of Hemicell™ HT except for following changes: Phase-1 (weeks 1-4): 3% soybean meal was replaced by PKE; Phase-2 (weeks 5-8): 6% soybean meal was replaced by PKE; and Phase-3 (weeks 9-18): 9% soybean meal was replaced by PKE. Standard performance and health parameters were collected. Data were analysed using JMP 14.0 statistical program – one-tail t-test.

Results

Performance parameters did not significantly differ between both study groups. However, a significantly higher ($P<0.05$) mortality (n=27; 9.00%) was observed in the control groups as compared to the Hemicell™ HT group (n=5; 1.67%). This was directly linked to significantly higher treatment cost in the control (€ 0.75/pig) as compared to the Hemicell™ HT group (€ 0.70/pig).

Discussion and Conclusion

Degradation of β-mannans in fattening diets by Hemicell™ HT resulted in lower feed cost by higher PKE inclusion rate combined with better overall health and without reduction of pig performance during the fattening period.

AWN-PP-04

EFFECTS OF A SYNBIOTIC DIETARY CONCEPT BIMULAC® WEANER TS ON FECAL CONSISTENCY AND GROWTH PERFORMANCE IN WEANED PIGLETS COMPARED TO PHARMACOLOGICAL DOSAGES OF ZINC OXIDE

B. Keimer [1], M. Hörstmann [2], A. Schlagheck [1], S. Asmussen [3]
[1]*R&D Department, Biochem Zusatzstoffe GmbH, Lohne, Germany*
[2]*Product Managment, Biochem Zusatzstoffe GmbH, Lohne, Germany*
[3]*Livestock Feed Tests IVS, Bylderup-Bov, Denmark*

Background and Objectives

Pharmacological zinc oxide (ZnO) is used in weaned piglets to control diarrhea and ensure growth but will be banned within the EU by 2022. The objective of this trial was to test a dietary concept as an alternative to ZnO.

Material and Methods

216 weaned piglets (d28 of age, 6.78±0.65 kg, DanBred x Duroc) were allocated to 3 groups (n=8, 9 piglets per n). All piglets were fed standard diets (d1-14) offered ad-libitum. The first group received no additional treatment (NC), whereby the further groups received diets supplemented either with 2500ppm ZnO (ZnO) or with 5000ppm of a synbiotic feed supplement (SYN, Bimulac®Weaner TS), which is based on probiotic (Bacillus coagulans DSM32016) and prebiotic components. Body weight (BW) at d1, d14 and feed intake (FI) were recorded pen-wise to calculate average daily gain (ADG) and average daily FI (ADFI) per piglet and feed conversion ratio (FCR). Daily fecal consistency (FS, 1=optimal, 2=soft, 3=diarrhea) was scored pen-wise. Statistical analyses using SPSS were performed by ANOVA or ANCOVA (BW, ADWG) considering BWd1 as covariate. Significant differences were accepted at $P<0.05$.

Results

FS were above optimal scores. ZnO and SYN tended to improve FS with significant differences at d4 (NC:2.8±0.5, each ZnO/SYN:2.1±0.4). BW at d14 were higher in ZnO and SYN compared to NC (NC:10.0^{a}±1.17, ZnO:10.6^{b}±1.33, SYN:10.7^{b}±1.0 kg). Furthermore, ADG (NC:231^{a}±44.3, ZnO:272^{ab}±50.0, SYN:282^{b}±35.5 g) and FCR (NC:1.22^{a}±0.04, ZnO:1.18^{ab}±0.09, SYN:1.13^{b}±0.03) differed between treatment groups. Two piglets (=2.7%) from NC died. No losses were recorded in ZnO and SYN.

Discussion and Conclusion

ZnO and SYN improved growth performance, survivability and fecal consistency in weaned piglets. SYN showed similar effects to ZnO and could be considered as an alternative concept.

AWN-PP-05

ATTITUDES REGARDING PREVENTION AND TREATMENT OF SOW SHOULDER ULCERS IN SWEDEN

F. Matti [1], M. Lindberg [2], A. Backhans [3]
[1]*Farm & Animal Health, Vreta Kloster, Sweden*
[2]*Farm & Animal Health, Uppsala, Sweden*
[3]*National Veterinary Institute (SVA), Uppsala, Sweden*

Background and Objectives

Sow shoulder ulcers are pressure ulcers of different severity that may develop during the lactation period. The objective of this project was to investigate knowledge and attitudes regarding prevention and treatment of shoulder ulcers in Sweden.

Material and Methods

In 2018 a web survey was completed by 86 animal caretakers, 22 veterinarians and 5 advisors in Sweden; in total 113 answers. Participants were requested to state the procedures in the largest herd they were associated with. Most of the answers regarded herds with >100 sows.

Results

Preventive measures: In 63% of the answers it was stated that preventive measures were carried out. Most common were breeding or feeding strategies as well as pressure relief or mechanical protection (surgical tape or plaster spray).
Treatment and interventions: In 66% of the answers it was indicated that measures were taken once shoulder ulcers developed. Pressure relief and mechanical protection were most common. Antibiotics were only used in cases of severe ulcers (>5 cm) or when clinical signs of depression, fever or infection were present. The majority (94%) stated that benzylpenicillin was the first choice when antibiotics were used.
Attitudes: Twice as many veterinarians as animal caretakers considered wound care important. Also, twice as many veterinarians as animal caretakers regarded usage of NSAID:s advantageous. Instructions from herd veterinarians on how shoulder ulcers are prevented and treated were missing in one third of the herds.

Discussion and Conclusion

Professionals with an interest in the subject may be more prone to answer a survey, which may bias the results. Nevertheless, the results indicate a restrictive approach in treating shoulder ulcers with antibiotics. However, there is room for improvement in how herd veterinarians communicate prevention and treatment of shoulder ulcers, and in particular the importance of wound care.

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AWN-PP-06

DIET INTERVENTION CAN REDUCE TONSILLAR STREPTOCOCCUS SUIS SEROTYPE 9 ABUNDANCE IN PIGLETS.

P. Van 'T Veld [1], A. Van Enckevort [1], X. Guan [2], F. Molist [2]
[1]*Denkavit Nederland BV, 3781 PV Voorthuizen, The Netherlands*
[2]*Schothorst Feed Research, Lelystad 8218 NA, The Netherlands.*

Background and Objectives

The opportunistic pathogen Streptococcus suis is a problem to piglets during early life. As effectiveness of vaccines is uncertain, and antimicrobial usage should be reduced, nutritional prevention strategies are of interest.

Material and Methods

A post-weaning study was conducted with 30 piglets/3 treatments: 1, standard diet A, non-challenged (NC), 2, standard diet A, challenged (PC), 3 experimental diet, challenged (T), to compare S. suis carriage and the tonsillar and ileal microbiota related to oral and nasal challenge (19 days post-weaning) with a pathogenic S. suis serotype 9 strain (SS9). Tonsil swabs were taken at 8, 16, 20, 21, 23 and 27 days post-weaning, and ileal digesta were sampled at 27 days post-weaning for qPCR analysis and 16s rRNA gene sequencing.

Results

After challenge, tonsillar SS9-count (qPCR) was significantly lower in the experimental diet group (T) than in the challenged control (PC) fed the standard diet (4.4 vs. 4.8 $\log_{10}$ CFU/ml, P=0.04). Stomach-pH for the T-group tended to be lower than for control group NC (3.46 vs. 4.21, P=0.08), with less variation (CV 9.2% vs. NC=17% vs. PC=32.5%). The 16s rRNA gene-sequenced total relative S. suis abundance was far higher in tonsils than in ileum microbiota (8.45% vs. 0.42% at day 27 post-weaning). The treatment groups had significantly different ileal microbiotas (P<0.05), with on genera level a much higher Lactobacillus abundance in the experimental diet group. Tonsillar microbiota was not significantly different, but trended towards lower S. suis abundance in group T.

Discussion and Conclusion

The experimental diet reduced tonsillar SS9-abundance and initiated stomach pH- and ileal microbiota-changes, which may lower the risk for S. suis infections in post-weaning piglets.

AWN-PP-07

EARLY PREDICTION OF CARCASS COMPOSITION IN FATTENING PIG TYPES USING A SOY-FREE AND LOCALLY GROWN FEED RATION BY MEANS OF ULTRASOUND EXAMINATION

B. Reckels [1], C. Schwennen [1], A.A. El-Wahab [2], R. Hoelscher [3], C. Visscher [1]
[1]*University of Veterinary Medicine Hannover, Foundation, Institute for Animal Nutrition*
[2]*Department of Nutrition and Nutritional Deficiency Diseases, Faculty of Veterinary Medicine, Mansoura University, Egypt*
[3]*Hoelscher & Leuschner GmbH & Co.*

Background and Objectives

The dominant protein carrier in diets for fattening pigs is soybeanmeal. Current feeding concepts are based on the average fattening pig - individual requirements are insufficiently taken into account although the performance potential and thus the nutrient requirements within a fattening group can differ significantly. Due to resource efficiency the consumption of nitrogen in excess of requirements must be minimised. Previous studies have shown that animals with a high feed intake capacity are prone to excessive fat and nitrogen excretion. By early prediction of carcass composition already during fattening, it becomes possible to feed the pigs more efficiently. Aim of this study was to examine whether it is possible to fatten pigs according to their needs with indigenous plants and at what point a prediction of the carcass is possible by means of ultrasound measurements.

Material and Methods

The study was performed in a conventional large group-housing barn (n=325 pigs) with sorting gate and automatic bodyweight recording. The animals were grouped (ØBW 50kg) according to their bodyweight into “light” and “heavy”. The feed was offered ad libitum the rations were designed according to current recommendations of the DLG2018. At the average body mass of 57/70/90/110 kg, ultrasound images of the backfat and longissimus muscle were taken from all pigs.

Results

There was a weak negative correlation between the lean-meat-content and the ratio of backfat/muscle (57kg r = -0.44;70kg r = -0,51;90kg r = -0,61;110kg r = -0,71). The later the examination was performed,the better the examinations correlated with each other.

Discussion and Conclusion

Summarising it`s possible to fatten pigs with indigenous feeds without any loss of performance. Also, it`s possible to predict the carcass at an early stage. By feeding pigs more individually, it should be possible to feed fattening pigs more efficiency, i.e. closer to their actual requirements and save resources.

AWN-PP-08

EFFECT OF BACILLUS-BASED PROBIOTIC ON PERFORMANCE OF SOWS, REARING RESULTS AND GUT FUNCTIONAL STATUS IN PIGLETS AT WEANING

P. Konieczka [1], K. Ferenc [2], J.N. Jørgensen [3], R. Zabielski [4], J. Olszewski [2], Z. Gajewski [2], M. Mazur-Kuśnirek [7], D. Szkopek [5], N. Szyryńska [6], K. Lipiński [7]

[1]*Department of Poultry Science, University of Warmia and Mazury in Olsztyn*

[2]*Center of Translational Medicine, Warsaw University of Life Sciences, Poland*

[3]*Chr. Hansen A/S, Denmark*

[4]*Center of Translational Medicine, Warsaw University of Life Sciences, Poland;*

[5]*Department of Animal Nutrition, The Kielanowski Institute of Animal Physiology and Nutrition Polish Academy of Sciences*

[6]*Department of Histology and Embryology, University of Warmia and Mazury in Olsztyn*

[7]*Department of Animal Nutrition and Feed Science, University of Warmia and Mazury in Olsztyn*

Background and Objectives

The aim of this study was to evaluate gut functional status, biofilm formation of probiotic bacteria in piglets at weaning and the performance of sows fed probiotic-supplemented diets.

Material and Methods

The experiment was performed on 96 sows (DanBred) divided into 2 groups (n=48/group): control and experimental. The diets of the experimental sows were supplemented with a probiotic consisting of B. subtilis (DSM25841) and B. amyloliquefaciens (DSM25840) (1.1E+09 CFU/kg feed) supplied via top dressing. Suckling piglets from treatment group were offered creep feed with the probiotic in the same amount. In 20 piglets (n=10/group) whole sections of anterior ileum was assessed regarding thickness of the ileal mucosa, villi length, areas of Peyer's patches and the visualization of probiotic-bacteria using fluorescence in situ hybridization method (Histo-FISH) was performed. One-way analysis of variance (ANOVA) was performed (Tukey test).

Results

The sows receiving probiotic were characterized by significantly ($P \leq 0.05$) reduced back fat (3.05 vs 3.68 mm) and BW loss during lactation (24.47 vs 35.59 kg), and they tended to have better BCS after weaning (2.77 vs 2.57) as well as heavier piglet at birth (1.34 vs 1.27 kg). Dietary supplementation with the probiotic significantly increased litter feed consumption (av. 300 g), litter gain (av. 5.48 kg) and piglet weaning weight (6.94 vs 6.60 kg). In piglets supplemented with probiotics ($P \leq 0.05$), the ileal mucosa was thicker due to longer villi, and the Peyer's patches were larger by 39%. In the experimental group the probiotic bacteria were detected in the digesta and in the villi structures of each piglet, visualized as structure-like biofilm.

Discussion and Conclusion

Feeding a bacillus-based probiotic to sows improves their performance as well as functional status of the piglet gut. In addition, biofilm formation of probiotic bacteria in the gut in piglets is promoted, indicating that they were metabolically active.

AWN-PP-09

EFFECT OF DIETARY ROSEMARY EXTRACT SUPPLEMENTATION ON GROWTH PERFORMANCE, CARCASS COMPOSITION AND CORTISOL IN FINISHER PIGS

M. Lingbeek [1], J. Doelman [1], G. Boerboom [1]
[1]*Trouw Nutrition R&D, The Netherlands*

Background and Objectives

The grow-finishing (G-F) phase in commercial swine production represents the majority of the total production period and is therefore an ideal window in which to improve health and performance. Supplementation of phytochemicals is known to have positive effects on supporting the immune system. This study aimed to investigate the effect of a rosemary extract (RE) on health, performance, carcass characteristics and stress response of G-F pigs when fed for the final 33 days of the G-F phase.

Material and Methods

A total of 384 pigs, distributed over 48 pens, were provided four levels of RE at 0, 80, 160 and 320 ppm. Dietary treatments were offered in the last 33 days of the finisher phase. Body weight was measured at day 0, 7, 14, 21 and 33 and feed intake was measured continuously using automated feeding stations. At the beginning and end of the 33-day experimental period, adipose and muscle thickness were measured using handheld ultrasound. Carcass characteristics were measured using AUTOFOM ultrasound technology. Plasma cortisol was measured prior to experiment commencement and pre- and post-transport to the slaughterhouse.

Results

No significant differences were observed for growth performance parameters measured on farm, although an increase in carcass weight at slaughter was observed with the use of RE ($P=0.03$). This was accompanied by an increase in adipose thickness ($P=0.04$). Analysis of salivary cortisol concentration indicated a reduction in cortisol post-transportation with the addition of RE ($P=0.04$).

Discussion and Conclusion

Effects were predominantly observed in carcass characteristics and cortisol, which suggests potential improvements to dietary nutrient assimilation and reduced impact of stress in response to RE supplementation in the G-F phase. The results indicate that RE provision could be used to modulate energy partitioning and improve performance and welfare of G-F pigs.

AWN-PP-10

EFFECT OF DIFFERENT ORAL IRON APPLICATION IN SUCKLING PIGLETS TO AN OPTIMAL HEMOGLOBIN CONTENT AT WEANING

M. Hörstmann [1], A. Schlagheck [2], T. Stigen Martinsen [3], V. Bøhn Lund [3]

[1]*Product Management, Biochem Zusatzstoffe Handels- und Produktionsges. mbH, Lohne, Germany*

[2]*Research & Development, Biochem Zusatzstoffe Handels- und Produktionsges. mbH, Lohne, Germany*

[3]*Product manager monogastrics, Vilomix Norway*

Background and Objectives

Since the natural iron supply from sow's milk is not sufficient for healthy piglet development, additional iron should be provided. Combination of dietetic feed supplements like iron paste and iron peat is a common strategy in Norway. A hemoglobin content of 10-11g/dl is descripted as optimal in piglets (Honal, 2003). The aim of the study was to compare two iron pastes with different iron sources and to reach an optimal hemoglobin content at weaning.

Material and Methods

The study included 69 suckling piglets. Group one (G1) (n=33) got orally 1.5ml Lactiferm® Fe per piglet, an iron-II-fumerate based paste, with 180mg iron per application. Group two (G2) (n= 36) got orally 2ml of product A, an iron-dextran based liquid product, with 200mg iron per application. Both groups got the oral product within the first 24 hours of life and additionally an iron peat, day three until day 32 of life. Peat was for voluntary intake and contained iron fumerate. Hemoglobin content was measured: G1 at day 25 of life and G2 at day 24 of life - blood samples were collected via vena jugularis and analyzed in laboratory, day 41 (G1) and 40 (G2) of life with HemoCue 210 + Vet (HemoCue, Sweden/ Bergmann Diagnostica). All data were subjected to statistical analysis using a non parametric test (Mann-Whitney-U, SPSS Vers. 24).

Results

Piglets of G1 had significantly more blood hemoglobin at first measuring compared to G2 (G1: 10.76^{a}± 1.12; G2: 9.15^{b}± 1.69 g/dl; $p<0.01$). This result was also observed at second measuring (G1: 11.87^{a}± 0.93; G2: 9.60^{b}± 2.11 g/dl; $p<0.01$).

Discussion and Conclusion

The application of 1.5ml Lactiferm® Fe in combination with voluntary intake of iron peat shows an optimal hemoglobin content (>10g/dl) at weaning. Standard variation in G1 indicate also more homogenous piglets respectively to hemoglobin content.

AWN-PP-11

EFFECT OF SHORT-CHAIN FATTY ACIDS ON THE INTESTINAL BARRIER IN INTESTINAL PORCINE CELLS (IPEC-J2)

M. Andrani [1], R. Saleri [1], V. Cavalli [1], L. Ferrari [2], E. De Angelis [1], P. Borghetti [1], P. Martelli [2]
[1]*Department of Veterinary Science, University of Parma*
[2]*Department of Veterinary Science, University of Parma, 43126 Parma, Italy*

Background and Objectives

An alternative strategy to antibiotic growth promoters is represented by fatty acids, which are essential not only for growth, but also for regulating metabolism and immunity. The aim of this study was to evaluate the effect of supplementation with main short-chain fatty acids (SCFAs) (acetate, propionate, butyrate) at different concentrations on the nitric oxide (NO) production and expression of immune- and tight junctions (TJ)-related markers in IPEC-J2.

Material and Methods

IPEC-J2, a non-transformed intestinal cell line derived from neonatal piglet jejunal epithelium, were cultured in DMEM-F12 medium supplemented with sodium acetate or sodium butyrate at 0.5, 1, 2.5, and 5 mM, or sodium propionate at 1, 2.5, 5 and 10 mM for 24 h. These ranges were used to determine their effect on cell viability (MTT assay), nitric oxide production (Greiss assay in culture supernatants) and expression of immune- and TJ-related genes by qPCR.

Results

Treatment with SCFAs increased beta-defensin 1 (BD1) expression which resulted associated with down-regulation of TNF-α and NF-κB, while the membrane proteins zona occludens 1 (ZO1), occludin (OCLN) and claudin 4 (CLDN4) expression varies depending on the SCFA type and concentration. Overall, data can confirm the defensive role in contributing to maintain barrier integrity. The importance of these TJ-related markers is supported by the fact that the increase in gene expression was concordant with increased cell viability upon acetate and propionate supplementation.

Discussion and Conclusion

The effects of SCFAs are variable and may depend on concentration. Their action is associated with a protective effect, through the maintenance of the integrity of the intestinal mucosal barrier and the regulation of innate immunity. They could be considered singularly or in combination, being able to suppress enterocyte apoptosis due to stressors by maintaining cell membrane integrity. Therefore, the present results are important for the investigation of the cellular mechanisms underlying SCFA efficacy in pig diet.

AWN-PP-12

PORCINE EAR NECROSIS IN PIGLETS: DEVELOPMENT OF LESIONS AND GERMS.

M. Malik [1], S. Theuns [2], S. Croubels [3], K. Chiers [3], I. Chantziaras [4], D. Maes [5]
[1]*Department of Internal Medicine, Reproduction and Population Medicine, Faculty of Veterinary Medicine, Ghent University, Belgium*
[2]*PathoSense BV, Lier, Belgium*
[3]*Department of Pathobiology, Pharmacology and Zoological Medicine; Faculty of Veterinary Medicine, Ghent University, Belgium*
[4]*Department of Internal Medicine, Reproduction and Population Medicine; Faculty of Veterinary Medicine, Ghent University, Belgium*
[5]*Department of Internal Medicine, Reproduction and Population Medicine; Faculty of Veterinary Medicine, Ghent University, Belgium*

Background and Objectives

Porcine ear necrosis(PEN) is characterized by uni- or bilateral lesions of the ear tip or margin followed by necrosis. Lesions mostly appear in piglets between the sixth and eighth week of life. Different risk factors have been described such as infections, ear biting, high stocking density, poor ventilation, mycotoxins in the feed or insufficient enrichment of the environment. However, the lesions and pathogens involved are poorly characterized. The present study investigated the progression of the lesions and associated germs in affected pigs from commercial farms.

Material and Methods

Three farms with PEN problems in nursery piglets have been selected. On each farm, during the nursery period, the PEN prevalence was assessed and the severity of lesions was scored. In the last two weeks of the nursery, affected and non-affected animals were blood sampled (n=90 animals), swabs (n=30) for microbiological culture and scrapings (n=30) for metagenomics-nanopore-sequencing were collected, as well as biopsies (n=90) for histology, were taken.

Results

Microbiological culturing resulted in growth of Staphylococcus aureus and hyicus, Streptococcus suis and dysgalactiae and Escherichia coli in both, PEN affected and non-affected pigs. The nanopore-sequencing results showed the presence of more than twenty different viruses and bacteria, of which Streptococcus, Staphylococcus, Fusobacterium and Mycoplasma appeared most relevant. Of these, only Mycoplasma hyopharyngis was present in 78% of lesions, but absent in control animals. Histopathology results (2 farms) revealed epidermal hyperplasia, hyperkeratosis, ulcerations, with almost no vasculitis or thrombosis.

Discussion and Conclusion

A broad variety of environmental and skin physiological germs were found on the ears of affected and healthy piglets. The role of Mycoplasma hyopharyngis, which is part of the oral microbiota, warrant further research. The histopathology results suggest that the skin alternations may be due to external toxins. Nanopore-sequencing results suggest that ear biting & bacteria may play a role in the pathogenesis of PEN in present farms.

AWN-PP-13

ASSESSMENT OF FIELD EFFICACY OF INJECTABLE GLEPTOFERRON + TOLTRAZURIL IN COMPARISON WITH INJECTABLE GLEPTOFERRON ON THE EXCRETION OF CYSTOISOSPORA SUIS OOZYSTS, FAECAL CONSISTENCE AND ZOOTECHNICAL PERFORMANCE

J. Aundrup [1], M. Köchling [2], V. Cvjetković [2], D. šperling [3]
[1]*Swine Health Service, Chamber of Agriculture Lower Saxony, Oldenburg, Germany*
[2]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*
[3]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Infections with Cystoisospora suis in suckling piglets are most often characterized by diarrhoea in the piglets second, third week of age respectively. The objective of this study was to assess the effect of an injectable toltrazuril + gleptoferron product on oocyst shedding, faecal consistency and growth performance on a conventional piglet producing farm in comparison to injectable gleptoferron.

Material and Methods

Litters were randomly allocated based on parity and farrowing date of the dam. The control group (CG; n=200) was treated with 200mg gleptoferron (i.m.) and the experimental group (EG; n=192): with 45 mg toltrazuril + 200 mg gleptoferron (Forceris®); both products on piglets 2nd DOA. Litters were weighed on the same day as well as at weaning. Faecal samples from 30 litters in each group were collected on their 9th DOA and examined by autofluorescence microscopy for the presence of oocysts. Faecal consistency was evaluated according to following scheme: 1 = firm; 2 = pasty, 3 = semi-liquid and 4 = liquid. Diarrhoea was defined with a faecal score ≥ 3.

Results

No significant difference between litter weights at beginning of the trials (EG: 19.74 kg vs CG: 19.81 kg) was found. Oocyst shedding was eliminated in EG (0% vs 20.7 %; p<0,05). Diarrhea was significantly less present in the EG (3.3% vs. 30.0%; p = 0.012). Fecal score values were significantly lower in the EG compared to the CG (1.70 vs. 2.067; p = 0.0318). No significant weight differences were found at weaning, however litters from the EG were on average 0.60 kg heavier than in the CG.

Discussion and Conclusion

The injectable combination of gleptoferron and toltrazuril provided an effective elimination of oocyst shedding, a significantly lower prevalence of suckling piglet diarrhoea and consequently significantly lower faecal score values. Differences in litter weights at weaning were numerically higher in piglets in the experimental group.

AWN-PP-14

EFFECTS OF THE WEBBING BELT PROVISION ON SALIVARY CORTISOL CONCENTRATIONS, WOUNDS ON BODY, AND BEHAVIOUR OBSERVATIONS OF GROWING PIGS IMMEDIATELY AFTER TRANSPORTATION AND GROUPING

J. Kim [1], J. Lee [1], J. Cho [1], K. Kang [2], H. Cho [2], J. Yun [1]
[1]Department of Animal Science, Chonnam National University, South Korea.
[2]Swine Research Center, Sunjin R&D Institude, Sunjin Co., Ltd, South Korea.

Background and Objectives

We evaluated the effectiveness of the polyester webbing belt, which is manipulable and chewable, but not edible for 9-weeks-old pigs, immediately after transportation, grouping, and exposure to new housing conditions.

Material and Methods

After two-hour transportation (the loading began at 08:00), a total of 319 pigs (LYD, 50-55 pigs per pen) were instantly allocated to three treatments: 1) C: control group with no enrichment materials, 2) W3: three webbing belts per pen were horizontally tied on three sides of the fence, 3) W6: six webbing belts were horizontally tied on three sides of the fence. Pigs were video-recorded for 24 h after regrouping for behaviour observations. We collected saliva samples from three pigs per pen for cortisol assay on days 1 and 2 after grouping. We furthermore measured body weight, wounds on the body, and lesions related to tail biting, at day 0 and 6 after grouping.

Results

During the sampling period, i.e. 6 days after grouping, mortality and tail biting did not occur in the study pigs. We found lower cortisol levels in pigs with the W6 group than W3 and C on days 1 and 2 after grouping ($P < 0.05$). At day 6, the control group appeared to have numerically higher percentage of pigs with wounds on the body compared to the W3 or W6 group (33.7 % vs. 22.2 or 27.1 %, respectively). These cortisol levels as well as the rate of the pigs with wounds on the body have showed tendencies of negative correlations with the pig's manipulating behaviour towards the webbing belt ($r = -0.79$, $P = 0.06$; $r = -0.75$, $P = 0.08$, respectively).

Discussion and Conclusion

In conclusion, our preliminary results show the potential that the provision of the webbing belt as an enrichment material can mediate the adverse effects of social stressors after mixing in growing pigs.

AWN-PP-15

COLOSTRUM FOSTERING: UNDER PRACTICAL CONDITIONS, IS IT USEFUL TO ANALYZE COLOSTRUM WITH A BRIX REFRACTOMETER IN THE FOSTERING PROTOCOLS OF HYPERPROLIFERATIVE SWINE GENETICS?

G. Laszlo [1], A. Botond [2], H. Rita [2]

[1]*veterinarian*

[2]*University of Győr, Wittmann Antal Plant-, Animal- and Food Sciences Multidisciplinary Doctoral School*

Background and Objectives

The long-term impact of colostrum on animal health is unquestionable. Unfortunately, the colostrum yield fluctuates, and at least 30% of the sows do not produce enough colostrum. A Brix refractometer proved to be a quick and easy to use method for measuring colostrum ImmonglobulinG under field conditions.

Material and Methods

In our study, colostrum quality was examined in 556 breeding animals twice with a Brix refractometer: The value of <20 was considered low, 21-25 adequate, and >26 high. Postpartum Disgalactia Syndrome and as well as suckling pig mortality, weaned piglet/sow, and fostering potential, were also recorded and analyzed individually.

Results

At farrowing, 98.9% of sows had a Brix value of> 21, of which 73.7% belonged to the high category. Twenty-four hours after farrowing, 65% of the sows had a value of> 21, but only 15.9% had a very high level. In sows where the value was between 21-25 at farrowing, only 33.8% reached an acceptable value of> 21 after 24 hours. Taking into account the 24-hour measurements, the average piglet mortality at all three values was the same. Regarding the number of the weaned piglets, approximately more than1 piglet/sow was at 21-25 (13.2) and> 26 (13.4) values. The sows with> 26 value were able to raise 25% more piglets compared to the 21-15 or <20 groups.

Discussion and Conclusion

According to this study, 99% of the sows supplied the piglets with a good concentration, but not quality, of colostrum. More than half of the sows maintained this concentration for 24 hours after farrowing. Colostrum fostering is a good option for farms to raise large numbers of piglets, but without a unique examination of the colostrum, it is impossible to make an informed decision. In this farm, only 15% of the sows can be used for colostrum fostering with adequate safety.

AWN-PP-16

REDUCTION OF DRINKING WATER TEMPERATURE DURING THE LACTATION PERIOD IN WARM ZONES: PROFITS IN A PRACTICAL EXPERIENCE.

P. Sánchez-Giménez [1], H. González-Ramiro [1], R. Fernández-Rodríguez [1], A. Martínez-Moreno [1], G. Ramis [2]

[1]*AGROPOR, Murcia, Spain*

[2]*Dpto. Producción Animal,. Facultad de Veterinaria., Universidad de Murcia, Spain*

Background and Objectives

The ideal drinking water temperature (DWT) during lactation of the sow is 18-22ºC. However, in warm areas, and in farms lacking of a good insulation of the water conduction system, this objective is never achieved. DWT rises in the pipes and tanks when it is not moving. This practical experience shows the productive profits obtained by isolated DW pipes, reducing its temperature in a commercial farm in S-E Spain.

Material and Methods

In a commercial farm with 2.000 farrowing places, we measured DWT and ambient temperature during July 2020. In June 2021, we insulated all pipes that were exposed to the sun with a 25mm thick elastomer material and later we painted it with white paint to refract the sun. In July 2021, we measured DWT and ambient temperature again and we compared the productive data of lactating sows that month of 2020 vs 2021.

Results

We reduced mean and maximum DWT by 2.4ºC and 3.5ºC respectively (27.9ºC vs 25.5ºC and 32.3ºC vs 28.8ºC), but not the minimum (23.3ºC vs 23.2ºC) comparing 2020 vs 2021. Average feed intake per sow per day (5.42kg vs 5.63kg, $p<0.05$) and weaning weight (5.52kg vs 6.13kg, $p<0.05$), were improved. In the next cycle, the wean-to-first service interval was reduced, and fertility improved. There was also a benefit in the percentage of sows in heat before 7 days postweaning.

Discussion and Conclusion

The results demonstrates the importance of DWT to increase feed intake during lactation; even without reaching the ideal value. Several parameters improved, and DWT may play a relevant role, even when other factors could influence. In warm climate areas is key to continue studying how to improve in this regard and reduce the negative consequences of heat stress.

AWN-PP-17

EVALUATION OF THE EFFECT OF SURGICAL AND IMMUNOLOGICAL CASTRATION ON BOAR TAINT COMPOUNDS IN ORAL FLUID AND FAT TISSUE BY A LIQUID CHROMATOGRAPHY–TANDEM MASS SPECTROMETRY (LC-MS/MS) METHOD

P. Cybulski [1], B. Woźniak [2], A. Jabłoński [3], S. Witek [2], I. Matraszek-żuchowska [2]

[1]*Goodvalley Agro S.A., Przechlewo, Poland*

[2]*Department of Pharmacology and Toxicology, National Veterinary Research Institute, Puławy, Poland*

[3]*Center of Translational Medicine, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*

Background and Objectives

Surgical castration preventing boar taint caused by the presence of androstenone, skatole and indole, is commonly applied in swine production; however, the practice arouses growing social concern. An alternative method is immunological castration. The first aim of our study was to analyse and compare the effectiveness of both methods. The second aim was to evaluate the usefulness of oral fluid for ante-mortem predictive testing for boar taint.

Material and Methods

The research was conducted on 4 pens of animals (14 animals in each) reared in a commercial farm: gilts, surgically castrated male finishers, immunologically castrated male finishers, mix of gilts and surgically castrated male finishers (50:50). The male finishers received Improvac (Zoetis, Belgium) at the age of 13 and 17 weeks. The surgically castrated animals had undergone the procedure on the 3rd day of life. The ante-mortem material obtained from each group was oral fluid, collected at 12, 15, 19, and 22 weeks of age. Neck fat samples were collected post-slaughter from gilts and male finishers castrated using both techniques (15 samples from each group). All the samples were tested with LC-MS/MS method validated in this research on Nexera X2 UHPLC coupled with MS 8050 triple quadrupole mass spectrometer (both Shimadzu Corporation, Japan).

Results

The compounds responsible for boar taint were found sporadically above the accepted limits. Only one sample of oral fluid contained skatole at a concentration above 200 $\mu g\ L^{-1}$, and one contained indole with concentration exceeding 100 $\mu g\ L^{-1}$. Indole above the limit value was also detected in one fat sample. Androstenone was not detectable.

Discussion and Conclusion

Our research indicates similar effectiveness of both methods of piglet castration on the reduction of boar taint; however, the usefulness of oral fluid as the material in ante-mortem identification of boar taint has not been fully confirmed yet and requires further investigation.

AWN-PP-18

FIGHTING ENTEROPATHOGENIC E. COLI WITH ALGAL POLYSACCHARIDES

M. Garcia-Suarez [1], M. Gallissot [1], M. Berri [2], P. Nyvall-Collen [1], M. Porter [2], D. Marzin [1]
[1]*Olmix Group, Brehan, France*
[2]*Infectious diseases and Public Health Unit, INRAE, University of Tours, Nouzilly, France*

Background and Objectives

Young piglets are highly sensitive to enteropathogenic Escherichia coli infections, which can colonize the intestinal epithelium and trigger diarrhea with important economic losses. The first objective of the present work was to evaluate, in vitro, the capacity of the red algal extract from Solieria chordalis to reinforce the gut barrier in the presence of E. coli K88 1305 and E. coli K88 968. Also tested, in vivo, was the ability of this red algal extract, together with a green algal extract from Ulva sp, to improve the health status and performance of nursery piglets.

Material and Methods

In the in vitro assays, IPEC-1 cells were incubated with the red algal extract prior to incubation with E. coli K88 1305 and E. coli K88 968. Trans-epithelial electrical barrier (TEER) and bacterial adhesion to cell culture were measured. In vivo, 211 piglets weaned at 21 days were homogenously distributed to 8 post-weaning pens of 27±1 piglets and divided in 2 experimental groups: a control group (not supplemented), and a test group receiving the algae-based supplement for 43 days.

Results

The red algal extract maintained a higher TEER than the negative control in the first 10 hours of infection with E. coli K88 1305 and reduced the adhesion of E. coli K88 968 to IPEC-1 cells at the three concentrations tested compared to the negative control. Tested piglets presented an improved health status when compared to the control as seen by a decreased inflammatory status (-16% haptoglobin level), improved fecal consistency and a lower number of animals needing a medical treatment (-57%, $P<0.01$). The nursery piglets were better prepared for this stressful period and showed improved performance (+300g at 64 days, -1pt FCR).

Discussion and Conclusion

This algae-based supplement has proven to be promote both health and performance of pigs in the nursery phase.

AWN-PP-19

MEASURING BEHAVIOR FOLLOWING VACCINATION USING AN AUTOMATED CAMERA AND DRINKING WATER INTAKE

R. Jansen [1], M. Steenaert [2], H. Prüst [2], C. Alonso [1]
[1]*Boehringer Ingelheim Vetmedica GmbH*
[2]*Boehringer Ingelheim Animal Health Netherlands bv*

Background and Objectives

This study evaluated the impact of different vaccinations on piglet's activity using modern camera techniques.

Material and Methods

Pigs were vaccinated 8 days after weaning with a combination of the same antigens (Pcv2, Mhyo & Lawsonia), group W (n=256) with a water- carbomer adjuvant combined with an oral vaccine. Group MO (n=256) was vaccinated IM with a mineral oil adjuvant. Water intake was logged every 6 hours. Animal activity was monitored using cameras and expressed as the changed pixels percentage between two sequential photos. Activity was modeled through Auto-Regressive and Moving Average (ARMA).

Results

Six animals from group MO showed anaphylactic shock after vaccination which was higher when compared with the W group without anaphylactic shocks ($p<0.05$). Rectal temperature of group MO was elevated compared to group W (40.7°C vs 39.7°C, $p<0.001$). The ARMA-model forecasted appropriately for group W since the observed values are mainly within the predicted 95% CL. On the other hand, results from group MO highlights the fact that piglets did not behave as expected. Mean square difference between expected and observed values overtime differ significantly between groups ($p < 0.0001$). This is supported by the differences in drinking water intake. Pigs from group MO experienced a dropped of 74% (87 ml/kg BW to 21 ml/kg BW) and from group W dropped 6% (84 ml/kg BW to 79 ml/kg BW) 24h after vaccination. The water intake of group MO dropped over a 2-day period when compared to group W ($p<0.001$).

Discussion and Conclusion

Animal behavior monitoring with objective and noninvasive techniques like camera analysis and drink water intake monitoring proved to be a useful way of assessing animal activity and to compare the effect of two different vaccine platforms. Camera observation combined with drink water intake are valuable parameters to assess piglet activity differences.

AWN-PP-20

FOOT LESIONS IN ITALIAN HEAVY PIGS OBSERVED AT THE SLAUGHTERHOUSE

C. Tansini [1], A. Gazzola [1], S. Bariselli [1], F. Guadagno [1], A. Ianieri [2], S. De Luca [2], S. Ghidini [2], G.L. Alborali [1], F. Scali [1], F. Vezzoli [1], A.M. Maisano [1]

[1]*Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Brescia, Italy*

[2]*Department of Food and Drug, University of Parma, Via del Taglio 10, 43126 Parma, Italy*

Background and Objectives

In Italy, pigs are usually slaughtered at 150-170 Kg since they are reared for traditional Protected Designation of Origin products. Claw lesions and lameness in such heavy animals represent an important cause of culling. Those lesions are often a multifactorial problem. The aim of this study was to investigate the prevalence of different foot lesions in Italian heavy pigs and to evaluate differences among farms.

Material and Methods

A total of 11,189 pigs from 84 farms located in Northern Italy were evaluated. Overall, 22,378 front feet (44,756 claws and 44,756 dewclaws) were inspected, after stunning and bleeding, for the presence of eight types of lesions. Namely, cracked wall vertical (CWV) and horizontal (CWH), heel-sole crack, white line damage (WL), heel overgrowth and erosion (HOE), overgrowth toe and dew claw (DCL), coronary band damage toe and dew claw (DCCB) and sole ulcer. Differences among farms were assessed using a Chi-square test.

Results

The overall prevalence of claw injuries was 65.0%. WL and HOE were the most frequent lesions (32.6% and 31.4%, respectively), whereas CWV and CWH were only occasionally found (5.6% and 4.6%, respectively). Significant differences among farms were found for every lesion ($P<0.001$), except for DCCB and DCL ($P>0.05$).

Discussion and Conclusion

In our study, due to feasibility issues, we only inspected the front feet which could explain the lower overall prevalence of the lesions when compared to previous studies. Nevertheless, the distribution of those lesions was in accordance with the literature with WL and HOE being the most frequent. Moreover, pigs with WL are likely to develop lameness with negative effects on their welfare and an increased risk of culling. Considering the significant differences among farms and the implication on pig welfare, further studies should be performed to identify risk factors associated with the development of foot lesions.

AWN-PP-21

PARITY, LAMENESS STATUS AND STEREOTYPIES IMPACT THE USE OF POINT-SOURCE ENRICHMENT IN GROUP-HOUSED SOWS

P. Zhitnitskiy [1], C. Terreaux [2], H. Phillips [3], B. Ventura [3]
[1]*University of Minnesota College of Veterinary Medicine*
[2]*Charles River Laboratories*
[3]*University of Minnesota*

Background and Objectives

Environmental enrichment is an important strategy to improve the welfare of farm animals. However, there are few practical options for sows raised indoors on concrete slats.

Material and Methods

We investigated the short-term (4d) impact of a point-source enrichment object on the behavior of gestating sows housed in group pens. Four pens of gestating sows were randomly allocated to receive either enrichment or no enrichment (control) in a 2 by 2 crossover design. We established time budgets by video recording focal sows' behaviors (n=10 focals per pen) every 15 minutes between 0800 and 1500 every day and continuously for one hour between 0830 and 0930.

Results

Focal sows spent most of the time inactive and lying down (70%). The next most common behaviors included sham-chewing (16%), 3% exploring, 2% feeding, 2% walking and 1% interacting with the enrichment when it was available. Low-parity sows, moderately-lame sows, and sows observed sham chewing at baseline displayed more consistent enrichment use ($p=0.02$, $p<0.01$, $p=0.04$, respectively). There was no adverse behavioral effect due to provision or removal of the enrichment object. Eighty-five percent of sows interacted with the enrichment at least once.

Discussion and Conclusion

However, interest declined sharply after the first day, suggesting a need to identify more effective enrichment strategies for gestating sows housed on slatted floors.

AWN-PP-22

IMPACT ON MORTALITY, MEDICATION USE AND WEIGHT DAILY GAIN OF THE ADMINISTRATION OF AN INJECTABLE COMBINATION OF GLEPTOFERRON + TOLTRAZURIL VS. AN INJECTABLE DEXTRAN IRON PREPARATION.

D. Ponzoni [1], F. Cominotti [3], P. Casappa [3], D. Sperling [2], E. Pileri [3]
[1]*Swine pratictioner, Italy*
[2]*Ceva Animal Health, France*
[3]*CEVA Animal Health, Italy*

Background and Objectives

Iron Deficiency Anemia (IDA) causes reduced growth and impairs the swine immune system. Objective of this study is to assess the impact of IDA's prevention on mortality, ADG and medication use in piglets treated with an injectable combination of Gleptoferron+Toltrazuril based product, in comparison with these treated with an Iron dextran product.

Material and Methods

592 commercial piglets of 2 doa were individually weighted and divided in two groups: A) piglets (n=296) treated with Forceris® (Ceva Santè Animale) (200mg of Fe as Gleptoferron + 45mg of toltrazuril), and B) animals (n=296) treated with Ferrosil Forte® (200mg of Fe dextran, IZO) plus Baycox Multi® (Elanco, 50mg/ml of oral toltrazuril). At weaning piglets were individually weighted and their Hemoglobin (Hb) concentration in blood was assessed by Hemocue® Photometer. Based on Hb levels, piglets were classified as Healthy (Hb ≥ 11 g/dl) or Anemics (Hb ≤9 g/dl). Data about clinical diseases, mortality and medication use (number of animals treated with antibiotics and duration of the interventions) were collected throughout the study and compared between groups as well as average Hb level and ADG.

Results

Piglets treated with Gleptoferron+Toltrazuril had higher average Hb value (11.8 [11.6; 11.9] g/dl) than those treated with Iron dextran (11.13 [10.9; 10.3] g/dl) ($p<0,05$). Percentage of anemic piglets was 0.7% and 6.2% in group A and B, respectively. Antibiotic use was required only once in 0.68% of piglets treated with Gleptoferron+Toltrazuril vs. 2.03% of group B. Piglets' mortality was lower in group A (5.07%) than in group B (6.76%). No differences were found in terms of ADG.

Discussion and Conclusion

Prevention of IDA by Forceris® use allowed a reduction of mortality and antibiotic treatment in suckling piglets compared with treatment with Dextran Fe, even in farms with high sanitary status.

AWN-PP-23

INFLUENCE OF THE APPLICATION METHODS OF IRON/ANTICOCCIDIAL PRODUCTS ON THE BEHAVIOUR AND ASSOCIATED STRESS FACTORS OF SUCKLING PIGLETS

M. Rodríguez [1], J. Morales [1], G. Díaz-Amor [1], A. González-Bulnes [2], H. Karembe [3], D. Sperling [3]
[1]*PigCHAMP Pro Europa*
[2]*Universidad Cardenal Herrera-CEU, CEU Universities, C/ Tirantlo Blanc, 7, 46115 Alfara del Patriarca, Valencia, Spain*
[3]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Piglets are sensitive to stressors; they are nevertheless routinely subjected to manipulation. The aim of the study was to evaluate the effect of different treatment protocols for the control of iron-deficiency anaemia and coccidiosis, combination injection versus injection of iron and oral application of Toltrazuril, on the general behavioural of piglets.

Material and Methods

Six sows (parity 3-5) and litters (12 piglets/litter) were included: T1-negative control (negative control group, NC); T2-oral administration of anticoccidial agent (20mg/kg BW) plus iron dextran i.m. (200mg/ml) (oral + parenteral group, O+P); T3- combination product i.m. (1.5 ml; Forceris®, CEVA Santé Animale) (parenteral group, P). Six cameras were installed in each farrowing cage. The video was captured 3 hours before (-3h, -2h, -1h) iron/anticcocidial supplementation till 3 hours after (+1h, +2h, +3h). 7 behaviours were classified as active: (suckling + positive interactions + normal locomotion + exploration) and neutral (resting + sitting + standing). Cortisol concentrations were analysed.

Results

Administration of combined product reduced time on handling (T2 vs. T3 (mean ± sem) 198.5 ± 22.98 s vs. 111.5 ± 22.98 s, respectively). Positives interactions were greater ($p = 0.0563$) immediately after both treatment administration (+1h) due to the fact that piglets were handled. Animals in T3 spent more time suckling after treatment, when compared with individual single treatments in T2. Three hours after processing, a statistical trend on reduction of the cortisol concentration in T3 compared to T2 could be observed ($p= 0.08$).

Discussion and Conclusion

Our study showed that administering a single injection decreases the time of administration and handling of piglets. Regarding general behaviour, these animals spent more time suckling after treatment than those in which the administration protocol involved oral and parenteral treatment with trend to see lower plasma cortisol as frequently used stress marker.

AWN-PP-24

INSTALLATION OF A PIG TOILET IN A NURSERY PEN WITH STRAW-LITTERED LYING AREA

M. Tillmanns [1], K. Scheepens [2], N. Kemper [1], M. Fels [1]
[1]*University of Veterinary Medicine Hannover, Foundation, Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour*
[2]*Educatijeboerderij Walnoot & Wilg, Oirschot, Foundation, The Netherlands*

Background and Objectives

The emission of ammonia is one of the largest problems in intensive pig production. Currently, air filter systems are used to reduce ammonia levels and to protect the environment. However, in order to reduce the formation of ammonia itself and to improve animal welfare, it is necessary to reconsider and optimise pig housing conditions. In this study, a pig toilet was installed on an organic pig farm in the Netherlands, which enabled the pigs to use a lying area littered with straw and keep it clean.

Material and Methods

For this purpose, the natural excretory behaviour of pigs, i. e. separating the elimination area from the lying area, was used. Sixteen animals (nine female and seven male pigs) of Berkshire breed were weaned at six to seven weeks of age and housed in the experimental system for a period of four weeks. Four trials, each with four pigs per group, were performed, and videos were recorded on two days per week during each experimental cycle from 8:00 to 18:00.

Results

A total of 1500 elimination processes were recorded and analysed during that time. An individual pig had 7.07 ± 1.4 defecations and 4.8 ± 0.8 urinations per day, on average. 96.4% of all urinations and 97.4% of all defecations were carried out in the pig toilet.

Discussion and Conclusion

Video analysis also revealed that the use of the toilet did not change during the 4-week housing period, thus the animals immediately divided their new environment into functional areas and strictly adhered to them. We conclude that installing a pig toilet offers the possibility to create littered lying areas in pig farming, possibly reducing ammonia emissions and increasing animal welfare. Further studies are needed to elucidate whether the system could be transferred to commercial farms. This study was funded by Tönnies Foundation.

AWN-PP-25

INVESTIGATION INTO THE OPTIMIZATION OF THE AUTOMATED ISOFLURANE ANESTHESIA FOR THE PERFORMANCE OF SAFE, PAINLESS CASTRATION OF PIGLETS UNTIL THE SEVENTH DAY OF LIFE.

J. Ruedebusch [1], S. Kaestner [2], M. Wendt [1], K. Waldmann [1], A. Von Altrock [1]

[1]*Clinic for Swine, Small Ruminants, Forensic Medicine and Ambulatory Service, University of Veterinary Medicine Hannover, Foundation, D-30173 Hannover, Germany*

[2]*Clinic for Small Animals, University of Veterinary Medicine Hannover, Foundation, D-30559 Hannover, Germany*

Background and Objectives

With the enactment of the Ordinance on administering anaesthesia with isoflurane in the castration of piglets by qualified persons in 2020 automated anaesthesia devices have been implemented in many German farms. The aim of this work was to determine a sufficient anaesthetic induction time using a uniform isoflurane concentration and comparing oxygen and room air as carrier gases to guarantee painless castration in piglets.

Material and Methods

Anaesthesia was induced via mask (5vol.% isoflurane, carrier gases: oxygen or room air, flow rate: 2 L/min). Piglets were divided into 6 weight classes. Starting with an induction time of 105 seconds (s) in each weight class, depth of anaesthesia (DOA) was determined by recording withdrawal movements after interdigital pinch in groups of 8 piglets. If no movement was observed, induction time was reduced by 5s for the next group. The procedure was repeated until first movements occur and anaesthesia was judged as insufficient. The lowest induction time within each weight class without reaction was tested for DOA during castration in corresponding weight classes of 22 piglets. When pain induced movements occurred, induction time was increased for 5 s. After testing three different induction times maximum, the whole group was castrated and defensive movements were recorded using a score system.

Results

The induction times determined by toe pinch proved insufficient to eliminate sensations during castration. Insufflation time was increased twice for each weight class and carrier gas, resulting in 100-115 s duration depending on weight. Nevertheless, 27.5% (carrier gas: oxygen) and 14.2% (carrier gas: room air) of the piglets showed withdrawal movements during castration.

Discussion and Conclusion

Complete analgesia during castration could not be achieved with isoflurane induction times up to 115 s. Therefore, automated anaesthesia devices, which work with significantly shorter induction times of about 85 s, do not meet the requirements of the German Animal Welfare Act.

AWN-PP-26

IS THE CARCASE QUALITY OF ENTIRE MALES VACCINATED AGAINST BOAR TAINT COMPATIBLE WITH DRY-CURED HAMS PROCESSED IN SOUTHWEST FRANCE?

P. Charrier [1], F. Colin [2]
[1]*LES BASTIDES DU SUD, 9 Chemin de Brousse, 64160 MORLAAS, France*
[2]*ZOETIS, Bâtiment VIVA, 10 Rue Raymond David, 92240 Malakoff, France*

Background and Objectives

Immunocastration of male pigs using vaccination against boar-taint modifies the fat covering of finisher pigs compared to physical castrated pigs. A substantial fat coverage is required by curing processors and while immunocastration has been found to provide hams suitable for dry-curing in Spanish trials, no such information is yet available from France. This trial aimed to assess whether high-quality dry-cured hams from the South-West of France can also be obtained from boar-taint vaccinated pigs.

Material and Methods

The study was conducted in a 200-sow breeder-finishing farm located in Southwestern France. Male pigs from two consecutive batches were included. In each batch, half of the males were surgically castrated and the other half received three injections of a boar taint vaccine (Improvac®, Zoetis) at 10, 14 and 18 weeks of age to obtain a prolonged immunocastration period. They were slaughtered between 5 and 8 weeks after the last vaccination. Maximum feed intake was adapted to the type of castration (higher maximum daily feed distribution to vaccinates). Zootechnical performance and slaughter parameters were collected and analysed (Student's test with Bonferroni correction).

Results

Immunocastrated pigs were significantly fatter, having a lower lean meat percentage and a higher hot carcass weight (+ 5.77 kg) compared to physically castrated males ($p=0.009$; $p=0.024$ and $p<0.0001$ respectively). This resulted in an increase of the rate of labelable hams for carcasses from immunocastrated pigs (64% versus 59%).

Discussion and Conclusion

Under the conditions of this study, a three-dose protocol of boar-taint vaccination of entire males produced fat coverage that complied with the dry-curing process required for ham in Southwestern France. Further similar studies, but changing the nutrition and vaccination timing (i.e. two delayed vaccine injections) could be recommended in order to find the optimal return on investment under the context of this particular specification.

AWN-PP-27

IS THE CARCASE QUALITY OF IMMUNOCASTRATED MALE PIGS SUITABLE FOR THE PRODUCTION OF DRY-CURED 'AUVERGNE' HAMS?

L. Larraillet [1], F. Colin [2]
[1]*SELARL DES VOLCANS, 9 Rue de Gutenberg, 15000 Aurillac, France*
[2]*ZOETIS, Bâtiment VIVA, 10 Rue Raymond David, 92240 Malakoff, France*

Background and Objectives

Pork meat with a substantial fat coverage is required for the dry-curing of hams. The production of high-quality dry-cured hams requires meat from castrated males. Vaccination against boar-taint, which induces an immunocastration, has been shown to produce hams suitable for dry-cured ham production in Spain. This trial aimed to validate that this is also the case in France for producing Protected Geographic Indication 'Auvergne' ham.

Material and Methods

This study was conducted in a 130-sow farrow-to-finishing farm in the Centre of France. Three consecutive batches of pigs were included (born in December 2020 and January 2021). All male pigs in these batches were vaccinated with Improvac® at 13 and 17 weeks of age and compared with historical data from the farm. They received the same feed as usual on the farm, but with a higher intake in order to favour fat deposition, and they were slaughtered between 23 and 25 weeks of age. Zootechnical performance was recorded. At the curing plant, the thickness of the fat covering on the surface of hams was measured from all vaccinated entire males; final pH and weight of each ham were also measured.

Results

ADWG over fattening was on average of 896 g/d. Fat thickness was on average 17.8 mm in immunocastrated pigs, significantly higher than the 16.3 mm from surgically castrated male pigs from the same farm ($p=0.02$). Entire vaccinated males were significantly fatter ($p=0.001$) and had a lower lean meat content ($p<0.0001$) than surgically castrated males.

Discussion and Conclusion

A two-dose immunocastration protocol produced a fat covering on the surface of the ham sufficient for the production of superior quality cured hams in France. Although back fat samples with rind from vaccinated pigs have been analysed for fatty acid profiles, results were not available at the time of submission.

AWN-PP-28

KEEPING PIGS WITH UNDOCKED TAILS – CAN A FEED ADDITIVE PREVENT TAIL BITING IN WEANERS?

J. Aundrup [1], G. Bruggeman [2], I. Hennig-Pauka [3]
[1]*Swine Health Service, Chamber of Agriculture Lower Saxony, Oldenburg, Germany*
[2]*Nutrition Sciences N.V., Booiebos 5, 9031 Drongen, Belgium*
[3]*Field Station for Epidemiology, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany*

Background and Objectives

Tail biting is a multifactorial problem associated with reduced animal welfare and economic losses due to less productivity and carcass condemnation. In this study the effect of an immunomodulatory feed additive (functional ingredient based on fibres) on the prevalence of tail biting was assessed in nursery pigs with intact tails. The hypothesis was, that improved gut health is reflected by less tail biting.

Material and Methods

In a German farrow-to-finishing farm 405 pigs out of three batches were randomly allocated at weaning to two feeding groups (A=experimental group & B=control group). The feed additive was provided to pigs in group A during the rearing period. Tails were scored weekly by the same observer during an adspectory clinical examination. Pooled faecal samples from each pen (n= 7 in each group) were examined in the second week after weaning for Lawsonia intracellularis, Salmonella spp., E.coli/F18, Shiga-Toxin Stx2e, rota- and coronavirus.

Results

There was no significant difference in the number of pens affected by diarrhoea (A: n= 5; B: n=6) between both groups in the second week after weaning. Number of pens positive for respective pathogens (rotavirus A and C, E.coli/F18) did not differ between groups. Proportion of pigs with intact tails at the end of nursery (10^{th} week of life) indicates consistent results between the groups. Batch 1: **A**: 17.57 % vs **B**: 17.81 % intact tails ($p>0.05$) Batch 2: **A**: 6.58 % vs **B**: 9.59 % intact tails ($p>0.05$) Batch 3: **A**: 22.22% vs **B** 54.55 % intact tails ($p<0.05$)

Discussion and Conclusion

The results of this study demonstrates again that it is a challenge to keep piglets with intact tails under conventional conditions even in a controlled setting as in the experiment conducted. Within the setting of this study, the feed additive could not prevent or reduce tail biting in this trial.

AWN-PP-29

TIMING OF EUTHANASIA - IS IT AN ECONOMIC OR ANIMAL WELFARE ISSUE?

L. Gombos [1], H. Rita [2], A. Botond [2], V. Laszlo [3]
[1]*Agrofeed Ltd., Győr, Hungary*
[2]*University of Győr, Wittmann Antal Plant-, Animal- and Food Sciences Multidisciplinary Doctoral School*
[3]*Bold Agro Ltd, Derecske*

Background and Objectives

In practice, it is almost inevitable that there will be need for euthanasia on a swine farm. One of the biggest challenges is judging low viability (LV) piglets. In addition to animal welfare issues, economic considerations also play a role in these cases. In our study, we examined whether euthanasia is indeed a solution to both an animal welfare and an economic problem and, if so, when the decision should be made.

Material and Methods

A total of 2,970 piglets in 3+1 batches were screened on a farrow to finish farm. The collected mortality data are sorted by the cause of death. Proportion of LV piglets that died, compared to all: suckling piglet: 28.4% (2 types: 19.4 non-viable + 9% small-viable), weaned piglets: 15.6%, fatteners: 42%. Based on the data that approx. 10-12% of LV piglets are transferred to the fattening barns, the management of the unit has the right to request an analytical audit.According to the study, the unit managers had to choose approx. 30-30 piglets (farrowing: at weaning, nursery: 1 week after weaning), which will probably not be able to reach the slaughterhouse alive or in good quality. The piglets were ear-tagged and monitored.

Results

The postweaning mortality was lower in piglets marked in the farrowing unit (11,1%) compared to marked in the nursery (36,1%). The average daily weight gain (ADG) in the nursery was on average -80 g/day below the farm average in both groups. After transfer to the fattening unit, the number of the compromised pigs was< 10% and 20-30%, according to the Unit manager's decision.

Discussion and Conclusion

The study revealed that euthanasia cannot be clearly determined on the basis of the pig's current quality or state of development. This study also highlights the need for managers to be well prepared to make appropriate decisions about whether to euthanize or not.

AWN-PP-30

THE ABILITY OF AN ALGOCLAY-BASED MYCOTOXIN DECONTAMINANT TO DECREASE THE SERUM LEVELS OF ZEARALENONE AND ITS METABOLITES IN LACTATING SOWS

J. Laurain [1], M. Rodriguez [1], X. Benthen De Grave [2], R. Santos [2]
[1]*Olmix Group, Brehan, France*
[2]*Schothorst Feed Research, Lelystad 8218 NA, The Netherlands.*

Background and Objectives

Mycotoxins are toxic compounds produced by different fungal species, Fusarium being responsible for most contamination of feedstuffs in the field. Pigs are very sensitive to both DON and ZEN. This study evaluated the effect of an algoclay-based mycotoxin decontaminant on the levels of ZEN, DON, and their derivatives in the colostrum, milk, and serum of sows, as well as in the serum of weaned piglets after maternal mycotoxin exposure during the last week of gestation and during lactation of sows (26 days).

Material and Methods

For this, 15 healthy sows were fed diets contaminated with 100 (LoZEN) or 300 (HiZEN) ppb ZEN, with or without an algoclay-based mycotoxin decontaminant in the highly contaminated diet. All diets contained 250 ppb deoxynivalenol (DON), as the diets were prepared with naturally occurring contamination.

Results

Dietary treatments did not affect the performance of the sows and piglets. Only α-ZEL was significantly increased in the colostrum of sows fed the HiZEN diet, however, no differences in milk mycotoxin levels were observed at weaning. The highest levels of ZEN, α-ZEL, and β-ZEL were observed in the serum of sows fed the HiZEN diet. When the HiZEN diet was supplemented with the tested algoclay-based mycotoxin decontaminant the levels of ZEN and its metabolites were significantly decreased in the serum of sows. Although all sows were fed the same levels of DON, the serum level of de-epoxy-DON was increased only in the serum of piglets from the sows fed a diet with the non-supplemented HiZEN diet.

Discussion and Conclusion

In conclusion, the tested algoclay-based mycotoxin decontaminant can decrease the levels of ZEN and its metabolites in the serum of sows and the level of de-DON in the serum of piglets.

AWN-PP-31

THE EVALUATION OF HEAT STRESS IN FATTENING PIGS BY ARTIFICIAL HEATING

L. De Prekel [1], D. Maes [1], A. Van Den Broeke [2], B. Ampe [2], M. Aluwé [2]
[1]*Porcine Health Management, Department Internal medicine, reproduction and population medicine, Faculty of Veterinary Medicine University Ghent, Merelbeke, Belgium*
[2]*Institute for Agricultural, Fisheries and Food Research (ILVO), Melle, Belgium*

Background and Objectives

Pigs are more sensitive to higher ambient temperatures than most other farm animals due to the poor ability to sweat, the thick subcutaneous adipose tissue layer and the limited heart- and lung capacity. The objective of this study was to evaluate the effect of heat stress with different parameters in fattening pigs.

Material and Methods

Two compartments (COMP90 and COMP70) with each 40 pigs of different weight classes (96.5 ± 7.3kg and 72.7 ± 9.9 kg, respectively) were included. In each compartment, the pigs were divided into four pens. The compartments were artificially heated for three days at ± 30°C. Before, during, and after heating, breathing frequency, rectal temperature, skin temperature, passive behaviour, and feed intake were observed at different time points. The temperature-humidity index (THI) based on ambient temperature and relative humidity was calculated. A THI-value between 75 and 79 is considered as a warning for the occurrence of heat stress. This threshold was used to differentiate between days of artificial heating (AHD) and normal days.

Results

On AHD, the breathing frequency significantly ($p<0.001$) increased from 35.6 to 74.2 flank movements/min. Rectal and skin temperature and passive behaviour (percentage of lying animals per pen) were also significantly different ($p<0.001$, $p<0.001$ and $p<0.05$, respectively) on AHD (39.0 vs 39.2°C, 31.8 vs 34.6°C and 72 vs 83%). Furthermore, skin temperature in COMP70 was higher ($p<0.001$, 1.1°C) than COMP90 during the entire trial. Feed intake did not differ significantly during AHD, compared to the normal period ($p=0.111$), probably due to the high variance in the different pens. Despite this insignificance, there was a numeric reduction of 426 g/animal.day on the AHD, compared to the preheating period.

Discussion and Conclusion

Heat stress was expressed by significant changes in rectal and skin temperature, breathing frequency and passive behaviour in this study.

AWN-PP-32

APPLICATION OF HEMICELL HT™ – A β-MANNANASE ENZYME – COMBINED WITH A REDUCED ENERGY CONTENT RETAINS PERFORMANCE AT A LOWER PRODUCTION COST PER KG CARCASS WEIGHT

F. Vangroenweghe [1]

[1]*BU Swine & Ruminants, Elanco Benelux, Elanco Animal Health*

Background and Objectives

β-Mannans are strongly anti-nutritive polysaccharide fibres found in most vegetable feed ingredients. Estimated content of soluble β-mannans in common fattening diets is 0.25-0.35%, and in vitro studies have demonstrated that as little as 0.05% soluble β-mannan in feed can elicit a strong innate immune response. This innate response is referred to as a feed induced immune response (FIIR), which suppresses growth to protect the liver and reserve energy/nutrients for high priority immune functions. Hemicell™ HT (Elanco) is a β-mannanase enzyme for animal feeds breaking down β-mannans, thereby preventing economic losses from this wasteful immune response to β-mannans. Objective was to evaluate finishing performance and slaughter data in control and reformulated diet with reduction of 65 kcal NE/kg feed combined with Hemicell™ HT inclusion.

Material and Methods

The trial including 191 pigs was conducted in 2 compartments. Standard three-phase control diets were compared to similar diets with 300 g/tonne of Hemicell™ HT with reduction of 65 kcal NE/kg feed, resulting in an average feed cost reduction of € 7.71 per tonne. Standard performance, health and slaughter parameters were collected. Data were analysed using JMP 14.0 statistical program – one-tail t-test.

Results

Performance parameters did not significantly differ between both study groups. Mortality was significantly ($P<0.05$) higher (n=4; 4.2%) in the control as compared to the Hemicell™ HT group (n=2; 2.1%). No significant differences in slaughter data were observed, except for muscle depth that significantly ($P<0.05$) increased in the Hemicell™ HT (75.33 mm) as compared to the control group (73.58 mm). Overall production cost per kg of carcass weight was € 0.02 lower in the Hemicell™ HT group.

Discussion and Conclusion

Degradation of β-mannans in fattening diets by Hemicell™ HT resulted in similar performance with a lower dietary energy content, leading to reduced production costs per kg carcass weight.

AWN-PP-33

ENRICHED FEED, INCREASED LIGHT AND ACCESS TO FIBRES DECREASED TAIL BITING

P. Wallgren [1], M. Johansson [2], S. Johansson [2]
[1]*National Veterinary Institute SVA, 751 89 Uppsala, Sweden*
[2]*Nibble Farming, Tillberga, 725 95 Västerås, Sweden*

Background and Objectives

Tail biting decrease welfare and spread infections. This study scrutinised the efficacy of measures aimed to prevent tail-biting in a non-tail-docking high performing high-health integrated herd.

Material and Methods

The herd had 4 identical fattening buildings with windows and 15 units with two pens of 19.6 m^2 housing 20 pigs. The incidence of tail injuries recorded at slaughter during 2017-2020 was documented for each building.

By week 1 2021, the buildings were allotted into; A Lighting 6am-20pm; B Melatonin-decreasing lighting 6am-20pm; C-control Lighting during care (2*1h/day); D Silage (light as C). From week 19, all pigs slaughtered had been exposed to these lights during the entire fattening period. They had also consumed a new feed with increased levels of minerals, fibres and amino acids since birth. No alterations in technology of feeding or ventilation were made.

Results

During 2017-2020, tail injuries at slaughter differed ($p<0.05-0.001$, χ^2-tests) between all units; 6.6% in A, 8.7 in B, 9.9% in C and 11.8% in D.

During week 19-52 2021, tail injuries at slaughter was reduced significantly ($p<0.001$, χ^2-tests) in all buildings; 3% in A, 1.2 in B, 3.0% in C and 4.9% in D, corresponding to 31%, 14%, 30% and 41% of the levels recorded during 2017-2020.

Discussion and Conclusion

Tail injuries decreased within all groups, also in the C-control indicating a positive effect of the feed optimizing, but also coinciding with increased daylight This indicated a positive effect of light, as also seen in A. The larger decrease in B supported theories that melatonin-reducing light create tranquillity. Also, a positive effect of fibres was indicated in D.

Fast growing pigs risk to bite tails. Extra minerals, trace elements and access to fibres appeared to reduce tail-biting. A positive effect of light, in particular melatonin-reducing light, was indicated.

AWN-PP-34

PRACTICAL POINTERS FOR IMPROVEMENT IN DRY FEED CONSUMPTION BY SUCKLING PIGLETS

J. Jeusselin [5], C. Teixeira-Costa [1], A. Lebret [5], M. Roumezi [2], V. Normand [5], T. Nicolazo [3], C. Chevance [4], P. Berton [5], F. Bouchet [5], M. Brissonnier [5], G. Boulbria [5]

[1]*Rezoolution Pig Consulting Services, Noyal-Pontivy, France*

[2]*UT – Sciences and Technology Faculty, University of Tours, Tours, France*

[3]*PORC.SPECTIVE, Swine Vet practice, Noyal-Pontivy, France*

[4]*PORC. SPECTIVE, Swine Vet practice, Noyal-Pontivy, France*

[5]*PORC.SPECTIVE, Swine Vet practice, ZA de Gohélève, 56920 Noyal-Pontivy, France*

Background and Objectives

The transition from feeding on sow's milk to feeding exclusively on solid feed at weaning is a gradual process that starts during lactation. Stimulating the consumption of solid feed prior weaning may improve piglet adaptation after weaning. The aim of this study was to provide some key recommendations to improve creep feed intake in sucklers.

Material and Methods

Twenty-one and 11 litters, weaned at 21 and 28 days of age (doa), respectively, were included in this trial. The litters were creep-fed in two different round conventional feeders from d5 after birth (4 cm (feeder A) or 8,5 cm (feeder B) height rim feeders). Two times a day until d14 and then three times a day until weaning, fresh feed was weighed and given to litters, and the number of piglets was recorded. The feed remaining in each feeder was weighed to quantify feed disappearance at the litter level. Finally, piglets were individually weighed on d2 and at weaning (21 or 28 doa). Statistical analyses were performed using R Studio.

Results

Regardless of the age at weaning, feed disappearance increased with piglet age, especially from 2 weeks of life. Depending on the feeder characteristics, mean creep-feed intake per litter during lactation was 1294 g (feeder A) for weaning at 21 doa and 1616 g (feeder B) or 3227 g (feeder A) for weaning at 28 doa. Weaning weights of piglets with feeder A were significantly higher (+400 g, on average). We also noticed that the more piglets in the litter, the higher the dry feed disappearance for 28 doa weaning. Finally, whatever the age at weaning, the heavier the piglet at d2, the higher the feed disappearance.

Discussion and Conclusion

The accessibility of the feeder, the number of piglets per litter and the piglets' weight on d2 played a significant role in creep feed dissapearance per litter.

AWN-PP-35

PREVALENCE OF GASTRIC LESIONS IN FINISHERS IN POLAND

P. Cybulski [1], M. Larska [2], A. Woźniak [3], A. Jabłoński [4], T. Stadejek [3]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Department of Virology, National Veterinary Research Institute, Puławy, Poland*
[3]*Department of Pathology and Veterinary Diagnostics, Institute of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*
[4]*Center of Translational Medicine, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*

Background and Objectives

Aetiology of ulceration of the pars oesophagea is multifactorial. Pathological lesions evolve from parakeratosis, through erosion to deep ulceration. Even though the disease has developed into a widely recognised welfare and health problem, the epidemiological data from many countries are missing. The aim of our investigation was to determine the prevalence of gastric alterations in finishers reared in 16 modern farms located in Poland.

Material and Methods

The prevalence of gastric alterations in 32264 finishers from 16 farms, slaughtered in 360 batches between January 2013 and February 2017, was investigated. The stomachs were opened along the greater curvature and evaluated at 20 min post slaughter. In order to perform the morphological qualification of pathology degree, a four-point scale by Kopinski and McKenzie was adopted: grade 0 - intact tissue, grade 1 - parakeratosis, grade 2 - erosion, grade 3 - ulcer.

Results

From a total of 32264 stomachs examined, 71.9% (23188) had gastric alterations. About 54.9% (17703) stomachs had ulcers (score 3). In the rest of the animals, scores 1 (parakeratosis) and 2 (erosion) were observed in 9.2% (2958) and 7.8% (2527), respectively. Only 28.1% (9076) of evaluated finishers were classified as score 0 (intact epithelium).

Discussion and Conclusion

In our study, the prevalence of pathological alterations was similar to the figures from other countries, where 33.3 to 100% of finishing pigs were diagnosed with ulcers and preulcerative lesions. An upward trend is being noticed on each of the continents where the prevalence of gastric ulcers has been investigated; therefore, to gain the valuable insights and take effective preventive measures, further reasearch should be carried out in a harmonised and centralised manner across the EU.

AWN-PP-36

PREVALENCE OF GASTRIC LESIONS IN SOWS IN POLAND

P. Cybulski [1], J. Urban [2], E. Michalik [1], A. Woźniak [3], T. Stadejek [3]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Joachim Urban - Private Veterinary Practice, Lipka, Poland*
[3]*Department of Pathology and Veterinary Diagnostics, Institute of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*

Background and Objectives

Gastric ulceration is a well-recognised issue in modern swine production. Despite the fact that the disease causes economic losses and welfare problems in virtually every pig producing country, the vast majority of available reports deal with the data collected from finishing pigs. The epidemiological data regarding prevalence of gastric lesion in sows are limited to few reports. The objective of our study was to determine the prevalence of gastric alterations in sows from 4 farms located in Poland.

Material and Methods

The prevalence of gastric alterations in 329 DanBred sows culled in March 2020 was investigated. Before culling, they were reared in 5 commercial herds with 3300, 3600, 5000, 8000 sows in each. The number of the analysed animals per farm was 35, 21, 114, 159, respectively. Despite being reared in different farms, all animals had the same health status and they were managed using the same procedures (weekly farrowing system, slatted floor, pelleted feed). In order to perform the morphological qualification, a scale by Kopinski and McKenzie was adopted: grade 0 - intact issue, grade 1 - parakeratosis, grade 2 - erosion, grade 3 - ulcer.

Results

From a total of 329 stomachs examined, 66.6% (219) had gastric alterations. Gastric ulcers (score 3) were noticed in 49.5% (163) stomachs. In the rest of the animals, scores 1 (parakeratosis) and 2 (erosion) were observed in 1.2% (4) and 15.8% (52), respectively.

Discussion and Conclusion

Despite the variation in share of different alterations, our results can be considered typical for European production. Previous Danish, Polish, and Dutch research works showed parakeratosis in 6.3 to 62.5% of stomachs examined. Erosions were noticed in 9.4 to 39.6% of animals, whereas the prevalence of gastric ulcers was 0.6 to 51.6%. It might be speculated, that growing prevalence is linked to intensification of swine production; however, specific factors leading to such a phenomenon deserves further investigation.

AWN-PP-37

PREVALENCE OF WHITE LINE ALTERATIONS IN SELECTED SOW FARMS IN POLAND

P. Cybulski [1], R. Kondratiuk [1], P. Talaga [1], A. Jabłoński [2], E. Michalik [1]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Center of Translational Medicine, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland*

Background and Objectives

Lameness in sows is an important welfare issue causing significant financial loss in modern pig production. Among different pathological alterations affecting locomotory system, white line (i.e. junction between sole and wall) has been described as frequently affected. The aim of our investigation was to evaluate the prevalence of white line lesions in selected modern sow farms located in northern Poland.

Material and Methods

The prevalence of white line alterations of hind limbs in 604 pregnant DanBred sows was investigated. The animals were reared in 6 commercial herds with 1500, 3300, 3600, 4000, 4000, 5000 sows in each. The number of the examined sows in each farm was 51, 91, 101, 114, 114, and 133 respectively. The total number of sows sorted by parity (P) was: P1 – 129, P2 – 129, P3 – 129, P4 – 93, P5 – 62, P – 62. While being reared in different locations, all the sows were managed using similar facilities (slatted flooring), procedures (weekly farrowing system), and feeding. Claws were evaluated when the sows had been moved from group-housing facilities to farrowing pens. In order to perform the macroscopic qualification, FeetFirst scale (by Zinpro Corp., USA), was adopted: grade 0 – intact tissue, grade 1 – shallow and/or short separation along white line, grade 2 – long separation along white line, grade 3 – long and deep separation extending into corium.

Results

White line alterations were detected in 73.7% (445/604) of examined animals. The average lesion score noticed in P1, P2, P3, P4, P5, and P6 sows was 0.98, 1.15, 0.97, 1.12, 1.01, and 0.87, respectively.

Discussion and Conclusion

Similarly to previous publications, prevalence of white line lesions in sows is high. Obviously, the result can be biased, because sows with the most advanced alterations might have already been culled due to locomotory problems and poor production performance. Specific factors leading to such a picture deserves further investigation.

AWN-PP-38

Welfare and nutrition

PROVISION OF WEBBING BELT AND COTTON TOWEL FOR PREPARTUM SOWS WITH CRATING SYSTEM: THEIR EFFECTS ON FARROWING PERFORMANCE

J. Lee [1], Y. Kim [1], H. Jeon [1], H. Choi [1], J. Kim [1], J. Kang [2], K. Kang [2], J. Yun [1]
[1]*Department of Animal Science, Chonnam National University, South Korea*
[2]*Swine Research Center, Sunjin R&D Institude, Sunjin Co., Ltd, South Korea*

Background and Objectives

We hypothesized that the provision of the polyester webbing belt and cotton towel as nesting materials, which are pawable, chewable and manipulable would improve parturition performance in sows with crating system.

Material and Methods

A week before farrowing, a total of 29 sows (19 Landrace and 10 Yorkshire) moved to farrowing crate system and were allocated to three treatments 1) C: n=9, control group with no enrichment material, 2) W: n=9, one webbing belt was horizontally tied in front of feeding trough, 3) WT: n=11, one webbing belt was horizontally tied in front of feeding trough and supplemental cotton towel was provided. During farrowing, the sows were video-recorded for measuring the birth interval, farrowing duration and the numbers of still born and born alive piglets.

Results

The numbers of litter size, still born, and born alive piglets did not differ among treatments. Duration of farrowing as well as the average birth interval of the piglets seem to be shortened by the provision of the webbing belt and cotton towel (Means ± SEM for duration of farrowing and birth interval; C = 383 ± 91, 27 ± 6, W = 348 ± 83, 24 ± 6, WT = 266 ± 58, 20 ± 4, respectively). Furthermore, our treatments seem to affect the piglet mortality during farrowing (Means ± SEM for piglet mortality; C = 0.4 ± 0.3, W = 0.9 ± 0.5, WT = 0.1 ± 0.1). However, those differences between treatment groups in both results were not statistically significant (P=0.44, P=0.31, respectively).

Discussion and Conclusion

Contrary to our expectation, the provision of the webbing belt and cotton towel for the prepartum sows did not bring significant beneficial effect on parturition performance when the sows were housed in crating system. Nonetheless, the results seem to deserve further investigation in particular in comparison with loose-housed farrowing system.

AWN-PP-39

L-CARNITINE SUPPLEMENTATION DURING GESTATION INCREASES PIGLET BIRTHWEIGHT

J. Bach [1], L. Kunstmann [2], L. Meedom [2], L. Claerhout [3], W. Depondt [3]
[1]*Danvet K/S*
[2]*Huvepharma NV, Denmark*
[3]*Huvepharma NV, Belgium*

Background and Objectives

High prolificacy sows produce large litters resulting in an increased number of small piglets (below 700 g). At around 700 g live weight only 50 % may survive. The birthweight of piglets in a herd with high prolificacy was compared in 3 groups: 2 groups supplemented with L-carnitine for 16 and 4 weeks prior to farrowing and a control group.

Material and Methods

In a SPF +myc +AP2 Danbred LY sow herd of 1200 sows, the sows received 1 ml Carnitol-L® per kg feed during gestation. 1 group (41 sows) was supplemented with 120 mg L-Carnitine (4 ml) the last 4 weeks of gestation. Another group (47 sows) received a supplement of 60 mg L-Carnitine (2 ml) also the first 12 weeks of gestation. Piglets, from sows farrowing in the control group (41 sows), and both supplementation groups were weighed during 5 days from 6.30 AM to 11.30 AM. Student's t-test for 2 samples with equal variances were calculated for piglet weights.

Results

Control group (41 sows, 876 piglets, 15 % gilt litters): Average weight liveborn 1259 g, average weight stillborn 960 g. Last 4 weeks of gestation supplementation group (41 sows, 836 piglets, 17,5 % gilt litters): Average weight liveborn 1292 g, average weight stillborn 966 g. Full gestation supplementation group (47 sows, 998 piglets, 15 % gilt litters): Average weight liveborn 1291 g, average weight stillborn 968 g.

Discussion and Conclusion

Inclusion of 120 mg L-Carnitine for the last 4 weeks of gestation increased live born piglet birth weight significantly + 33 g (p=0,05) vs. control.

AWN-PP-40

BETAINE HYDROCHLORIDE CAN REPLACE CHOLINE CHLORIDE IN FEED FOR LACTATING SOWS

L. Vande Maele [1], A. Van Der Aa [1]
[1]*Orffa Additives BV, Breda, The Netherlands*

Background and Objectives

Betaine is a very efficient methyl donor and moreover functions as protective osmolyte. Therefore, it could be beneficial to use betaine in replacement of supplemented choline as methyl donor in animal feed. Data on total replacement of supplemented choline in swine is scarce. The objective of this study was to evaluate replacement of supplemented choline in feed for lactating sows by betaine at two dosages.

Material and Methods

A total of 33 sows and their litters were divided in three groups, blocked by parity. From farrowing onwards, the control group (C) received a standard lactation diet, including 500ppm choline chloride (Choline chloride 75%). For the treatment groups, this choline chloride was replaced by betaine hydrochloride (HCl), (Excential Beta-Key), at 300ppm (T1) or 1330ppm (T2). Performance of both sow and litter was followed.

Results

In total 553 piglets were born alive, of which 78 dropped out during the trial. No differences were observed between treatments on number of piglets (live born and weaned), piglet weight or litter weight. However, the average daily gain of piglets tended to be higher for T1 compared to C (220.15 vs. 208.57g/d, $P<0.1$). Body weight of sows and weight loss during lactation did not differ, while a tendency for increased backfat loss was observed for T2 compared to C (5.88 vs. 4.09mm, $P<0.1$).

Discussion and Conclusion

Results observed in this trial indicate betaine HCl can replace choline chloride in feed for lactating sows, even at lower inclusion level, while supporting piglets' performance. The tendency for higher backfat loss when supplying high betaine HCl levels confirms the lipotropic working of betaine and the improved mobilization of fat. In conclusion, replacement of choline chloride by betaine HCl in lactation feed could be considered depending on market prices, without negative impact on sows and piglets' performance.

AWN-PP-41

SERUM CORTISOL LEVELS AS THE MARKER FOR EVALUATION OF STRESS RESPONSE IN DIFFERENT PIG PRODUCTION SYSTEMS

M. Stukelj [1], J. Plut [1], I. Golinar-Oven [1], P. Njegovec [2], T. Snoj [3]
[1]*University of Ljubljana, Veterinary Faculty, Clinic for Reproduction and Large Animals, Clinic for Ruminants and Pigs, Ljubljana, Slovenia*
[2]*VOA d.o.o, Domzale, Slovenia.*
[3]*University of Ljubljana, Veterinary faculty, Institute of Preclinical Sciences, Ljubljana, Slovenia*

Background and Objectives

The issue of animal welfare in intensive pig farming has gained public attention in recent years. Any slight change in pig handling or management can cause stress to the animals. Prolonged stress due to the activity of the hypothalamic-pituitary-adrenal axis leads to changes in metabolism, which manifest in higher cortisol levels, lower feed intake, lower feed conversion and greater susceptibility to infections due to weakened immune system. Finally, meat quality is also poorer. Not only for economic reasons, but also for ethical reasons, pigs in intensive production systems must be provided with conditions in which the animals feel as comfortable as possible.The aim of the study was to compare the serum cortisol levels in different pig categories reared on farms of different sizes.

Material and Methods

Samples were collected from six pig farms: two large one-site farms with 3,000 breeding sows, a two-site farm with approximately 500 breeding sows, and three small one-site farms with less than 100 breeding sows. Blood samples were collected from anterior vena cava from 10 pigs from the following age groups: 5, 7, 9, 11, 13-week-old, fatteners, and breeding sows. Serum cortisol concentrations were determined using Demeditec EIA kit.

Results

Cortisol concentrations did not differ among pigs in the same age group from different farms, except in 5-week-old weaners, when concentrations were significantly higher ($P < 0.05$) in pigs from one large farm compared to pigs of the same age from all other farms, and at 7 weeks of age, where cortisol concentrations were significantly lower in pigs from that same large farm compared with pigs from all other farms.

Discussion and Conclusion

Results suggest that serum cortisol levels may indicate stress during some critical points of rearing, but farm size alone was not associated with stress in intensive pig production on the farms that were part of our study.

AWN-PP-43

SERUM- AND SALIVA BIOMARKERS IN PIGS FED WITH AN IMMUNOMODULATORY FEED ADDITIVE IN NURSERY

J. Aundrup [1], J. Hardt [2], L. Kreienbrock [3], G. Bruggeman [4], J.J. Cerón [5], I. Hennig-Pauka [6]
[1]*Swine Health Service, Chamber of Agriculture Lower Saxony, Oldenburg, Germany*
[2]*2Department of Biometry, Epidemiology and Information Processing, WHO Collaborating Centre for Research and Training for Health in the Human-Animal-Environment Interface, University of Veterinary Medicine Hannover, Foundation, Hanover, Germany*
[3]*Department of Biometry, Epidemiology and Information Processing, WHO Collaborating Centre for Research and Training for Health at the Human-Animal-Environment Interface, University of Veterinary Medicine Hannover, Germany*
[4]*Nutrition Sciences N.V., Booiebos 5, 9031 Drongen, Belgium*
[5]*Interdisciplinary Laboratory of Clinical Analysis of the University of Murcia (Interlab-UMU), Regional Campus of International Excellence 'Campus Mare Nostrum', University of Murcia, Campus de Espinardo no16, 30100 Espinardo, Murcia, Spain*
[6]*Field Station for Epidemiology, Bakum, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany*

Background and Objectives

In context of reducing antibiotic usage and improving animal health, feed additives are becoming increasingly important in pig husbandry. Biomarkers are a common way to assess immunity and stress, or the effect of treatment in pigs. Particularly salivary biomarkers offer an advantage: they can be obtained without fixation of the pig and therefore without stress. The objective of this study was to evaluate the efficacy of an immunomodulatory feed additive using salivary and serum biomarkers.

Material and Methods

On a conventional farrow-to-finishing farm in Germany, nursery pigs in three consecutive batches were divided in control group (CG) and experimental group (EG). Latter were fed with an immunomodulatory functional ingredient based on fibres during the whole rearing period. At weaning and in the 9th week of life (WOL), saliva- and blood samples were obtained of 25 piglets per batch (n= 75) and in 20th WOL serum samples for measurement of C-reactive protein (CRP) and Haptoglobin (Hp) in serum and amylase, lactate dehydrogenase, total esterase activity and adenosine deaminase in saliva samples. Group-, time- and batch differences were modelled.

Results

CRP and HP concentrations did not differ significantly between groups (9th WOL CRP (µg/mL) and Hp (g/L): CG: 25.2; 2.3 and EG: 19.3; 3.1), while for Hp there was a significant time effect ($p<0.001$), batch effect ($p<0.05$) and batch*time interactions ($p <0.05$). For saliva parameters, significant changes were found between weeks 4 and 9 and differences between batches. Group differences were found for amylase (IU/L) in 9th WOL (EG: 2552; CG: 2408).

Discussion and Conclusion

Generally, in this study group differences were hardly observed, while differences between batches existed. The differences due to time and batch reflected inflammatory/stress responses in nursery and fattening pigs, which were not due to the feed additive. The amylase activity might be influenced by the feed additive.

AWN-PP-44

THE IMPACT OF HOUSING AND WEANING MANAGEMENT ON POST WEANING DIARRHOEA – BASED ON A SEMI-STRUCTURED QUESTIONNAIRE IN 250 AUSTRIAN PIGLET PRODUCING FARMS.

R. Renzhammer [1], A. Käsbohrer [2], S. Vetter [2], A. Ladinig [1]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[2]*Institute for Veterinary Public Health and Epidemiology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Due to the upcoming ban of the therapeutic usage of zinc oxide in the European Union in June 2022 preventative approaches for post weaning diarrhoea (PWD) are urgently requested. Recent investigations have particularly been focusing on feeding strategies and feed additives. However, studies about the impact of management and housing of weaning piglets are scarce. In this study, we aimed to emphasize differences between farms having problems with PWD and farms without PWD.

Material and Methods

Altogether 250 piglet producing farms throughout Austria were visited personally and data regarding feeding strategies, biosecurity, weaning management and housing were collected via a questionnaire. Farms were divided into two groups depending on the occurrence of PWD or not. The final dataset (n=239, p=140) was divided into nine thematic subgroups. For each subgroup Variable Importance for all observations depending on the occurrence of PWD and the treatment with zinc oxide or antibiotics was assessed using the random forest algorithm (ntree=5000; mtry=p/2) in R®.

Results

The highest mean decrease accuracy (MDA) was assessed for the variable "all-in/all-out system" with farms with a constant all-in/all-out pig flow in the nursery units having less problems with PWD than farms without a continuous pig flow. High MDAs were also observed for the type of floor and temperature of nursery units prior to weaning. The abundance of PWD was lower in farms with weaned piglets on fully slatted floors. Farms which did not heat up nursery units to at least 27°C prior to weaning had problems with PWD despite treatment with zinc oxide or antimicrobials more frequently.

Discussion and Conclusion

Temperature, housing and weaning management play a crucial role for the prevention of PWD. Despite recent animal welfare discussions, positive and hygienic aspects of fully slatted floors and all-in/all-out systems should not be forgotten.

REP-PP-01

FACILITATING VIRUS DIAGNOSTICS OF ABORTION MATERIAL IN PIGS – PLUCK-POOLS AS A POSSIBLE APPROACH?

H. Kreutzmann [1], C. Unterweger [1], L. Schwarz [1], A. Auer [2], T. Rümenapf [2], A. Ladinig [1]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[2]*Institute of Virology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

The investigation of infectious agents in abortion material is challenging for practitioners. Common pathogens are not always detectable in every fetus of a litter. Additionally, investigation costs should generally be kept as low as possible. Therefore, pooling of up to five fetuses was established for PCR investigations. In this study, pool samples of the individual organs of aborted fetuses were compared with one pluck-pool containing several organs. This approach may facilitate sample collection and reduce RNA/DNA-extraction effort and costs.

Material and Methods

487 fetuses from 74 different farms, which were sent to the Vetmeduni for routine diagnostic purposes, were included in this retrospective study. From each abortion, a thymus-pool for PRRSV-PCR (n=117), a heart-pool for PCV2-PCR (n=112) and a lung-liver-pool for PPV-PCR (n=43) were obtained from a maximum of five fetuses. In parallel, pluck-pools (thymus, heart and lung in equal proportions) were also taken from the same fetuses (n=122). In total, 35 individual pools and pluck-pools were examined in parallel, with the remaining pluck-pools stored at -20°C.

Results

Individual pools and pluck-pools yielded comparable results. Six pluck-pool and five heart-pool samples were positive for PCV2, with an average of 1.5×10^6 genome equivalents [GE]/g tissue and 3.3×10^7 GE/g tissue, respectively. Six thymus-pools and corresponding pluck-pools were both PRRSV positive and viral load was almost equal (average 9.5×10^7 GE/g tissue in thymus-pools and 3.2×10^7 GE/g tissue in pluck-pools). Concerning PPV, only one lung-liver-pool and corresponding pluck-pool was positive, so no conclusions can be drawn so far.

Discussion and Conclusion

While the viral load in the pluck-pools is moderately lower for both PRRSV and PCV2, they still provide positive results when virus is detected in the individual organs. Pluck-pools are thus an economic and time-saving alternative compared to the investigation of individual organ pools.

REP-PP-02

ACUTE-PHASE PROTEINS: A POTENTIAL PARAMETER FOR DETERMINING SOWS HEALTH AROUND PARTURITION?

W. Pendl [1], M. Sigg [2], X. Sidler [2], T. Echtermann [2]
[1]*AgroVet-Strickhof, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland*
[2]*Division of Swine Medicine, Department of Farm Animals, Vetsuisse-Faculty, University of Zurich, Zurich, Switzerland*

Background and Objectives

Determining the health status of parturient sows or sows shortly after parturition is still a challenge in the field. Postpartum dysgalactia syndrome (PDS) is considered the main reason for treating lactating sows, and the diagnosis is often imprecise. Measuring acute-phase proteins (APPs) could refine the diagnosis of PDS and create a practical tool for diagnostics in the field. The aim of this study was to investigate the influence of physiological parturition on the concentration of APPs in serum and colostrum/milk of periparturient sows to take a first step towards better PDS diagnosis in the future.

Material and Methods

The study included the results of 20 clinically healthy periparturient sows. Samples were taken at the seven time points T0 (112thdayofgestation), T1 (duringfarrowing), T2 (12hp.p.), T3 (24hp.p.), T4 (48hp.p.), T5 (72hp.p.) and T6 (14dp.p.). At each time point, a clinical examination was performed (general and feeding-behaviour, breathrate, bodytemperature), colostrum/milk and serum samples were collected and analysed using commercially available ELISA kits.

Results

In serum Pig-MajorAcutePhaseProtein-concentrations (Pig-MAP) time points T3-T5 (2.46-3.95mg/ml) were significantly increased compared to T0 (1.15mg/ml) and the haptoglobin-concentrations were significantly increased at the time points T2-T5 (2.83-3.98mg/ml) compared to T0 (1.97mg/ml). In colostrum/milk both, Pig-MAP and haptoglobin-concentrations were significantely increased for T1-T5 (Pig-MAP: 0.06-0.07mg/ml; Haptoglobin: 0.99-0.62mg/ml) compared to T6 (Pig-MAP: 0.03mg/ml; Haptoglobin: 0.11mg/ml).

Discussion and Conclusion

Comparing the baseline value T0 in this study with the literature (Pig-MAP0.76-0.81mg/ml-Haptoglobin0.71-1.47mg/ml), it is striking that an increase in APPs-concentrations can already be measured in sows in late gestation. The significant increase in Pig-MAP and haptoglobin-concentration in serum and colstrum/milk already peripartal and up to 72hp.p. demonstrates that these two APPs may be important as indicators of sow health. This work clearly shows that even physiological parturition has a significant impact on the sow.

REP-PP-03

A NOVEL BOAR PHEROMONE IMPACTS WEANED SOW BEHAVIOR AND REPRODUCTION

A. Vela [1], L. Lafoz Del Rio [1], D. Reyero [2], O. Merdy [3]
[1]*Thinkinpig, Zaragoza, Spain*
[2]*Vetoquinol Especialidades Veterinarias S.A. Spain*
[3]*Vetoquinol S.A. France*

Background and Objectives

Reproductive performance on commercial farms depends on the ability to identify sexual behavior and breed females during estrus. The presence of a boar is essential in determining sow sexual behaviors and is greatly mediated by the adult boar odor. This study aimed at examining the effects of a novel boar salivary pheromone on weaned sow sexual receptivity and subsequent breeder reproductive performance.

Material and Methods

One hundred sows were either exposed to a live mature boar (BG) or to BOARBETTER® (Vétoquinol, France), given as a single spray while a boar grunting audio file was played (PG) from the second post-weaning day. Sexual behaviors were assessed twice daily with a back-Pressure Test (BPT). Sows expressing behavioral estrus were mated. Ultrasound was used to assess ovarian activity. Reproductive and prolificacy data were collected.

Results

Three sows were excluded because of illness or physiological anestrus. The breeding rate was 94% in BG and 87% in PG. A total of 100% and 91% of sows that ovulated were respectively detected in estrus. Sows in the BG had a shorter wean-to-estrus interval (97 vs 108h) and longer estrus duration (57 vs 39h; $p<0.05$). Wean-to-ovulation interval did not differ but the onset-of-estrus-to-ovulation interval was longer in PG (40 vs 30h, $p < 0.01$). Follicle size at the onset of estrus was larger among PG (5.76 vs 5.43mm, $p=0.04$). The timing of ovulation relative to insemination did not differ between the two treatment groups. Pregnancy rates were identical or similar for sows in the two treatment groups (93%) as was total born.

Discussion and Conclusion

Under the conditions of the study, exposing weaning sows to the novel pheromone and the boar grunting sound achieved a high estrus detection rate. Sows were successfully bred despite estrus being delayed and shortened.

REP-PP-04

EFFECT OF HEALTH, HOUSING, ENVIRONMENTAL AND MATING CONDITIONS ON THE SEXUAL BEHAVIOUR OF NATURALLY MATING BOARS IN SWITZERLAND

C. Hodel [1], H. Nathues [1], A. Grahofer [1]
[1]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

Although artificial insemination (AI) in pig production is widespread, numerous farms in Switzerland continuously use natural mating (NM). In organic pig production, the natural mating is even preferred, because of consumers' expectations in regards to natural animal behaviour, welfare and extensive pork production. The aim of this study was to investigate various parameters potentially affecting adequate sexual behaviour of boars including their level of libido, since this is crucial for appropriate reproductive performance in farms using NM.

Material and Methods

This observational study evaluated the libido level of 59 boars of different breeds and actually used for NM. A scoring system ranging from 0 (poor) to 23 points (perfect libido) was employed, and the effect of general health as well as housing and management factors on the libido were analysed.

Results

The mean libido score was 16.7 (SD ±2.3). In crossbreed (median: 17.5, min: 14.0, max: 21.0) ($p < 0.01$) and Landrace (median: 17.5, min: 17.0, max: 21.0) ($p < 0.05$) boars a significantly higher libido scores was observed compared to Piétrain boars (median: 14.0, min: 13.0, max: 17.0). Furthermore, a non-slippery mating area was positively associated with libido ($p < 0.05$), whereas disorders such as lameness showed a negative correlation ($p < 0.01$) on the libido score. In winter, significantly higher libido scores (median: 17.0, min: 14.0, max: 21.0) were recorded compared to spring (median: 16.0, min: 11.0, max: 21.0) ($p < 0.05$).

Discussion and Conclusion

This is the first study investigating the effect of housing conditions and management procedures on the libido of boars used for NM under field conditions. Genetics, general health condition and flooring in mating areas are critical parameters that significantly influence the libido score of boars used for NM and therefore should be carefully considered when examining natural mating on farm.

REP-PP-05

HEPARENOL SUPPLEMENTATION TO PREPARTUM SOWS DECREASES THE PERCENTAGE OF STILLBORN PIGLETS

B. Engelen [2], P. Van Rengen [1], T. Wijnands [1], B. Meijer [2]
[1]*Lintjeshof, Nederweert, The Netherlands*
[2]*Dopharma Research, Raamsdonksveer, The Netherlands*

Background and Objectives

Along with increased productivity of sows, the percentage of stillborn piglets has increased in recent years. The addition of a liver supporting complementary feed to prepartum high risk sows (≥ 4th parity and gestation lenght < 115 days) showed a decrease in percentage of stillborn piglets in a previous pilot-study. The objective of this study was to confirm this beneficial effect on stillborn piglets by supporting the liver metabolism of sows.

Material and Methods

A controlled and randomized trial was performed at a farm with high productive TN70-sows. Fourth parity and older sows of six consecutive farrowing groups of 104 sows each, were equally divided into a supplemented group and a control group. 45 ml of the liquid complementary feed was administered once daily on top of the dry feed from the time of entering the farrowing room until the day of parturition. Live-born and stillborn piglets were registered according to the usual practice at the farm. The percentage of stillborn piglets (stillborn per sow/total born per sow x 100%) was statistically analyzed by ANOVA for the treatment effect, with parity as non-categorical variable.

Results

71 treated and 76 control sows had a gestation length of less than 115 days. The mean duration of supplementation was six days. The average percentage stillborn piglets in treated sows was 8.6% compared to 13.1% in controls. The difference of 4.5% ($p = 0.008$) corresponded with 0.93 piglet per sow.

Discussion and Conclusion

We hypothesized that the functioning of the liver of high productive sows could be compromised during late gestation which could have a role in the pathogenesis of stillborn piglets. This study confirms results from our previous research that supporting the liver metabolism of high risk, prepartum sows with Heparenol significantly reduces the percentage of stillborn piglets.

REP-PP-07

BENEFITS OF OVULATION SYNCHRONIZATION WITH TRIPTORELIN UNDER EUROPEAN COMMERCIAL CONDITIONS

O. Merdy [1], E. Pagot [2], D. Reyero [3], J. Coatrieux [1]
[1]*Vetoquinol S.A., Lure, France*
[2]*CTPA, Ploufragan, France*
[3]*Vetoquinol Especialidades Veterinarias S.A. Spain*

Background and Objectives

Triptorelin is a GnRH agonist registered for ovulation synchronization in weaned sows allowing single fixed-time artificial insemination (AI). The objective of this study was to determine the impact of triptorelin treatment (OvuGel®, 100 µg/ml, Vétoquinol) on labor distribution and reproductive performance by analyzing data from a European multicentric field trial.

Material and Methods

On 6 commercial farms located in France or Spain, 700 [70-168 per test site] healthy weaned healthy sows were allocated to two groups according to parity. T sows received 2.0 mL OvuGel® (triptorelin acetate) intravaginally on Day_4_am (96 ± 2h) post-weaning and were inseminated once on Day_5_am (22 ± 2h later) regardless of estrus. C sows were inseminated twice at a 24-hour interval depending on the onset of estrus (Days_3-7) with variable timeout before breeding. C sows not in estrus by Day 7 were considered unbred.

Results

Over the 6 test sites, 93% of C sows came into estrus on Day_5_am at the latest and 97.9% during the post-wean week. A total of 1.97 AI [1.90-2.00] was performed per bred sow, with 37% [5-64%] of sows inseminated before Day_5_am. On Day_5_am, 61% sows [29-100%] were inseminated and 0.97 AI [0.83-1.05] per bred breeder were still to be done until Day 8 i.e. 49% [44-54%] of the total AI number required. For T sows, 90.8% were in estrus at the programmed single insemination on Day_5_am. The pregnancy rate in sows inseminated in estrus on Day_5_am (T) or 4-8 (C) did not differ between groups (92.1% vs 94.8%) as well as litter size (14.3 vs 14.6 total born). Considering all sows eligible for breeding up to Day_7, neither weaned sow pregnancy rate (89.4% vs 92.8%), nor litter size (14.2 vs 14.6) differed.

Discussion and Conclusion

Synchronization of ovulation with triptorelin allowed for labor simplification and savings while maintaining good breeding performance.

REP-PP-08

CONTINUOUS SUBJECTIVE SONOGRAPHIC GRAYSCALE ANALYSIS OF THE UTERINE INVOLUTION OF SOWS IN THE POSTPARTUM PERIOD

A. Grahofer [1], L. Häberli [1], H. Nathues [1], J. Kauffold [2]
[1]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*
[2]*Clinic for Ruminants and Swine, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany*

Background and Objectives

Physiological uterine involution during the postpartal period is essential for sows' reproductive health. Information on uterine tissue can be gained by grayscale analysis using ultrasonography. The aim of this study was to evaluate the continuous and subjective evaluation of echogenicity, echotexture and the presence of intrauterine fluid of the puerperal uterus of different parity sows, and to determine associations between grayscale values and uterine diameter (which was simultaneously assessed), body condition and farrowing parameters.

Material and Methods

The study population included 95 sows housed either in free farrowing (n = 46) or were crated (n = 49). Transabdominal ultrasound was done daily between day 2-14 postpartum (p.p.) and the day before weaning. Echogenicity (using the modified score by Bönhof, 1987 ranging between anechoic (1)-hyperechoic (6)), echotexture (homogenous/heterogeneous) and the presence of intrauterine fluid (yes/no) was evaluated on three cross-sections of the uterine horn/sow/ day.

Results

In the first week p.p., most sows showed a medium (median= 4.0) echogenicity, whereas from day 7 p.p., echogenicity decreased (median=3.5 to 3.0). Echotexture between days 2-7 p.p. was mainly heterogeneous, whereas between days 8-14 p.p., it was mostly homogeneous. Intrauterine fluid was detected until day 9. Echogenicity was associated with farrowing duration (FD) on days 8-14 p.p. ($p = 0{,}048$). Sows with FD >300 min had a slightly lower echogenicity (median = 3.0) than sows with FD ≤ 300 min (median = 3.5). There was a positive correlation between uterine diameter and echogenicity on day 2-7 p.p. ($r = 0{,}359$, $p < 0.001$) and days 8-14 p.p. ($r = 0{,}381$, $p < 0.001$).

Discussion and Conclusion

Subjective grayscale analysis by ultrasonography is suitable for characterizing uterine echogenicity and echotexture as well as intrauterine fluid in post partum sows. It is assumed that this will help in assessing patterns of the sow's puerperium.

REP-PP-09

Reproduction

NON-INVASIVE BIOMARKERS TO DETECT PROBLEM SOWS: A CASE STUDY

M. De Vos [1], C. Van Hoof [2], Q. Duan [1], S. Tanghe [1]
[1]*Nutrition Sciences NV*
[2]*HAS Hogeschool*

Background and Objectives

A good health of a breeding sow is essential to produce healthy litters. As blood-sampling and traditional rectal temperature measurement during this period might be experienced as stressful for the sow, we investigated the use of non-invasive biomarkers as a tool to measure her physiological status.

Material and Methods

In total, 32 TN70 primiparous and multiparous sows were monitored during the periparturient period. Farrowing induction was not applied. Saliva was collected 2.4 ± 1.2d antepartum and 2.3 ± 1.0d postpartum by using Salivette tubes. Saliva haptoglobin and cortisol were measured by previously described assays (Roelofs et al., 2019; Contreras-Aguilar et al., 2021). On the same day of saliva collection, infrared thermal images were taken by using a portal camera (FLIR E5xt). Standardized anatomical locations (orbital and root of the ear) were identified in infrared thermal images which were analyzed using professional software (FLIR tools) to determine the average temperature at each anatomical site of each sow.

Results

We could observe a significant increase in both ear (+2.3 ± 0.4°C) and eye (+1.4 ± 0.2°C) temperature after farrowing ($P<0.0001$). Moreover, saliva haptoglobin increased (+1713 ± 387 ng/ml) after farrowing ($P<0.0001$); whereas no differences in cortisol values could be observed ($P=0.30$). In this case study, pre-farrowing biomarkers were compared between normal sows and an individual sow with a stillborn rate of 100%. The latter had higher ear (+14%) and eye temperature (+7%), saliva haptoglobin (+189%) and cortisol (+178%) values pre-farrowing.

Discussion and Conclusion

The evaluation of biomarkers in saliva and sows surface temperature might be used as indicators of animal physiological state and early detection of problem sows and/or upcoming diseases. Further research is however required to assess the relevance of these parameters on a larger scale.

REP-PP-10

SUCCESSFUL USE OF ALTRENOGEST TO SECURE BATCH MANAGEMENT AND MAINTAIN REPRODUCTION PERFORMANCES DURING EPISODE OF MAJOR RENOVATION

S. Boulot [1], C. Puech [2], I. Correge [1], G. Herve [1]
[1]*IFIP-Institut du porc, Domaine de la Motte au Vicomte, BP 35104, 35651 Le Rheu*
[2]*Hyovet, Bd Jacques Cartier 35160 Montfort sur Meu, France*

Background and Objectives

Major renovation may be challenging both for people and sows. Batch management and reproduction can be disrupted by shortened lactations or late pregnancy transfers, with potential negative effect on performances and health. Altrenogest is a proven effective management tool which is often recommended and used. This study investigates the efficiency of strategies implemented in a farm during a long episode of disturbance.

Material and Methods

Study took place in IFIP experimental farm (170 LWxLF sows). Management (7 batches, Thursday weaning at 28 days) was disrupted for 10 months with a single farrowing house operating instead of 2. Late entry in farrowing house (± 114 days), sows received altrenogest 20 mg/day (Altresyn®, Ceva Sante Animale) for 3 consecutive days before transfer (5 batches). When lactations had to be shortened to 14/18 days (14 batches), altrenogest was administered for 10 to 14 days to postpone estrus onset. We compare performances during renovation and treatments with results of previous standard batches.

Results

Altrenogest prevented farrowings before Tuesday transfers, reduced farrowings before Wednesday (4% vs 40%) and <114 days gestations: 6% vs 22% ($p<0.01$). Late entry was associated with higher stillborn rates (9.6% vs. 7%, $p<0.01$) with no impact on litter sizes > 17 total born ($p>0.05$). Fertility rate after standard or shortened lactations were similar (93%). Litter sizes (total born) tend to be smaller after short lactations but without significancy.

Discussion and Conclusion

Results confirm the efficiency of altrenogest to deal with temporary various management disturbances. Potential negative effect of late transfer due to the stress and short adaptation could be expected. Additional measures such as prevention of post-partum discharge, improved stimulation and detection of estrus, may also help to control risks related to short lactations. Moreover, prevention of early farrowings may be of great interest to improve birth weights and viability of newborn in large litters.

REP-PP-11

COMBINING SINGLE FIXED-TIME ARTIFICIAL INSEMINATION TECHNOLOGY WITH FERTILITY ASSESSMENT - A CANADIAN FIELD EXPERIENCE

P. Renaud [1], N. Machell [2], M. Johnston [3], O. Merdy [1]
[1]*Vetoquinol S.A., Lure, France*
[2]*Vetoquinol N. A. Inc., Lavaltrie, Quebec, Canada*
[3]*United Animal Health, Sheridan, IN, USA*

Background and Objectives

Single fixed-time artificial insemination (SFT-AI) can help the pig industry that is facing labor and skill shortages. OvuGel® SFT-AI protocols offer the possibility to breed sows regardless of estrus with satisfying results. Estrus signs are nevertheless indicative of favorable fertility status. Thus, alternative SFT-AI programs were proposed: the "Select Sows" program consists of synchronizing ovulation only if signs of pro-estrus/estrus are present, the "Expert Sows" program relies on inseminating OvuGel®-treated sows only in presence of estrus signs. Their efficacy on breeding results was assessed in this study.

Material and Methods

In July 2020, on a Canadian commercial farm, 320 sows were assigned to two breeding groups: Control sows (n=116) were bred conventionally upon estrus detection. SFT-AI sows (n=204) were administrated OvuGel® 96±1 hour (Day 4) post-weaning followed by SFT-AI 22–23h later, regardless of estrus status. Fertility status was recorded in SFT-AI sows at time of OvuGel® treatment (Pro-estrus / Estrus) and insemination (Estrus). Controls in estrus from Days 4–5 post-weaning were selected for comparison.

Results

SFT-AI sows: 63% of sows showed pro-estrus (26.5%) / estrus (46.5%) signs at treatment; 69% showed estrus signs at insemination. A total of 62% of the Controls showed estrus from Days 4–5 post-weaning. The farrowing rate in both SFT-AI programs was as least as good as in Controls detected on Days 4–5 post-weaning (Select Sows: 89.1% [115/129] and Expert Sows 91.4% [128/140] vs 83.3% [60/72] in Controls). Noticeably, 85% of the Select Sows showed estrus signs at insemination; farrowing rates were 93.6% in sows bred in estrus and 66.7% in those bred in pro-estrus. Prolificacy data were similar between experimental groups and SFT-AI programs as well.

Discussion and Conclusion

Ovulation synchronization followed by SFT-AI in sows with expression of estrus can be a successful strategy to simplify and reduce labor while maintaining breeding performance.

REP-PP-12

EFFECT OF THE MATING BEHAVIOUR OF BOARS ON THE REPRODUCTIVE PERFORMANCE OF SOWS IN SWISS PIG FARMS

A. Grahofer [1], C. Hodel [1], H. Nathues [1]
[1]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

Numerous pig farms in Switzerland use both, artificial insemination (AI) and natural mating (NM), in their breeding concept. This study compares the performance characteristics of sows after AI and NM,on individual herd level. Moreover, the effect of mating behaviour of boars on reproductive performance was examined.

Material and Methods

In total 16 breeding farms, housing more than 40 sows and conducting at least 10% of NM during the last 12 months, were included in this study. Reproduction records and the mating behaviour of the boars were evaluated.

Results

Overall, 58.8% of the sows received AI and 41.2% went through NM. When comparing the reproductive data of both groups, first insemination after weaning was significantly more often performed by AI (94.2% ±5.6, $p < 0.01$) compared to NM (73.7% ±19.1), whereas sows returning to estrus were significantly more often inseminated by NM (26.3% ±19.1, $p<0.01$) than AI (5.8% ±5.6). No further significant differences were detected, although sows with NM tend to have lower reproductive performance (farrowing rate: 72.7% ±16.7; live born piglet: 13.3 ±1.9) compared to sows with AI (farrowing rate: 80.3% ±8.0; live born piglet: 14.0 ±0.9). However, nudging and nosing of the sow's vulva during NM led to a significantly higher proportion ($p < 0.05$) of sows returning to estrus (Median 23.4%, Min: 0.0%, Max: 50.0%). In addition, a high libido level of boar significantly increased ($p < 0.05$) the live-born piglets (Median: 14.0, Min: 10.5, Max: 17.0) compared to boars with a low libido level (Median: 13.0, Min: 9.0, Max: 13.5).

Discussion and Conclusion

Results indicate that NM is often applied in sows with reproductive failure, but no difference in subsequent reproductive performance compared to AI was detected. These findings suggest that mating behaviour of boars, i.e. libido, etc., have a significant effect on the reproductive performance.

REP-PP-13

A META-ANALYSIS ON THE EFFECT OF FARROWING INDUCTION WITH PROSTAGLANDINS IN LITTER CHARACTERISTICS OF SWINE.

M. Monteiro [1], B. Bracco Donatelli Muro [5], A. Pegoraro Poor [1], D. Feitosa Leal [2], R. Fernandes Carnevale [5], K. Sonalio [3], M. Ponstein Shiroma [4], C.A. Pospissil Garbossa [5], G. William Almond [2], A. Micke Moreno [1], C.H. Cabral Viana [6]

[1]Department of Preventive Veterinary Medicine and Animal Health, School of Veterinary Medicine and Animal Sciences, University of São Paulo (USP), Campus São Paulo, SP, Brazil

[2]Department of Population Health & Pathobiology, College of Veterinary Medicine, North Carolina State University, Raleigh, North Carolina, United States

[3]São Paulo State University (Unesp), School of Agricultural and Veterinarian Sciences, Jaboticabal, Brazil

[4]Department of Surgery, School of Veterinary Medicine and Animal Sciences, University of São Paulo (USP), Campus São Paulo, SP, Brazil

[5]Department of Animal Nutrition and Production, School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, Brazil

[6]Pontifical Catholic University Minas, MG, Campus Poços de Caldas, Brazil

Background and Objectives

Litter size has increased considerably over the last years, and litters with more than 16 piglets are commonly seen in commercial pig herds. Although the use of prostaglandins in the induction of farrowing facilitates farrowing supervision and care of the newborn piglets, negative effects can also be associated with their use. Therefore, a meta-analysis evaluating the effects of farrowing induction with prostaglandins on total born, stillbirth, and birth weight (BW) of piglets was performed.

Material and Methods

A search for peer-reviewed articles in scientific databases was performed. Studies that evaluated prostaglandins in association with other agents and studies that did not have a control group or had a high unbalance between control and treatment group, were excluded. To assess possible sources of heterogeneity, meta-regression and subgroup analyses were performed. Statistical analyses were carried out using R software.

Results

The results show that induction one day before the expected date of farrowing reduced by 28% the risk of stillbirth (CI 95%), while no significant effect was observed when induction was performed ≥3 days and two days before the expected date (P>0.05). When induction was performed ≥4 days before the expected date of farrowing, piglet BW was reduced by 100g (CI 95%: 40-160g). Furthermore, whereas induction performed three days before the expected date of farrowing reduced piglet BW by 80g (CI 95%: 60-90g), induction two and one day before the expected date did not alter piglet BW.

Discussion and Conclusion

Although farrowing induction with prostaglandins is a valuable tool to improve birth assistance and facilitate management practices in commercial pig herds, the deleterious effects on offspring, the sow postpartum health, and the mean gestation length of the herd also have to be considered. Thus, to obtain the maximum benefits, induction should be performed one or two days before the expected farrowing date, according to the insemination records.

REP-PP-14

OVULATION SYNCHRONIZATION AND FARROWING INDUCTION SIMPLIFIES WORK WHILE MAINTAINING PERFORMANCE UNDER CANADIAN COMMERCIAL CONDITIONS

F.O. Chamba Pardo [1], C. Pelland [1], C. Werth [1], G. Greaves [1], P. Canning [1], C. Lichty [1], M. Johnston [2], N. Machell [3], N. Seux [4], P. Renaud [4], O. Merdy [4]

[1]*South West Ontario Veterinary Services, Stratford, ON, Canada*

[2]*United Animal Health, Sheridan, IN, USA*

[3]*Vetoquinol N. A. Inc., Lavaltrie, Quebec, Canada*

[4]*Vetoquinol S.A., Lure, France*

Background and Objectives

Labor and skill shortage is an increasing concern for the pork industry. Any solution that simplifies and reduces labor can be of great help to maintain production. This study aimed at assessing the impact of labor simplification at breeding with ovulation synchronization and at farrowing with induction on farm performance.

Material and Methods

In July 2020, 320 sows were assigned to three groups: Control (C, n=116), ovulation synchronization with OvuGel® without farrowing induction (ON, n=102), OvuGel® with induction to farrow (OI, n=102). C sows were inseminated upon estrus detection and 24 hours later. C sows not in estrus by Day 7 were considered not bred. OI and ON sows were administered OvuGel® 96 ±1 hour post-weaning and inseminated once 22-23 hours later regardless of estrus status. OI sows were administered cloprostenol on Day 114 of gestation. Piglets were weighed on their first and 17th day of life.

Results

Breeding of OI and ON sows was concentrated on Day 5. More sows were inseminated in these groups due to 16% (19/116) of control sows not showing estrus. More weaned sows eligible for breeding farrowed in ON and OI groups (ON+OI: 75% vs C: 69%, p=0.30). In contrast, farrowing rate for inseminated sows was higher in C sows (83% vs 75%, p=0.18). Farrowing occurred earlier and was more concentrated in ON and OI groups. Prolificacy data were similar between groups. Birth weight was lower in the OI piglets compared to the C piglets.

Discussion and Conclusion

Concentrating labor at breeding by inseminating only once on Day 5 yielded similar farrowing results compared to conventional breeding. Ovulation synchronized sows, with or without farrowing induction. They farrowed earlier and more accurately, giving an opportunity for more homogeneous and increased lactation length. Lighter birth weight in OI piglets was likely the result of inducting too early.

REP-PP-15

ASSOCIATION BETWEEN BLOOD HAEMOGLOBIN CONCENTRATION IN SOWS AND THEIR PIGLETS AND THEIR PERFORMANCE CHARACTERISTICS AT FARROWING IN A FREE FARROWING SYSTEM

C. Sidler [1], L. Jahn [1], H. Nathues [1], A. Grahofer [1]
[1]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

Haemoglobin concentration (HbC) in sows and/or their piglets might influence the farrowing process. The aim of this study was to investigate the association between the HbC in sows and piglets and their performance characteristics.

Material and Methods

109 sows and their 1,662 piglets were included. The investigated parameters included the HbC in all sows and the HbC in approximately 5 piglets per litter (n=516), parity, litter size, litter weight, placenta weight, stillbirth rate, piglet expulsion duration, farrowing duration and other sow and piglet traits. A statistical analysis was conducted, and significance was considered for p-values <0.05.

Results

Sows with a HbC <100 g/l (low HbC) had a significantly higher parity number (5.0, min: 1, max: 10, p = 0.002), litter size (16.9 ± 4.6, p = 0.002) and placenta weight (4.6 ± 1.4 kg, p = 0.006) compared to sows with a HbC ≥100 g/l (high HbC) (3.0, min: 1, max: 10; 14.6 ± 3.9; 3.9 ± 1.2kg). The piglet expulsion duration and farrowing duration were significantly longer in low HbC sows (281 ± 105 min piglet expulsion duration, p = 0.030; 615 ± 302 min farrowing duration, p = 0.029) compared to high HbC sows (246 ± 110 min; 497 ± 245 min). Additionally, the stillbirth rate was higher in low HbC sows (5.1 ± 4.8 %, p = 0.004) compared to high HbC sows (2.8 ± 5.4 %). The HbC of the litter negatively correlated with litter size (p < 0.001), litter weight (p < 0.001) and placenta weight (p < 0.001). No significant correlation could be determined between the HbC of the sows and the HbC of their offspring (p = 0.263).

Discussion and Conclusion

HbC in sows and piglets were significantly associated with several performance characteristics. Hence, haemoglobin values might be used as indicators for the reproductive performance of the farrowing sows.

REP-PP-16

USE OF DEXTROSE TO IMPROVE THE WEAN-TO-FIRST SERVICE INTERVAL IN A WARM CLIME AREA: IMPORTANCE OF THE DURATION OF TREATMENT.

P. Sánchez-Giménez [1], H. González-Ramiro [1], A. Martínez-Moreno [1], R. Fernández-Rodríguez [1], G. Ramis [2]

[1]*AGROPOR, Murcia, Spain*

[2]*Dpto. Producción Animal,. Facultad de Veterinaria., Universidad de Murcia, Spain*

Background and Objectives

Supplementation of dextrose to the diet has been studied in sows to improve various parameters such as reproductive performance or litter birth weight variation. The reduction of wean-to-first service interval (WSI) is also achieved with its use, but a dose or duration of treatment is not well established.This abstract shows the results of a practical experience carried out in two commercial farms during Summer 2020 and 2021 in South-East Spain.

Material and Methods

In a 7.500 commercial sow farm (Farm 1), diets were supplemented with 20 grams of dextrose per kilo as top dressing during the last week of lactation phase and the WSI during July of 2021. In another 2.000 sows commercial farm (Farm 2), the treatment was supplemented only during the WSI. For each period were recorded length of WSI and sows in heat <7 days post-weaning (H<7dpw), comparing them with the same period in 2020.

Results

In Farm 1, there was difference for duration of WSI in 2020 vs 2021 (6.79±0.09 vs. 6.46±0.1, p=0.018). In Farm 2, there was not difference. The frequency of H<7dpw was significant different in farm 1 (83.1% in 2020 vs 88.6% in 2021; adjusted residue=7.7; p<0.0001), but there was no difference in farm 2 (89.6% in 2020 vs 90.5% in 2021; p=0.525)

Discussion and Conclusion

This experience reports a positive result reducing the duration of WSI in a farm using dextrose in diet during the last week of lactation and the WSI. However, in another farm with the same dose of dextrose but only in the WSI period we do not find differences. These results, even knowing that other factors may influence, suggests the importance of starting the treatment in lactation phase, when folliculogenesis has already started. More research is needed through a planned side by side trial in farm 1.

REP-PP-18

ALTRENOGEST MAY BE USED DURING EARLY PREGNANCY TO INCREASE LITTER SIZE

B. Bracco Donatelli Muro [1], A.C. Rodrigues De Oliveira [1], R. Fernandes Carnevale [1], D. Feitosa Leal [2], M. Saliba Monteiro [3], A. Pegoraro Poor [3], G. William Almond [2], J. Bonin Ferreira [2], C.A. Pospissil Garbossa [1]

[1]*Department of Animal Nutrition and Production, School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, Brazil*

[2]*Department of Population Health & Pathobiology, College of Veterinary Medicine, North Carolina State University, Raleigh, North Carolina, United States*

[3]*Department of Preventive Veterinary Medicine and Animal Health, School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, Brazil*

Background and Objectives

Early embryonic loss occurring in the first third of pregnancy represents 30% of total conceptuses loss in pigs. Thus, improve early embryo development is essential to achieve a better reproductive performance. Progesterone (P_4) plays a pivotal role on early embryo development since it modulates a specific intrauterine environment. However, the effects of P_4 or its analogues supplementation during early pregnancy on litter performance at birth are unknown. Therefore, the aim of this study was to evaluate the effects of altrenogest (Regumate®) supplementation from day 6 to 12 of pregnancy on the number of piglets born.

Material and Methods

A total of 301 females were blocked by parity (from 1 to 8) and allocated in two groups: non-supplemented females (NS; n = 163) or females supplemented orally with 20 mg of altrenogest (Regumate®) from day 6-12 of pregnancy (ALT; n = 138). The ovulation was considered as occurred 48 hours after the estrus detection in order to determine the first day of pregnancy.

Results

The farrowing rate was similar between both groups (95,6 and 93,1 for NS and ALT, respectively; $p > 0,05$). The treatment increased ($p < 0,05$) total piglets born (NS = 16,6; ALT = 17,3) and piglets born alive (NS = 14,8; ALT = 15,6).

Discussion and Conclusion

Although P_4 supplementation during early pregnancy may have positive effects on uterine environment, supplementation performed prior to day 6 of pregnancy may impair embryo survival and pregnancy rate. It was demonstrated previously that weaned sows supplemented with altrenogest from day 6-12 of pregnancy had greater embryo size at day 28 of pregnancy. In conclusion, the present study shown that the improvements in uterine environment and embryo development achieved with altrenogest supplementation from day 6-12 of pregnancy, as demonstrated by previous studies, results in increased number of piglets born without affecting farrowing rate.

REP-PP-19

CYSTIC ENDOMETRIAL HYPERPLASIA IN MINIPIGS - AN UNDERESTIMATED PROBLEM?

S. Dürlinger [1], V. Martin [1], C. Knecht [1], S. Schäfer-Somi [2], R. Brunthaler [3], A. Ladinig [1]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*
[2]*Platform Artificial Insemination and Embryo Transfer, University of Veterinary Medicine Vienna, Austria*
[3]*Institute of Pathology, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Over the last years, more and more cases of pathologic uterus lesions in female minipigs were treated at the University Clinic for Swine, Vetmeduni, Vienna. Cystic endometrial hyperplasia (CEH) was the most common diagnosis in these cases. In the current case series, CEH occurred in 19 female KuneKune pigs from one herd.

Material and Methods

The 19 female pigs in this case series were kept together with vasectomized boars in extensive husbandry. The age of the animals ranged from five to seven years and all sows except for one, were nulliparous. After one of the female pigs showed bloody, mucous vaginal discharge and fever, ultrasound examination of all sows was performed. The sonographic examination revealed the typical picture of CEH (thickened endometrium, proliferation and cystic dilated endometrial glands of different size). Due to the fact that clinical symptoms occurred in one animal, all uteri showed pathological findings in ultrasonography, and the animals were no longer expected to be used for breeding, it was decided to perform ovariohysterectomy under general anesthesia on all animals.

Results

The histological examination of all uteri revealed CEH in different grades (high-grade n=12, medium grade n=4, low grade n=3) with low- grade to high-grade cystic dilated uterine glands. In some cases, purulent endometritis (n= 4) was detected.

Discussion and Conclusion

This case series, former cases at the Vetmeduni and reports in literature show that CEH is not unlikely in female pigs which are not used for breeding, especially when they reach a higher age. The symptoms are often very unspecific. In this case for example, only one out of 19 pigs showed clinical symptoms such as fever and vaginal discharge. Many other cases over the last years showed that cystic endometrial hyperplasia should be kept in mind as a differential diagnosis in case of various symptoms seen in female minipigs.

REP-PP-20

IMPACTS OF BACKFAT THICKNESS ON FARROWING OUTCOMES

R. Carnevale [3], B. Muro [3], D. Feitosa Leal [1], A. Pegoraro Poor [2], M. Saliba Monteiro [2], N. Gomes [3], L. Alves [3], C.A. Pospissil Garbossa [4]

[1]*Department of Population Health & Pathobiology, College of Veterinary Medicine, North Carolina State University, Raleigh, North Carolina, United States*

[2]*Department of Preventive Veterinary Medicine and Animal Health, School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, Brazil*

[3] *Department of Animal Nutrition and Production, School of Veterinary Medicine and Animal Science,University of São Paulo, São Paulo, Brazil*

[4]*Department of Animal Nutrition and Production, School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, Brazil*

Background and Objectives

Excess or lack of adipose tissue predisposes sows to impaired reproductive performance. Ideally, the evaluation of body condition would be interpreted as a set of measures (backfat, loin muscle depth and area, body weight, visual body condition) taken overtime. However, using all the methods is challange in the farm routine. Thus, backfat is one of the most reliable method to access body condition considering that several studies shown a close relation among backfat, reproductive function and metabolism.

Material and Methods

A total of 101 hybrid sows with parity ranging between 2 and 4 were included in the study. Backfat measurements were performed at the P2 position prior to farrowing. The farrowing duration (FD) was defined as the time elapsed between the birth of the first-born and the last-born piglet. The total live born and (TB) stillborn (SB) piglets were evaluated. Sows were divided according to their backfat measurement in three groups: Thin (≤15,0mm) n =56; Ideal (15,1 – 19,9 mm), n = 29; and Obese (≥20,0 mm), n = 16.

Results

The obese sows had longer FD than the sows considered in an ideal condition. Sows classified as thin had similar FD compared to obese and ideal sows (Thin: 249 ± 36,1 min; Ideal: 232 ± 36,5min; Obese: 296 ± 38,6min). Additionally, thin sows had higher percentage of SB compared to sows classified as ideal. Otherwise, SB in obese sows was similar to ideal and thin sows. (Thin: 6.00± 0.84; Ideal: 1.83 ±0.52; Obese: 4,63±1.45). TB did not differ between the groups.

Discussion and Conclusion

Prolonged farrowing, observed in obese sows, is a contributing factor to impaired performance at farrowing and post-farrowing. Contrastingly, thin sows have impaired outcomes at farrowing, observed as increased stillbirth rate. Hence, the results shows that the mechanisms that lead obese and thin sows to impaired farrowing performance may be different.

MISCELLANEOUS

MIS-PP-01

EARLY UMBILICAL BACTERIAL INFECTIONS IN PIGLETS ARE HARD TO DIAGNOSE THROUGH CLINICAL EXAMINATION

I. Larsen [1], K. Barington [1], E. Kudirkiene [2], K.T. Hartmann [1], H.E. Jensen [1], J.E. Olsen [1], J.P. Nielsen [1], K.S. Pedersen [1]

[1]*Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark*

[2]*Bacteria, Parasites & Fungi, Statens Serum Institut, Artillerivej 5, DK-2300 Kbh. S., Denmark*

Background and Objectives

Clinical identification of bacterial infection of the umbilicus in young piglets is essential for optimal antimicrobial (AM) treatment and prudent AM use. The aim of this study was to elucidate if there is a correlation between clinical signs of infection and microbiological findings of the umbilicus.

Material and Methods

Among Danish herds with more than 600 sows (n=743) a subsample of 10 herds were randomly selected for clinical and microbiological examination of the umbilical area of young piglets. Each herd contributed with 8-10 randomly drawn newborn to 3-day-old non-treated case piglets with reddening, signs of mild bleeding or an umbilical stump of more than 2.0 cm. Piglets without these signs were selected as controls. All pigs were euthanized, and the umbilicus was aseptically incised and swapped for microbiological aerobic and anaerobic cultivation.

Results

A total of 98 case and 98 control piglets were included. Microbiological cultivation revealed bacterial presence in 134 (68 %) pigs in total with 59 (60%) and 75 (76 %) in case and control pigs, respectively. The most prevalent bacterial species were Streptococci ssp. (21%), Staphylococci ssp. (15%) and E. coli (13%), with no significant difference between cases and controls. The overall sensitivity and specificity of the clinical examination for detection of pigs with bacterial infection was 44 and 37, respectively. Clinical signs varied with age and gender, however, this did not improve the clinical identification of pigs with umbilical bacterial infection.

Discussion and Conclusion

Results from this study indicate that clinical examination alone is not suitable for identification of umbilical bacterial infections in young piglets. Similar and simultaneous presence of aseptic inflammatory reactions due to umbilical healing might be one explanation. The high prevalence of umbilical bacterial infections may explain the efficacy of early AM treatments for reduction of umbilical outpouchings.

MIS-PP-02

SEARCHING FOR A BIOMARKER FOR GASTRIC LESIONS IN PIGS

L. Dieste-Pérez [1], L. Bosma [1], X. Benthen De Grave [2], K. Junker [1], F. Bikker [3]
[1]*Royal GD, Deventer, The Netherlands*
[2]*Schothorst Feed Research, Lelystad 8218 NA, The Netherlands.*
[3]*Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, The Netherlands*

Background and Objectives

Pig farming needs a biomarker for the (early) screening of gastric lesions in pigs to prevent and lessen their impact on pig health and welfare. We assessed the validity of serum pepsinogen and several salivary parameters as potential indicator(s) of gastric lesions in pigs.

Material and Methods

In total, 121 pigs 6-8 months old, from the experimental farm of SFR were used. One to 3 days before slaughter, saliva was collected from 37/121 pigs using HydraFloc® swabs and pH of the saliva was measured in situ directly from the swab with a pH paper. At slaughter, serum was collected from all pigs and the stomach lesions were scored by a pathologist according to the protocol from Hessing et al. 1992. Pepsinogen activity in serum was analysed by using an enzymatic and colorimetric method, and saliva parameters including, amylase activity, total protein, total protease and pylori-specific protease activity were analysed according to protocols described in Prodan et al. 2015 and Kaman et al. 2013. All variables were tested individually against gastric lesion scores by one-way ANOVA or against presence or not of gastric ulcers by t-test with STATA 15.

Results

Gastric lesion scores ranged from 0 to 5. Pigs with severe gastric lesions had a statistically significantly higher salivary pH compared to pigs with milder lesions (ANOVA and Student's t-test; $p < 0.05$). Surprisingly, the salivary pH of the pigs ranged from 8 to 10. No differences were observed between groups of pigs on serum pepsinogen or other salivary parameters, nor between different feeds.

Discussion and Conclusion

Serum pepsinogen determination is not adequate as in vivo biomarker for gastric wall damage in pigs. Results of the salivary parameters should be taken with caution because of the limited database, but they provide some insight into the potential of pH as a biomarker for gastric lesions in pigs.

MIS-PP-03

HAEMORRHAGIC DIATHESIS IN PIGLETS: AN ATTEMPT TO DECIPHER THE CAUSES

L. Dieste-Pérez [1], E. Van Der Vries [1], M. Houben [1], T. Geudeke [1], K. Junker [1], L. Bosma [1]
[1]*Royal GD, Deventer, The Netherlands*

Background and Objectives

Understanding the cause of haemorrhagic diathesis in suckling piglets would support farmers and veterinarians to better approach and handle these cases in the future.

Material and Methods

Fourteen piglets around 11 days old from 5 different farms showing petechiae, and 12 control pigs from 4 of these farms where killed and subjected to pathological examination. Blood was collected during exsanguination for haematological screening, IgG and PIGMAP analysis and platelet function. From cases and controls from 2 of these farms, total nucleic acids were extracted from isolated platelets for metagenomics analysis exploring the potential role of virus infection. Differences between case and control piglets were analysed by t-test by STATA 15.

Results

In 36% of the cases, signs of sepsis due to Gram+ bacteria, as well as specific infection with S. suis, S. hiycus or E. coli was diagnosed apart from haemorrhagic diathesis. However, in the rest of the cases, only haemorrhagic diathesis was described. Regarding blood results, no differences were observed in serum IgG. PIGMAP was higher ($p<0.05$) in cases than in controls, and slightly above normal values, sign of certain acute inflammatory reaction. Erythrocytes were low in both, cases and controls, but significantly lower ($p<0.01$) in cases. MCV was higher ($p<0.001$) in cases than in controls, showing a reactive bone marrow in the affected piglets. Haemoglobin was generally low, but it was lower in cases ($p=0.05$). Thrombocytes levels were lower ($p < 0.01$) in cases than in controls, although always within normal range, but MPV was higher ($p<0.001$) in cases, showing higher presence of young platelets. Signals for several viruses were detected in both cases and controls.

Discussion and Conclusion

Piglets with haemorrhagic diathesis showed regenerative anaemia and mild acute inflammatory reaction, not clearly related with a viral infection. Research must go on!

MIS-PP-04

FEEDING BEHAVIOR OF NEWLY WEANED PIGLETS

K. Venrooij [1], L. Faba [1]
[1]*Trouw Nutrition R&D, The Netherlands*

Background and Objectives

Feeding behavior of post-wean piglets was studied using electronic feeding stations (EFS) to explore opportunities to improve management strategies.

Material and Methods

We used EFS with a capacity for 120 nursery piglets at 10 pigs/pen to measure individual feeding behavior. Data was collected from day 1 post-weaning onwards because EFS were inactive for training purposes on the weaning day. A dataset including 360 pigs (7.1±1.0 kg BW) and containing 86,954 individual visits was used to study feeding behavior over the first week post-weaning.

Results

In the first week post-weaning, most feeder visits and feed intake occurred between 7:00 and 11:00 AM and 3:00 and 7:00 PM, representing 20% and 24% of daily visits and 16% and 27% of daily feed intake, respectively. Remaining visits and feed intake occurred outside these time windows with lower frequency. On day 1 post-weaning, 14% of the visits occurred between 7:00 and 11:00 AM and 34% between 3:00 and 7:00 PM. The afternoon intake on day 1 post-weaning was 40% of total daily intake. The afternoon-intakes were between 16-22 g/hour and 20-25 g/hour for the first day and first week post-weaning, respectively. The hourly intakes outside the afternoon time window were on average 10g/hour and 17g/hour for the first day and first week post-weaning, respectively.

Discussion and Conclusion

In the first week post-weaning, the observed feeding pattern with morning and late afternoon active times aligned with expected circadian rhythms of cortisol and melatonin. Furthermore, the proportion of feeder visits and daily feed intake in the afternoon on day 1 post-weaning were higher compared to the afternoon proportions in the first week post-weaning. In conclusion, management strategies that focus on enhancing feed intake in the afternoon on day 0 and 1 have potential to support newly weaned piglets.

MIS-PP-05

IMPROVED DIAGNOSIS OF CLOSTRIDIUM PERFRINGENS AND CLOSTRIDIUM DIFFCILE IN CASES OF NEONATAL DIARRHOEA IN PIGLETS

L. Valls [1], M. Baratelli [1], J. Maldonado [1], O. Boix [1]
[1]*HIPRA, Amer (Girona), Spain*

Background and Objectives

Neonatal diarrhoea (ND) in pigs is multifactorial. ND control should consider, among others, the differential diagnosis of the multiple agents involved. Fresh faeces can be a problematic sample for this purpose, as results may be biased by storage and transport conditions. The FTA card is a support system that could have some advantages over the fresh sample. This work was aimed at the optimization of an RT-qPCR assay to detect C. perfringens (CP) and C. difficile (CD) toxin genes in stools dissected on FTA cards.

Material and Methods

An existing multiplex RT-qPCR assay intended to detect E. coli virulence factors (F4, F5, F6, LT genes), was optimized to also detect CP (type A and C genes) and CD (toxin A and B genes). Assay specificity was first tested in silico. The analytical and diagnostic performance (limit of detection [LOD], efficiency and specificity) were assessed with reference strains, and with a set of porcine pathogens. Stools collected from healthy (n=19) and diarrheic (n=51) piglets were loaded onto FTA cards and tested using the optimized assay.

Results

The assay detected CP and CD targets only, with LOD and efficiency ranging from 5.2 x 103 to 7.2 x 106 CFU/ml, and 94.73 to 101%, respectively. CP type A and C genes, and CD A+/B- and A+/B+ gene combinations were detected in 90.2% and 9.8%; 2.08% and 97.92% of the samples from pigs with diarrhoea, respectively. No positive samples were detected among healthy experimental piglets.

Discussion and Conclusion

The results showed that the developed system is a reliable method to detect the presence of CP and CD toxin genes in diarrheic animals for diagnostic purposes. In addition, the FTA card support platform avoids restrictions in the transport, storage and processing of fresh samples.

MIS-PP-06

BACTERIOLOGICAL AND VIROLOGICAL EXAMINATION OF FECAL SAMPLES COLLECTED FROM SUCKLING PIGLETS AFFECTED BY DIARRHOEA IN GERMANY DURING 2019-2020

V. Cvjetković [1], K. Dohmann [2], K. Golacz [1], D. Sperling [3]

[1]*Ceva Tiergesundheit GmbH, Kanzlerstraße 4, 40472 Düsseldorf – Germany*

[2]*Innovative Veterinary Diagnostics (IVD) GmbH, Albert-Einstein-Str. 5, 30926 Seelze-Letter – Germany*

[3]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Neonatal diarrhoea (ND) is one of the most important disorders in swine worldwide, leading to high economic losses, antibiotic therapy and risk of antibiotic resistance development. The aim of present work is to show a recent overview of most frequent agents identified in suckling piglets affected by ND.

Material and Methods

Between 2019-2020, 97 German farms either sent in pooled faeces (≥ 2 pools) or faecal swabs (≥ 2) from suckling piglets affected by ND. Samples were cultivated on Columbia Blood, Gassner (Escherichia coli; E. coli), and Schaedler (Clostridium perfringens; C. perfringens) agar. E. coli – and C. perfringens Type A/ C typing was carried out using multiplex Polymerase Chain Reactions (PCR). C. perfringens isolates were analysed for their respective toxin production (α-toxin and β2-toxin) via immunoblot. Presence of Rota Virus (RV) A was examined by a previously described real-time PCR (qPCR) and RVC by an in-house qPCR.

Results

In total, all farms were positive for at least one type of E. coli, out of which 29.6% were haemolytic and 70.4 % non-haemolytic isolates. We detected 55 isolates of different E. coli pathotypes, such as Enterotoxigenic E. coli (ETEC; 47.3%), Necrotoxic E. coli (NTEC; 30.9%) and Enteropathogenic E. coli (EPEC; 21.8%). Only C. perfringens Type A was found in 83 farms. Most isolates were shown to be toxicogenic in vitro (71.1%), with higher detection rates for β2-toxin (66.2%) than for α-toxin (33.8%). Rotavirus A isolates were more frequent than RV C isolates (65.0% vs. 35.0%).

Discussion and Conclusion

Within the frames of our work, we could confirm that the importance of C. perfringens Type C is no longer relevant. However, most of C. perfringens Type A isolates produced toxin, in particular β2-toxin which was found twice as frequently as α-toxin in vitro. Furthermore, we could observe a clear rise in RV A/C positive farms.

MIS-PP-07

COMPARATIVE EFFICACY OF DIFFERENT IRON-BASED PRODUCTS IN THE PREVENTION OF ANEMIA IN SUCKLING PIGLETS

H. Karembe [1], A. Geneteau [2], D. Sperling [1]
[1]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*
[2]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*

Background and Objectives

Iron deficiency anaemia (IDA) is a recognised clinical condition of fast-growing piglets. The objective of this study was to investigate whether single oral or intramuscular application of iron-based products is adequate to meet the needs of piglets by determining the haematological parameters.

Material and Methods

This study was performed according to a parallel, randomized, experimental block design. It included four sows and their litters. 18 piglets were included, allocated into 2 treatment groups, and treated on D0 (3rddays of life). The treated piglets received comparable total iron doses, 175 mg iron (as dextran) per piglet for group 1 (same dose as the commercially available oral iron/toltrazuril combo product) and 174 mg iron (as gleptoferron) per piglet for group 2 (Forceris®). Blood specimens were collected on D-1, D0, D7, D14, D22 and D30 for hematological tests. Piglets with Hb values lower than 9 g/dL were classified as anemic t-test (two-tailed) or Kruskal-Wallis test was used to compare the variables between the two groups at different time-points (GraphPad Prism 9). Statistical significance was set at $p<0.05$.

Results

From D14 to D30, piglets treated with injectable form of iron, had higher Hemoglobin ($p<0.0001$), Red blood cell counts ($p<0.03$), Hematocrit ($p<0.0004$) and MCV ($p<0.01$) values and were properly protected (0% anemia), while piglets treated with oral product had lower hematological parameters, 100% of piglets were anemic before weaning (D22). Piglets treated with injectable product were heavier on D22 (+470 g, $p=0.5943$) and on D30 (+1240 g, $p=0.2529$). There was no product-related adverse event during the animal phase.

Discussion and Conclusion

In this study, gleptoferron-based injectable iron treatment (Forceris®) demonstrated a significantly better anti-anemic activity when compared to oral treatment, with higher hematological parameters, no anemic piglets, and numerically better bodyweight. The finding is in line with former studies comparing oral versus parenteral iron.

MIS-PP-08

FIRST RESULTS OF THE CYSTOISOSPORA SUIS QPCR ASSAY ON 5 BELGIAN FARMS

E. Libbrecht [1], P. De Backer [1], E. De Jonghe [1]
[1]*Ceva Santé Animale, Brussels, Belgium*

Background and Objectives

Cystoisospora suis (C. suis) is the most important cause of coccidiosis in piglets. It can cause diarrhea, stunted growth, weak piglets or runts and a lower weaning weight. The standard method of flotation is limited by its sensitivity. To improve the diagnostics, a C. suis qPCR was developed and the first results in Belgium are listed below.

Material and Methods

5 randomly selected farms were sampled according to the same protocol; piglet faeces from 10 litters was collected in the farrowing pen. In each litter, half of the piglets were sampled and one mixed, faecal sample per litter was created. In addition to the sampling, several relevant data was collected: date of birth of the piglets, parity of the sow and faecal consistency of the litter (score from 1-4: 1 is solid faeces, 2 is pasty or creamy faeces, 3 is semi liquid faeces and 4 is liquid faeces). All 10 samples of each farm were sent to Diergezondheidszorg Vlaanderen (DGZ) in Belgium and frozen until the Cystoisospora suis qPCR assay was performed.

Results

Of those 5 farms, 2 farms were positive for C. suis in the faeces and 3 farms were negative. One positive farm had 4 positive litters out of 10 samples that ranged from moderate to very high amounts of DNA. This farm had stopped treatment against C. suis for several weeks before the sampling. The other positive farm had 3 positive litters with low to moderate amounts of DNA and was using an oral, anticoccidial treatment around 5 days of age. One of the negative farms was also using anticoccidial treatment.

Discussion and Conclusion

Cystoisospora suis is still present on Belgian farms, sometimes despite anticoccidial treatment. More samplings will be added in the future to increase our knowledge on the qPCR and the prevalence of C. suis on Belgian farms.

MIS-PP-09

INTERACTIVE ON A PIG FARM - 360° VIDEOS IN HERD HEALTH MANAGEMENT EDUCATION

U. Gerster [2], J. Durán Porras [1], F. Kalberer [1], S. Schwarz [1], H. Nathues [2], A. Grahofer [2]
[1]*iLUB, Support Center for ICT-Aided Teaching and Research, University of Bern, Switzerland*
[2]*Clinic for Swine, Vetsuisse Faculty, University of Bern, Bern, Switzerland*

Background and Objectives

The use of 360° videos is an efficient educational tool, which motivates students' active participation in teaching sessions, and they enrich the teaching and learning process. The aim of this project was to develop an interactive learning and teaching tool that illustrates and explains the structured approach of a herd examination on a pig farm in Switzerland.

Material and Methods

The learning and teaching tool includes videos from overall six pig farms with different production units. Two-dimensional videos give on overview of the farm and the piglet flow on a given farm. In specific production areas, a 360° camera was installed to produce several 360° videos.

Results

All videos were implemented in a virtual course room on the learning platform of the university. At the entrance site general information about the application, learning outcomes and the several farms are provided. The users can choose between the six different farm types and thereafter is routed to the specific work package for that particular farm. At the beginning, farm details including herd size, production type and management procedure are displayed. Depending on the farm type, the 360° videos are categorized into subgroups (e.g. farrowing unit, flatdeck, feed storage, external biosecurity measures). Each subgroup contains an informative text and after every video, the user has to answer two to five questions and receives an automatic feedback. After every work package of a particular farm, the user can evaluate the module thereby allowing future improvement of the learning tool.

Discussion and Conclusion

The newly developed learning and teaching tool will help to create knowledge among veterinary students for their further clinical education in porcine health management. The evaluation of the animal health and their environment during a virtual herd visit can be exercised and reflected, thus preparing the students for their first "real" herd examination.

MIS-PP-10

CONCENTRATION OF OXYTETRACYCLINE IN PIG MILK EVALUATED BY ULTRA-HIGH PERFORMANCE LIQUID CHROMATOGRAPHY-TANDEM MASS SPECTROMETRY (UHPLC-MS/MS)

P. Cybulski [1], A. Gajda [2], M. Bilecka [2], M. Gbylik-Sikorska [2]
[1]*Goodvalley Agro S.A., Przechlewo, Poland*
[2]*Department of Pharmacology and Toxicology, National Veterinary Research Institute, Puławy, Poland*

Background and Objectives

The available research works analysing the oxytetracycline (OTC) pharmacokinetics in swine describe its activity after oral, intramuscular, or intravenous administration; however, the studies were focused on blood, tissue, and oral fluid concentrations. The penetration of OTC into milk of lactating sows has not been investigated yet.

Material and Methods

The study was performed in a highly-performing sow farm located in Poland, where 6 multiparous sows were treated 1 day after farrow due to injuries caused by labour dystocia. A single dose of OTC (30 mg/kg body weight, Tetradur LA-300, Merial S.A.S., Lyon, France) was administered intramuscularly. Prior the administration, the sows were tested negative for the OTC presence in milk. The samples were collected manually at the same hour at 6 specific time points, i.e. 1, 3, 5, 7, 14, 21 days after injection. For the quantification of OTC and its metabolite, 4-epi OTC, in sow milk, an ultra-high performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS) method was developed and validated. The analysis was performed using Shimadzu Nexera X2 (Shimadzu, Japan) system connected to the QTRAP® 4500 triple quadrupole mass spectrometer (AB Sciex, Framingham, USA).

Results

All the 30 milk samples were OTC and 4-epi OTC positive. The highest average concentration of OTC (1132.2 μgL^{-1}) and 4-epi OTC (54 μgL^{-1}) were found at 1st day after the treatment. The average concentrations of OTC and 4-epi OTC found at the day 21 were 12.3 μgL^{-1} and 1.5 μgL^{-1}, respectively.

Discussion and Conclusion

Our research proves high utility of pig milk as a medium for detection of the OTC and its metabolite, 4-epi OTC. Its application to pharmacokinetic studies in pigs is valuable. Influence of milk contamination on piglets' health requires further investigation.

MIS-PP-11

DIAGNOSIS, THERAPY AND PROPHYLAXIS OF CONJUNCTIVITIS IN PIGS - A SURVEY OF AUSTRIAN PIG PRACTITIONERS

C. Riemann [1], C. Unterweger [1]
[1]*University Clinic for Swine, University of Veterinary Medicine Vienna, Austria*

Background and Objectives

Conjunctivitis in swine is a common finding, but relevant data about diagnostics, therapy and prophylaxis is lacking. The objective of this study was to conduct a survey among practitioners about their approach in the field.

Material and Methods

26 swine practitioners responsible for about 80% of Austrian pig herds were asked anonymously about their views on the diagnosis, treatment and prophylaxis of porcine conjunctivitis using the lime survey programme.

Results

As main pathogen responsible for conjunctivitis practitioners named PRRSV (96%), followed by chlamydia (80%); non-infectious causes such as ammonia or dust play an equally important role. 65% would only proceed diagnostically if animals showed additional clinical signs and 78% only if 1/3 to 1/2 of all pigs were affected with severe conjunctivitis. Diagnostic sampling includes serum (65%) – particularly for PRRSV diagnosis -, conjunctival (46%) and nasal swabs (27%). Although 46% say that conjunctivitis is (very) painful, therapy is only seen as (very) necessary by just under 8% of practitioners. 23% do not treat at all. Antibiotic treatment, which in most cases is administered without laboratory diagnosis, includes mainly doxycycline (71%) and tetracycline (29%), mainly orally (84%) and over a maximum period of 10 days. PRRSV vaccination and optimization of the management are common solutions. The basic approach is to solve the underlying problem.

Discussion and Conclusion

There is a lack of studies that address the causes of conjunctivitis. Although there is no scientific causality of PRRSV in conjunctivitis, the virus is considered a classical pathogen, while M. hyorhinis is scarcely considered as a causal agent. Data about application route and duration of antibiotic use in cases of conjunctivitis in pigs is missing and an authorization for the local ocular use of antibiotics would be helpful. To conclude, far too little is known about pathogenesis, therapy and prophylaxis in the case of conjunctivitis in pigs.

MIS-PP-12

DIFFERENT HEALTH STATUSES IN ALTERNATIVE PIG FARMS: AN ONLINE SURVEY OF 102 FARMERS

C. Fablet [1], E. Dubarry [1], F. Pol [1], N. Rose [1]
[1]*Anses-Ploufragan/Plouzané/Niort Laboratory, BP 53, 22440 Ploufragan, France*

Background and Objectives

Organic pig farms and other non-conventional farms are gaining ground with consumers demand. However, critical points may exist in these systems regarding pig welfare, health and biosecurity. The aim of this survey was to identify pig health problems in alternative farms.

Material and Methods

An alternative farm was defined as having at least one housing system different from closed confined building with fully slatted floor in at least one part of the production stage or with at least 30% of the pigs housed in alternative system. An e-questionnaire was send to 446 French farmers to collect data on the main health disorders observed with regard to the age of the animal (type, occurrence, percentage of affected pigs). The answers of farmers were converted into variables with several modalities. Data were then analysed by multiple correspondence analysis followed by hierarchical clustering.

Results

The questionnaire was filled in by 102 farmers. In breeding herds, four health clusters were found ranging from a cluster of herds without frequent health troubles to a cluster of herds with sows having reproductive disorders, gilts suffering from respiratory troubles and sows and sucklers suffering from leg disorders. After weaning, four health clusters were also found from herds without frequent health problems, herds reporting lameness and respiratory diseases in finishers, herds experiencing diarrhoea in weaners and respiratory troubles in finishers to herds facing leg disorders in weaners and respiratory diseases as well as bites in weaners and finishers.

Discussion and Conclusion

The results need to be considered carefully, because data were collected on a voluntary basis, and only a part of the contacted farmers took part. Farmers may also have under- or overestimated the health levels of their herd. However, these findings indicate a diversity of health troubles in alternative systems and that room from improvement need to be considered in some herds.

MIS-PP-13

HAEMATOLOGICAL REFERENCE INTERVALS OF SOWS AT END GESTATION IN TEN FRENCH HERDS, THE IMPACT OF PARITY ON HAEMATOLOGICAL PARAMETERS AND THE CONSEQUENCES ON REPRODUCTIVE PERFORMANCE

B. Gwenaël [1], T. Charlotte [2], V. Normand [3], V. Bachy [4], R. Daphné [5], M. Brissonnier [3], P. Berton [3], F. Bouchet [3], L. Arnaud [6]

[1]*Porc.Spective Swine Vet Practice*

[2]*Rezoolution Pig Consulting Services*

[3]*PORC.SPECTIVE, Swine Vet practice, ZA de Gohélève, 56920 Noyal-Pontivy, France*

[4]*Orbio - Finalab, Bron, France*

[5]*Orbio, Finalab Veterinary Laboratories, Bron, France*

[6]*PORC. SPECTIVE, Swine Vet practice, Noyal-Pontivy, France*

Background and Objectives

Changes in haematological values occur during the reproductive cycle and may have some clinical consequences. The aim of this study was to provide updated haematological reference intervals for sows at end-gestation, to study the influence of parity on those haematological parameters and to evaluate the impact of haemoglobin levels on production performance.

Material and Methods

The data were obtained using blood samples from 198 apparently healthy and conventionally managed group-housed sows at end-gestation from ten breeding herds located in France. The samples were analysed for haematological variables using impedance technique on Horiba ABX analyser (Horiba, Kyoto, Japan). The reference intervals were calculated according to the guidelines of The American Society for Veterinary Clinical Pathology using SUMMARY procedure in R Studio. Analysis of variance (ANOVA) models were used to evaluate the influence of parity on each haematological parameter and the impact of haemoglobin values on production performances at farrowing. Differences were considered as significant if $p<0.05$.

Results

Reference intervals produced in this study were similar to previously published references but we noticed marked differences in white blood cell values. The study of the impact of parity revealed significant changes for gilts and parity 5+ sows regarding haematological values. Gilts had higher red and white blood cells counts, haemoglobin and haematocrit values. Regarding haemoglobin values, the higher the number of liveborn and weaned piglets per litter, the lower the haemoglobin value at end-gestation. For sows of fifth or higher gestation, we found that the higher the percentage of stillborn piglets, the lower the haemoglobin value at end-gestation.

Discussion and Conclusion

This study provides haematological reference intervals for sows at end-gestation. These will be useful for swine veterinarians and researchers for a better understanding of the influence of parity on haematological parameters and haemoglobin values and their relation to reproductive performance.

MIS-PP-14

PHARMACOKINETIC PROFILES OF TOLTRAZURIL AND ITS MAIN METABOLITE FOLLOWING SINGLE ORAL OR INTRAMUSCULAR ADMINISTRATION TO SUCKLING PIGLETS

A. Geneteau [1], N. Varinot [1], R. Magnier [1], M. Peyrou [1], H. Karembe [2], D. Sperling [2]
[1]*Ceva Santé Animale SA, 10 Avenue de la ballastière, CS 30126 – 33501 Libourne Cedex, France*
[2]*Ceva Santé Animale, 10 Avenue de la Ballastière, 33500 Libourne - France*

Background and Objectives

Toltrazuril (TZ) is effective against Cystoisospora suis, and recently, the first parenteral formulation containing TZ in combination with iron (gleptoferron) was registered in the EU. The aim of this study was to compare the pharmacokinetic profiles of TZ and its metabolite following single oral or intramuscular administration of different combination products to suckling piglets.

Material and Methods

Study was performed according to a parallel, randomized, experimental block design. 18 piglets were included, allocated into 2 groups, and treated on D0 (3rddays of life) as follows: 20 mg/kg Toltrazuril per os (Group 1, oral combo) or Intramuscularly (Group 2, Forceris®, IM combo). Blood specimens were collected at different time-points from D-1 to D51. Plasma analyses for toltrazuril and toltrazuril sulfone were performed using a specific validated HPLC-UV method. The pharmacokinetic and statistical analysis were performed using Phoenix® WinNonlin® 8.

Results

The mean toltrazuril C_{max} was delayed and 25% lower (5.83 µg/mL vs 7.78 µg/mL, p=0.03434) while the mean AUC_{0-t} was 11% higher with Forceris compared to oral combo (44.83 day*mg/L vs 40.27 day*mg/L, p=0.50627). For toltrazuril sulfone, the mean C_{max} was 23% higher after IM combo (6.92 µg/mL) compared to oral combo (5.64 µg/mL) (p=0.09324). In addition, the mean AUC_{0-t} were 14% higher after IM combo (144.20 day*mg/L vs 126.42 day*mg/L, p=0.23212).

Discussion and Conclusion

In presented study, Toltrazuril Cmax was lower while the extent of absorption was higher after dosing with the intramuscular combo compared to the oral combo. The Cmax and extent of formation of toltrazuril sulfone (active against the parasite as well) were also higher after dosing with the intramuscular combo. However, the differences were not significant except Cmax of toltrazuril. New study with larger sample size is required in order to confirm the observed trends.

MIS-PP-15

INCIDENCE OF EAR-WOUNDS THE FIRST 14 DAYS AFTER INSERTION INTO TWO DANISH NURSERY UNITS

E.ø. Eriksen [3], M.V. Agerlin [1], A.E. Christensen [2], K.S. Pedersen [3]
[1]SEGES Danish Pig Research Centre, 1609 Copenhagen V, Denmark
[2]Ø-Vet A/S, Køberupvej 33, 4700 Næstved, Denmark
[3]Department of Veterinary and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark

Background and Objectives

Ear necrosis is a common condition in the intensive swine production. It presents as necrotic and ulcerative lesions of the pinnae. The exact causation is unknown, but bite-inflicted wounds have been hypothesized to predispose for a bacterial infection of the pinnae. Mixing after weaning may induce aggressive behaviors including ear-biting. The objectives of this study were to estimate the incidence of ear-wounds immediately after weaning, and to explore risk factors for ear-wounds at pig-level.

Material and Methods

We followed a cohort of 272 pigs the first 14 days after insertion into the nursery units at two different commercial indoor producers. Ear-wounds were recorded every day. Data was summarized with descriptive statistics and a Kaplan-Meier estimator, and a cox regression was used to explore risk factors for ear-wounds at pig-level.

Results

At the day of insertion to the nursery, ear wounds were more frequently present (RR=5.2, p=0.018) in pigs that had already been weaned for a few days in the farrowing unit (n=8/112) compared to pigs coming directly from the sow (n=2/159). The cumulative incidence of ear wounds over the 14 days period were 14% (n=18) and 58%(n=76) at the two producers respectively. The median time to occurrence was 3 days and 88% of the ear-wounds occurred within 7 days. The prevalence peaked at the sixth and seventh day after insertion. We did not find any significant risk factors. No signs of ear necrosis were observed.

Discussion and Conclusion

The hazard of ear wounds was high immediately after mixing, and therefore interventions to prevent ear-wounds must be enforced early. Health monitoring by cross-sectional data collections should advisably be conducted approximately one week after mixing of the pigs. The relationship between ear-wounds and ear-necrosis should be investegated in furture cohort studies.

MIS-PP-17

MICROGRANULATED PREMIXES DEMONSTRATE BETTER HOMOGENEITY IN THE FINAL FEED

L. Claerhout [1], W. Depondt [1], U. Klein [1]
[1]*Huvepharma NV, Belgium*

Background and Objectives

During production, transport by trucks and the provision on pig farms, medicated feed is transferred by pipelines over long distances. This is a potential risk for demixing of the veterinary premix. A trial was set up to investigate the impact of the premix formulation on the in-feed homogeneity of the active substance.

Material and Methods

Two veterinary premixes, both containing 100 g tiamulin hydrogen fumarate/ kg, were mixed into a commercial meal diet for pigs (200 ppm) and evaluated on their demixing potential. The first premix was a simple powder based formulation. The second premix was microgranulated (Vetmulin®). Microgranulation is a formulation technique providing equally sized and bigger particles and is especially developed for homogeneous and easy mixing into feed. The test was performed at Tecaliman institute (France). To mimic the field situation in the feed mill, in a truck and on farm, the medicated feed was dropped in a long PVC tube (5.5 meter standard) and collected at the bottom of the tube in a pot. Feed samples were taken at the top and the bottom of the pot and the tiamulin concentration was determined by HPLC. For each premix the test was performed 3 times and the average Elutriation Rate was calculated. This rate expresses the demixing potential: the closer to zero, the better the in-feed homogeneity.

Results

The average Elutriation Rate of the powder and the microgranulated premix was 41.3 and 15.4 respectively. This demonstrates a significant difference ($p<0.05$, Student Test) in the demixing potential of a powder based formulation versus a microgranulated formulation.

Discussion and Conclusion

The formulation of a medicated premix determines the demixing potential and consequently, the homogeneity of the active ingredient in the medicated feed. The equally sized and bigger particles obtained by the microgranulation technology of Vetmulin@ premix ensure a superior in-feed homogeneity and result in correct dosing.

MIS-PP-18

OCCURENCE OF CYSTOISOSPORA SUIS ON PIG FARMS IN BRAZIL

D. Sperling [1], J. Calveyra [2], E. De Freitas Costa [3]
[1]*Ceva Animal Health, France*
[2]*Ceva Animal Health, Brazil*
[3]*Wageningen Bioveterinary Research, Lelystad, the Netherlands*

Background and Objectives

Despite high efficacy of toltrazuril (TZL) against Cystoisospora suis the parasite still seems to be prevalent on pig farms. The objective of our study was to assess the prevalence of coccidiosis in industrial pig's farms in Brazil.

Material and Methods

A cross-sectional field trial was designed to assess the prevalence of coccidiosis in Brazilian industrial pig herds. We investigated 50 farms, average size 1.8 k sows (0.16 – 8.3 k), from the most important pig production areas with the sample size giving 95% confidence level to estimate a 5% coccidiosis prevalence with a relative margin error of 6%. Ten random litters per farm were sampled twice on 2nd (7-14 DOA) and 3rd (14- 21 DOA) week of life and faeces (min. 5 piglets per litter) were examined by flotation. Questioner about the farm practices and management was collected.

Results

On farm level, 41 (82 %) farms were positive for C. suis (2/3 farms without toltrazuril treatment were negative) All farms implemented protocol based on oral TZL treatment except 3 farms. On average 5.1 (standard deviation SD: 0.39) litters were positive for oocyst on positive farms. 8 negative farms were w/o diarrhoea (5 with and 2 without TZL treatment). The mean toltrazuil treatment age was 3 days (SD: 0.33) (from 2-4 DOA). Only 3 farms treated at the 2nd day of life or earlier, on opposite, 8 farms applied second shot of TZL (end of the first week). Despite the repeated treatment 5/8 (62.5 %) farms were positive for C. suis. 20 farms used different ATB protocols in farrowing house, despite ATB administration, diarrhoea was confirmed on 12 farms.

Discussion and Conclusion

High prevalence of coccidiosis despite the frequent treatment by TZL was observed in our study, as in other producing countries. 8/50 (16%) farms repeated TZL treatment during the 1st week of life in order to improve anti-coccidial program.

MIS-PP-19

USE OF A SEROLOGICAL TEST BASED ON ASCARIS SUUM LARVA L3 ANTIGENS FOR DIAGNOSIS REGARDING THE AGE OF THE ANIMALS AND THE STATUS OF THE FARM

T. Gin [1], E. Cantaloube [1], G. Friocourt [1], F. Launay [1], F. Larcher [1], M. Couteau [1], J.L. Pinsard [2]
[1]*Chêne Vert, 4 rue Théodore Botrel, 22 603 Loudéac*
[2]*BioChêneVert, Rue Blaise Pascal, 35 220 Chateaubourg*

Background and Objectives

Ascaris suum (A. suum) is the main internal parasite infesting growing pigs. The goal of this study was to evaluate A. summ infestation on growing pigs at different ages and in farms with different risk factors for A. suum infestation using a serological test based on A. suum larva L3 antigens.

Material and Methods

15 farms were divided in three groups: group 1, 5 farms on slatted floors and group 2, 5 farms on straw, 2 groups without A. suum clinical suspicion and group 3, 5 farms with known historic of A. suum infestation. For each farms, 10 blood samples were performed on 10 and 24 weeks old pigs. For one farm, 2 batches of pigs were followed with individual blood samples every 4 weeks from 10 to 22 weeks of age. Serological test based on A. suum larva L3 antigens were performed on each samples.

Results

Prevalence at piglet level around 10 weeks was low with respectively 2%, 12% and 20% of sera being positives for group 1, 2 and 3. Prevalence at farm level was higher with respectively 20%, 40% and 80% of farms being positives for group 1, 2 and 3. The average serological titer for each group was respectively 0.11, 0.16, 0.22 for group 1, 2 and 3. Prevalence for pigs older than 24 weeks was high with 74%, 92% and 92% of sera being positive, respectively for group 1, 2 and 3. The average serological titer for each group was 0.48, 0.61, 0.67, and significantly different, respectively for group 1, 2 and 3. At farm level, a correlation was observed on the average serological titer around 10 weeks of age and after 24 weeks of age ($p<0.002$; $r=0.63$).

Discussion and Conclusion

A. suum prevalence using a serological test based on A. suum larva L3 antigens differs among farm and age groups.

MIS-PP-20

COMPARISON OF COLOSTRUM QUALITIES OF GERMAN LANDRACE AND GERMAN SADDLEBACK SOWS

A. Vernunft [1], L. Diesing [2], C.C. Metges [3], C. Gladbach [4], M. Oster [1], K. Wimmers [1]
[1]*Research Institute for Farm Animal Biology (FBN), Dummerstorf, Germany*
[2]*Faculty of Agricultural and Environmental Sciences, University of Rostock, Rostock, Germany*
[3]*Research Institute for Farm Animal Biology (FBN), Dummerstorf, Germany; and Faculty of Agricultural and Environmental Sciences, University of Rostock, Rostock, Germany*
[4]*Research Institute for Farm Animal Biology (FBN), Dummerstorf, Germany; and Justus-Liebig-University Gießen, Gießen, Germany*

Background and Objectives

The quality of colostrum and milk is crucial for the health and development of piglets. The aim of this study was to compare blood parameters and the quality of the first milk (colostrum) of modern German Landrace (GL) and indigenous, fatty German Saddleback (GS) sows.

Material and Methods

Colostrum and corresponding blood samples were collected from 25 GL and 18 GS (22 primipara, 21 secundipara) during birth (D0) and on the first day post partum (D1). The sows were housed collectively in a conventional barn. Milk fat, crude protein (XP), lactose (Lac), dry matter (DM) and total energy (TE) contents were determined in the colostrum. Immunoglobulins (Ig) G, A and M were measured by an ELISA kit (Bethyl Laboratories). Several metabolic, biochemical and endocrine parameters were analysed in plasma.

Results

No differences were found between breeds or parity in macronutrients but XP, DM and TE decreased and Lac increased significantly from D0 to D1 ($p<0.05$). In GL sows, medians (ng/ml) of 21.3 and 12.6 IgG, 5.7 and 3.1 IgA, 4.9 and 3.1 IgM were found in D0 and D1 milk, respectively. In GS sows, 24.8 and 4.4 IgG, 7.2 and 1.7 IgA, 3.4 and 1.7 IgM (ng/ml) were found in D0 and D1 milk, respectively. Immunoglobulins decreased 2-fold in GL ($p=0.02$) but 3.6-fold in Saddleback colostrum ($p<0.001$) from D0 to D1. Plasma levels of β-hydroxybutyrate and non-esterified fatty acids were correlated positively to milk fat and significantly higher in GS than in GL ($p<0.05$).

Discussion and Conclusion

The macronutrient quality of colostrum did not differ between modern (GL) and indigenous pig breed (GS) but immunoglobulin levels on D1 were higher in modern than in indigenous breed. Additionally, GS showed indications of metabolic stress in the blood parameters. Therefore, practitioners should not assume that native breeds are necessarily more robust under conventional husbandry conditions.

MIS-PP-21

DERMATOPHYTOSIS CAUSED BY TRICHOPHYTON MENTAGROPHYTES AMONG EXTENSIVELY REARED PIGS

K. Ryytty Sylvén [1], L. Eliasson-Selling [1]
[1]*Farm and Animal Health, Sweden*

Background and Objectives

In August 2021 a commercial organic fattening farm practising extensive rearing received 200 pigs at twelve weeks of age to a pasture equipped with huts providing a lying area of 0,45 m^2 per pig. In November, when the pigs had reached 20 weeks of age, they were transferred to an indoor system with straw bedding and access to a concrete outdoor area. One week after being accommodated to the straw bedding indoors the farmer discovered skin lesions in 10% of the fatteners. The lesions were discovered when the pigs were handled individually for weighing.

Material and Methods

Skin lesions from four different pigs were sampled, merged two and two. Sampling was performed by scraping with a scalpel, plucking of hairs and brushing with a clean toothbrush. A qualitative analysis was made by using selective agars (dixon agar and 2% sabouraud agar) followed by macroscopic assessment and use of light microscopy.

Results

Trichophyton mentagrophytes was demonstrated by qualitative analysis. An inspection of the huts and pasture showed poor environmental conditions. No visible signs of rodents were noted, but the owner confirmed that rats were seen adjacent to the huts from time to time.

Discussion and Conclusion

Most likely the pigs had attracted the fungus at pasture were stocking densities were high and hygiene poor. The presence of rodents may have been a contributing factor as they can act as carriers of dermatophytes. Adverse weather conditions may also have contributed to growth of mycelia. Interestingly there was another fattening farm receiving pigs from the same source of origin, that also developed the same type of skin lesions in one batch of pigs. Moreover, the zoonotic aspect of dermatophytosis must be considered as personnel developed a skin lesion after close contact with affected pigs. The ongoing investigation will hopefully give us more answers, which will be presented at ESPHM2022.

MIS-PP-22

ESTABLISHING OF REFERENCE VALUES FOR PORCINE NEUTROPHIL TO LYMPHOCYTE RATIO REGARDING DIFFERENT AGE GROUPS

D. Hoeltig [2], E. Nerbas [1], M. Wendt [1]

[1]*Clinic for Swine and Small Ruminants, forensic Medicine and Ambulatory Service, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany*

[2]*Clinic for Swine and Small Ruminants, forensic Medicine and Ambulatory Service, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany / Clinic for Ruminants and Swine, Department of Veterinary Medicine, Freie Universität Berlin, Berlin*

Background and Objectives

In human medicine, neutrophil to lymphocyte ratio (N/Lratio) is an established marker for the evaluation of subclinical inflammation and chronic stress. The N/Lratio might also be a possible tool for the detailed evaluation of inflammation and stress in pigs. Therefore, we aimed to establish first N/Lratio reference values for pigs.

Material and Methods

877 healthy pigs were sampled and differential blood counts were performed. Age groups were: A) piglets day 1-3 (n=42, mean age (ma±sd)= 1.8±0.6), B) piglets day 4-7 (n=10, ma=6.3±1.2), C) piglets day 8-21 (n=48, ma=16.3±3.7), D) weaners day 22-29 (n= 11, ma=27.5±1.4), E) weaners day 30-56 (n=50, ma=41.7±4.7), F) growers day 57-84 (n=72, ma=65.5±6.5), G) finishers day 85-189 (n=152, ma=140.1±61.6), H) gilts age >189 days (n=116, ma=236.8±51.9), I) pregnant sows (n=161, ma=479.5±100.5), K) lactating sows (n=138, ma=505.4±114.0), L) premature boars, age >189 days to 260 days (n=28, ma=226.6±44.7) and M) mature boars, age > 260 days (n=50, ma=768.8±258.9). N/Lratio was calculated as i) total N/Lratio, ii) N/Lratio based upon segmented neutrophils and iii) N/Lratio based upon neutrophil band cells. 95% percentile was calculated for the reference values.

Results

Calculated reference values were: Group A: i) 1.08-6.39, ii) 0.93-5.98, iii) 0-0.63; B: i) 0.58-6.76, ii) 0.45-6.20, iii) 0.0-0.56 C: i) 0.22-2.55, ii) 0.17-2.53, iii) 0.00-0.16; D: i) 0.28-2.16, ii) 0.26-2.03, iii) 0.00-0.03, E: i) 0.16-4.47, ii) 0.14-3.92, iii) 0.00-0.5, F: i) 0.17-1.29, ii) 0.15-1.23, iii) 0-0.07, G/H: i) 0.29-1.72, ii) 0.24-1.52, iii) 0-0.09, I: i) 0.72-3.99, ii)0.62-3.55, iii) 0-0.18, K: i) 0.41-2.64, ii) 0.31-2.37, iii) 0-0.07; L: i) 0.35-1.19, ii) 0.21-1.01, iii) 0-0.18; M: i) 0.34-2.16, ii) 0.30-2.03, iii) 0-0.11.

Discussion and Conclusion

Reference values for porcine N/Lratio were age dependent (younger pigs showing higher values). Further investigations can estimate their impact for evaluation of inflammation and chronic stress in pigs..

MIS-PP-23

COMPARATIVE FIELD TRIALS ON THE INCIDENCE OF ANEMIA AND COCCIDIOSIS USING A COMBINATION OF TOLTRAZURIL AND GLEPTOFERRON IN BRAZILIAN FARMS

J. Calveyra [1], C. Postal [1], C. Sartori [1], N. Savaris [1], T. Grasel [1], F. Betiolo [1], H. Fries [1], V. Aguiar [1], M. Souza [1], F. Neimaier [1], D. Sperling [2]

[1]*Ceva Animal Health, Brazil*

[2]*Ceva Animal Health, France*

Background and Objectives

Challenges such as coccidiosis caused by Cystoisospora suis and Iron Deficiency Anemia (IDA) cause a significant decrease in zootechnical performance. Different protocols for the control of these two pathologies have been implemented in the field.The aim of this study was to evaluate for the first time field efficacy of the recently introduced combination product of an injectable Toltrazuril and Gleptoferron (Forceris®, Ceva Sante Animale, France) in the control of these two pathologies on Brazil farms.

Material and Methods

In this study seven commercial farms were evaluated. In total 202 litters were selected and randomly distributed into two groups. G1 received the Injectable combination of Toltrazuril and Gleptoferron (Forceris® Group) and G2 received Oral Toltrazuril and Injectable Iron Dextran (Control Group). Between 2 and 4 DOA (SD0), the animals received their respective treatment and hemoglobin levels (Hb) of 564 animals were measured (SD 0) and at weaning using analyzer Hemocue® Hb 201+. In SD 10 and SD 17, feces of 1040 animals were collected for oocyst investigation by flotation.

Results

In SD 0, there was no difference in Hb levels between treatment groups ($p>0.05$). G1 had an average Hb level of 11.32 g / dL, while the G2 had an average Hb level of 10.88 g / dL ($p<0.0001$). The percentage of anemic and subanemic animals in the G1 group was lower compared to the G2 (39% vs 57%) ($p < 0.05$).G1 Group led to significant decrease of oocyst excretion (1306 vs. 2256) expressed as Opg (Oocysts per gram of feces), resulting in a 42% reduction in oocyst .

Discussion and Conclusion

Injectable treatment was more effective in IDA control, reducing the number of anemic piglets at weaning and reduce oocyst shedding, assessed based on the quantification of oocysts in the feces.

MIS-PP-24

ACUTE SEVERE SKIN LESIONS AND TRANSIENT MORTALITY IN GROWING PIGS OF UNCONFIRMED AETIOLOGY

M. Richey [1], S. Bell [1], J. Payne [1], S. Williamson [1]
[1]*Animal and Plant Health Agency, England, UK*

Background and Objectives

An investigation into an unusual presentation of skin lesions with significant mortality affecting 13-week-old pigs.

Material and Methods

Postmortem examination, laboratory testing, farm visits and feed analysis were undertaken.

Results

In September 2020, 70 of 90 growing pigs in one of seven pens showed sudden onset “scalded skins” and agitation resulting in death of 75% of affected pigs within 24 hours. The remainder recovered with no treatment. There was extensive ventral brick-red shiny skin lesions, subcutaneous oedema, conjunctival congestion and reddened gastric mucosa. Histopathology revealed a severe acute irritant contact dermatitis but was otherwise unremarkable. Biochemistry identified markedly alkaline urine and excretion of toxic metabolites in urine could result in similar lesions. Analysis of old and current feed did not identify any nutrient abnormalities. No mycotoxins were detected in a standard screen apart from low levels of zearalenone and vomitoxin. Farm visit findings included recent introduction of new feed and internal corrosion of the feed silo with visible mould accumulation.

Discussion and Conclusion

Despite extensive investigations there was no evidence of infectious disease or differentials such as water deprivation, mineral (e.g. magnesium), trace element or drug toxicity and chemical exposure Targeted standard mycotoxin testing was unrewarding. The rapid resolution of the disorder limited the opportunity to examine additional material.Several similar incidents with skin lesions, transient mortality and disrupted feed supply were investigated by APHA in recent years occurring August to October. The brief course of disease and irregular distribution between pens suggests point source exposure with patchy dissemination of an unknown causative agent making investigation challenging. Consumption of toxic mouldy feed dislodged from the feed silo at refilling is a suggested hypothesis. Future cases require immediate investigation involving post mortem examination, blood and urine collection at farm visits and feed analysis, particularly broader mycotoxin analysis to include feed from affected pens and silo mould.

MIS-PP-25

COMPARISON OF PLASMA PHARMACOKINETICS OF TOLTRAZURIL AND ITS ACTIVE METABOLITE ADMINISTERED IN 3-DAY OLD SUCKLING PIGLETS IN ORAL, INTRAMUSCULAR AND NEEDLE-FREE INTRAMUSCULAR APPLICATIONS

F. Vangroenweghe [1], R. Krebber [2], K. Fraatz [3]
[1]BU Swine & Ruminants, Elanco Benelux, Elanco Animal Health
[2]Bayer AG – Crop Science Division, Monheim am Rhein, Germany
[3]Elanco Animal Health – R&D, Monheim am Rhein, Germany

Background and Objectives

Coccidiosis due to Cystoisospora suis is an intestinal parasitic infection in suckling piglets provoking clinical or subclinical disease. Standard prevention is performed using oral application of toltrazuril (20 mg/kg) on day 3. A fixed combination product, containing both toltrazuril and iron dextrane glucoheptonate (Baycox Iron; Elanco) has been registered for intramuscular application in suckling piglets on day 3 for prevention of both coccidiosis and iron deficiency anemia. Objective was to compare plasma pharmacokinetics of toltrazuril and its active metabolite in suckling piglets treated with toltrazuril via oral (PO), intramuscular (IM) or needle-free intramuscular (NF-IM) application.

Material and Methods

Newborn piglets (n = 32) from 3 sows were included in a GLP-compliant study (PO-IM) and a GRP compliant study (NF-IM). Piglets were treated with one of the applications (PO (n = 10), IM (n = 10), NF-IM (n = 12)) on day 3. Blood samples were collected at different timepoints for quantitative analysis of toltrazuril and toltrazuril-sulfone. Statistical analysis was performed using Phoenix® WinNonlin, version 8.3 (Certara, USA).

Results

Plasma exposure profiles, such as C_{max} (6.32 to 6.56 mg/L) and $T_{1/2}$ (63 to 77 h) of toltrazuril were not significantly different among applications. T_{max} for toltrazuril occurred later (+ 72-79 h) than for toltrazuril-sulfone. Bioavailability (AUC_{last}) of toltrazuril and its metabolite toltrazuril-sulfone was higher in the IM (1244 and 4095 mg*h/L, respectively) and NF-IM (1690 and 3880 mg*h/L) applications as compared to the PO application (756 and 2448 mg*h/L, respectively).

Discussion and Conclusion

The registered fixed combination product, containing both toltrazuril and iron dextrane glucoheptonate (Baxycox Iron; Elanco), administered to suckling piglets on day 3 of life through intramuscular or needle-free intramuscular injection results in comparable plasma levels of toltrazuril, and toltrazuril-sulfone, and a slightly higher bioavailability than the standard oral application of toltrazuril (Baycox; Elanco).

MIS-PP-26

LONGITUDINAL STUDY ON THE DEVELOPMENT OF OSTEOCHONDROSIS USING COMPUTED TOMOGRAPHY, PATHOLOGY AND SERUM MARKERS

P. Sutter [1], T. Echtermann [1], J. Sanchez-Andrade [2], H. Richter [2], G. Rosato [3], F. Seehusen [3], X. Sidler [1], D. Kümmerlen [1]

[1]Division of Swine Medicine, Department of Farm Animals, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland

[2]Diagnostik Imaging and Research Unit, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland

[3]Institute for Veterinary Pathology, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland

Background and Objectives

Both hereditary and environmental factors are considered to be involved in the development and progression of osteochondrosis. We present a preliminary long-term CT study of OC lesions in relation to occurrence of lameness, to a linear scoring system for exterior traits and to serum levels of osteocalcin, CTx-1 and CPII.

Material and Methods

Ten female and ten male, castrated pigs were selected out of three litters of Swiss Landrace crossbred piglets and were examined for osteochondrosis (OC) from birth to the 10th month of life. Lameness examinations as well as blood sampling and weight controls were carried out from birth to slaughter. Serum levels of osteocalcin, CTx-1 and CPII were determined. Three CTs were performed during the study and the lesions were classified using six CT scores according to size. After the last CT, limbs of all study animals were pathologically examined and the OC lesions were scored.

Results

The prevalence of OC was 100%, that of osteochondrosis dissecans (OCD) 20%. The most prominent lesions were found on the medial humeral condyle (MHC), followed by the medial femural condyle (MFC). Concerning these locations also correlations with linear exterior scoring and lameness development could be seen. All three blood values showed a correlation with the number of lesions.

Discussion and Conclusion

The study gives information on the potential of a combination of CT examination, exterieur scoring and the determination of serum markers for the early detection of OC in the live pigs. The combination of linear description and determination of lesion sizes at MHC by CT around the 218th day of life seems to be the most promising for breeding selection. At least a reduction of OC should be possible by excluding animals using linear exterieur scoring of the forelimbs or large lesions of the MHC. Our findings need to be confirmed in a larger study.

MIS-PP-27

OCCURENCE OF IRON DEFICIENCY ANEMIA ON PIG FARMS IN BRAZIL

J. Calveyra [1], E. De Freitas Costa [2], D. Sperling [3]
[1]*Ceva Animal Health, Brazil*
[2]*Wageningen Bioveterinary Research, Lelystad, the Netherlands*
[3]*Ceva Animal Health, France*

Background and Objectives

One of the management practices in the first days of the piglet's life is iron administration. Despite practically all farms have adopted this practice, iron deficiency anemia (IDA) still seems to be a challenge present in swine farms. The aim of this study to assess the prevalence of IDA in industrial pig's farms in Brazil.

Material and Methods

50 randomly selected farms using injectable iron supplements were included in the study. Within each farm, ten randomly selected litters from diferent parity sows have been assessed. Within each litter, one large, one medium and one small piglet were sampled. In total 1983 piglets from 661 batches at weaning (from 17 to 30 DOA) were sampled. The Hb concentration was measured with the Hemocue® Hb 201+ system. Piglets were classified as follows: Hb levels < 90 g/l are considered to be anemic, Hb levels ≥ 90 g/l and ≤ 110 g/l are suboptimal and Hb levels > 110 g/l are optimal.

Results

The average Hb level of piglets at weaning was 109,4 g/l. 55% of piglets had Hb levels ≥90 g/l and <110 g/l. 49% of the piglets had Hb levels ≥110 g/l, 43% of piglets showed Hb levels between 90 and 110 g/l and 9% of piglets showed Hb levels <90 g/l. The group of large piglets had statistical more anemic piglets (n=64/661) compared to the group of medium (n= 52/661) and small piglets (n=49/661).

Discussion and Conclusion

Anemic and subanemic animals are found at weaning. Even using preventive treatment with iron injection in the first days of life, as observed by other authors in similar studies. Large piglets are at greater risk of developing IDA.

MIS-PP-28

PREVALENCE STUDY OF IRON DEFICIENCY ANEMIA IN MATERNITY PIGLETS IN LATIN AMERICAN COUNTRIES

J. Calveyra [1], F. Rolandi [1], F. Chama [1], M. Deza [1], M. Molina [1], D. Sperling [1]
[1]*CEVA ANIMAL HEALTH*

Background and Objectives

Iron deficiency anemia (IDA) is the most common disorder identified in the postnatal period, responsible for the drop in performance of piglets. One of the main parameters to identify IDA is hemoglobin level (Hb). The aim of this study was to assess the prevalence of IDA in countries from Latin America.

Material and Methods

Five countries and 125 farms were included in the survey: (Brazil, n piglets = 1953; Chile, n = 715; Colombia, n = 1690; Mexico, n = 331 and Peru, n = 420) with total 5109 piglets included in the survey. Piglets were selected according previous recommendation as large, medium and small per litter. The litters represented sows of different parities (minimum 10 litters/30 piglets per farm). Hb levels were measured with the analyzer Hemocue® Hb 201+ at weaning. Piglets were classified as follows: levels of Hb < 90 g/l are considered indicative of anemia, Hb ≥ 90 g/l and < 110 g/l, subanemia, and Hb ≥ 110 g/l, optimal.

Results

In total, 24.8% (1257) of the piglets were with anemia in the survey, with differences significant among participating countries ($P < 0.0001$). The highest prevalence of IDA was observed in the Mexico and Chile (37% and 30%). Regarding the size of the piglets sampled, there was an effect on the percentage of subanemic animals: 47% (2401) of the larger piglets presented anemia, followed by 39% (1972) of the medium piglets and 36% (1860) of the small piglets.

Discussion and Conclusion

A higher percentage of subanemic animals in the group of big piglets was observed, resulting risk of IDA, as found in preliminary studies. The results of this study also allow us to conclude that the percentage of cases of iron deficiency anemia is high, even with the administration of iron in the first days of life.

MIS-PP-29

THE WAY TO MORE PRUDENT USE OF ANTIMICROBIALS IN CURRENT UNFAVOURABLE ECONOMICAL SITUATION.

C. Bonckaert [2], F. Baudoin [1], E. Wauters [1], S. Ribbens [2]
[1]*Flanders Research Institute for Agriculture, Fisheries and Food, Burg. Van Gansberghelaan 115 bus 2, 9820 Merelbeke, Belgium*
[2]*DGZ Vlaanderen, Hagenbroeksesteenweg 167, 2500 Lier, Belgium*

Background and Objectives

More prudent use of antimicrobials is considered as the challenge in livestock and human. After all, antimicrobial resistance takes lives at a rate of one life every 45 seconds. ROADMAP is a European project which is a roadmap and a acronym: Rethinking of Antimicrobial Decision-systems in the Management of Animal Production. In this project we aim to diagnose the reason for antimicrobial usage and act to a more prudent use of antimicrobials in the Flemish pig sector.

Material and Methods

In October 2020 the Kick-Off meeting was organised for a broad range of stakeholders active in swine industry. During "Living Lab" sessions throughout 2021, the group focussed on identifying technical, economical and socio-economical barriers present in the pig industry, hampering a change in antimicrobial use.

Results

In total, four "Living Labs" were organised with an average participation of 18 stakeholders, involving private partners, researchers, multipliers and policy-makers. The participants drew a "problem tree" illustrating the antimicrobial use in the pig sector. Pig gut health, management, economic reasons such as vaccine purchase and peer pressure are the main reasons of antimicrobial use for the Flemish pig farmers.

Discussion and Conclusion

The "problem tree" that was made during the "Living Labs" involves four branches, meaning there are currently four main reasons for the farmers to give antimicrobials. The economical aspect of the antimicrobial usage in the pig sector has to be studied more in depth, especially in current unfavourable economical situation in Flanders.
Next step is the creation of "Action Labs" in which proposed solutions toward more prudent use of antimicrobials will be evaluated (veterinary advice, diagnostics, management…).

MIS-PP-30

EVALUATION OF AN INJECTABLE GLEPTOFERRON AND TOLTRAZURIL COMBINATION IN THE CONTROL OF ANEMIA AND PIGLET PERFORMANCE

F. Chama [1], H. Valencia [1], D. Sperling [2], J. Calveyra [3]
[1]*Ceva Animal Health, México*
[2]*Ceva Animal Health, France*
[3]*Ceva Animal Health, Brazil*

Background and Objectives

Iron deficiency anemia have a great impact on the development of piglets. The control of this challenge improves the clinical and physiological condition and, consequently, the performance of the animals. The aim of this study was to evaluate the effectiveness of different protocols for the control of anemia and the impact on hematological parameters and animal performance.

Material and Methods

The study was conducted on a 1000 sow wean to finishing farm located in the Puebla region of Mexico. 120 animals were individually identified and divided into 2 groups: G1: animals treated with Forceris® (1.5 mL injectable of 45 mg Toltrazuril + 200 mg Gleptoferron) at 3 DOA and G2: animals treated with injectable 200 mg of iron dextran and 20mg/Kg Oral Toltrazuril at 3 DOA. Hemoglobin levels at the beginning (D0) and at weaning were measured. And the animals were weighed at different ages: D0, D61, 170.

Results

Initial weights showed no significant difference (G1 = 1.811 Kg Vs G2 = 1.867, $p>0.05$) There was also no difference in Hemoglobin Level at the beginning of the study. At weaning, it was observed a statistical difference in hemoglobin levels (G1 = 12.6 g/dL VS G2 = 8.3 g/dL), which corresponded to 16% subanemic animals and no anemic animals in G1 and 23% and 67 % respectively of anemic and subanemic animals from G2.The animals in G1 presented 786g more at 61 DOA when compared to G2 (G1 = 15.136 Kg Vs G2 =14,349 Kg) and at 170 DOA, G1 presented 3.5 Kg more when compared to G2 (G1 =95.5 Kg Vs G2 = 92 kg).

Discussion and Conclusion

Piglets treated with Forceris resulted in a lower percentage of anemia. Improved haematological status at weaning was associated with piglet weight gain in subsequent phases. This positive correlation was also found in previous studies.

MIS-PP-31

FIELD EVALUATION OF THE EFFECTIVENESS OF AN INJECTABLE TOLTRAZURIL – GLEPTOFERRON IN GROWTH PERFORMANCE BY PREVENTING COCCIDIOSIS AND ANEMIA IN NEONATAL PIGLETS

J. Calveyra [1], F. Rolandi [2], D. Sperling [3]
[1]*Ceva Animal Health, Brazil*
[2]*Ceva Animal Health, Conosur*
[3]*Ceva Animal Health, France*

Background and Objectives

The swine neonatal period is considered critical for the development of animals due to challenges such as coccidiosis (Cystoisospora suis) and iron deficiency anemia (IDA). The aim of this study was to evaluate the effectiveness of a product with a combination of Gleptoferron and Toltrazuril.

Material and Methods

The field test was performed in 2019 on a farm of 1,200 sows in Chile. 120 animals were included and randomly assigned to the Forceris® group (G1, n= 60; 45 mg toltrazuril + 200 mg iron/piglet, 3 DOA, and to the Control group (G2, n= 60; 200 mg iron dextran 3 DOA . Body weight and hemoglobin (Hb) were determined at 3 and 25 DOA and the percentage of anemic piglets was calculated (Hb levels < 90 g/l anemic, Hb levels ≥ 90 g/l and < 110 g/l suboptimal and Hb levels ≥ 110 g/l ideal) Pooled fecal samples (5 piglets/litter) were collected directly from the rectum and also from the pen at 10 and 17 DOA and examined for the presence of oocysts by flotation.

Results

Both groups remained negative for the presence of oocysts. There was no significant difference in relation to the initial weight of the groups (Pvalue = 0.45). Final weaning weight was significantly higher in the G1 group (6.90 kg vs. 6.31 kg, p = 0.022). The percentage of anemic animals between the groups also showed a significant difference at the end of the study. (1.67% vs. 26.32%, p < 0.0001).

Discussion and Conclusion

G1 Group was able to significantly reduce the number of anemic animals at the end of the study and gain greater weight at weaning. A single combined injection in piglets to prevent iron anemia as well as coccidiosis reduces not only the number of handlings, but also replaces the 'cumbersome' oral treatment.

MIS-PP-32

ASSOCIATED FACTORS TO THE OCCURRENCE OF CYSTOISOSPORA SUIS IN BRAZILIAN PIG FARMS

E. De Freitas Costa [1], J. Calveyra [2], D. Sperling [3]
[1]*Wageningen Bioveterinary Research, Lelystad, the Netherlands*
[2]*Ceva Animal Health, Brazil*
[3]*Ceva Animal Health, France*

Background and Objectives

Cystoisospora suis is the most frequent parasite of piglets in intensive pig farms. The objective of our study was to assess the associated factors of coccidiosis in industrial pig farms in Brazil.

Material and Methods

A cross-sectional field study was designed to assess the prevalence of coccidiosis in Brazilian industrial pig herds. We investigated 51 farms from important pig production areas. The sample size gives 95% confidence level to estimate a 5% coccidiosis prevalence with a relative margin error of 6%. Ten random litters per farm were sampled twice on 2nd and 3rd week of life, and feces were examined by flotation. A questionnaire was applied to record 13 variables concerning litter information, farm practices, and management. A multivariable logistic regression model was fit using a stepwise procedure to select the significant variables.

Results

On the farm level, 82.35% (42/51) farms were positive for C. suis, and the average within farm prevalence was 36% (23.47% – 50.77%) 95% confidence interval. Out of the 13 initial variables, five were selected to be offered to the final multivariable model: the presence of diarrhea, parity assistance, type of the floor, room temperature, and the average number of piglets per sow. The final multivariable model retained the room temperature and the presence of diarrhea. The chance of coccidiosis in litters affected by diarrhea is 5.75 higher than the chance of litters without diarrhea. On average, an increase of one degree in the room temperature increased the chance of coccidiosis by 23.2%.

Discussion and Conclusion

A high prevalence observed in our study is similar to other producing countries. Diarrhea is the primary clinical manifestation of coccidiosis; thus, it is likely both being correlated. Room temperature may play a role in the survival and optimal sporulation of the cysts in the environment. Further studies should be conducted to clarify the drivers for coccidiosis.

MIS-PP-33

COMPARISON OF LUNG EP-LIKE LESIONS IN SLAUGHTERED PIGS, VACCINATED WITH DIFFERENT COMMERCIAL MYCOPLASMA HYOPNEUMONIAE VACCINES UNDER FIELD CONDITIONS.

M.T. Lasierra [1], P. Del Carmen [1], M. Carmona [1]
[1]*Ceva Salud Animal, Barcelona, Spain*

Background and Objectives

Vaccination against Mycoplasma hyopneumoniae (Mh) is a common tool used for prevention and control of Enzootic pneumonia (Ep). Evaluation of lung lesions in slaughterhouse it is a common method to assess efficacy of vaccination. The aim of this study was to investigate the prevalence and extension of lungs with Ep-like lesions observed at slaughter in pigs vaccinated with either Hyogen® (vaccine-H) and other 9 commercial Mh vaccines.

Material and Methods

From January 2016 until October 2021 a total of 2.174 batches and 344.966 lungs from different farms from Spain were scored at the slaughterhouse using the Ceva Lung Program (CLP) score methodology, which assists lung scoring for EP-like lesions.

For each batch the following parameters were calculated:

Percent of affected lungs with Ep-like lesions
Percent of affected surface out of all lungs
Percent of affected surface of pneumonic lungs
Percent of scarring lungs
Percent of cranial pleurisy

The statistical analysis was performed using the Mann-Whitney test.

Results

Pigs vaccinated with Vaccine-H showed statistically ($p<0.01$) less percentage of affected lungs with Ep-like lesions (35.22%), less percentage of affected surface (2.12%) and less scars (8.98%) than lungs vaccinated with other one-dose vaccines (4.32%, 3.63%, 14.26%), bi-dose vaccines (46.15%, 3.50%, 12.09%), or one-dose_two-antigen vaccines (48.37%, 3.84%, 13.55%).

Batches vaccinated with Vaccine-H showed statistically lower percentage of affected lungs with Ep-like lesions than vaccines 2,3,4,6,7,8,9 ($p<0.01$), and statistically lower percentage of affected surface than vaccines 2,3,4,6,7,8,9($p<0.01$) and vaccine-5 ($p<0.05$). Respectively scarring lungs, Vaccine H showed statically lower percentage than vaccines 2,3,4,5,6,7,8 ($p<0.01$) and vaccines 1 and 9 ($p<0.05$).

Discussion and Conclusion

Lungs from farms vaccinated with vaccine-H showed less EP-like lesions than lungs from farms vaccinated with any other commercial vaccine.

The vaccine-H showed, in this study, its superiority in the reduction of lung lesions over the rest of the vaccines included in the study.

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Source: *Horsington J. et al. Efficacy of Simultaneous Intradermal Vaccination of Swine against Porcine Circovirus 2, Porcine Reproductive and Respiratory Syndrome Virus, Mycoplasma hyopneumoniae and Lawsonia intracellularis. Animals 2021, 11, 2225.*

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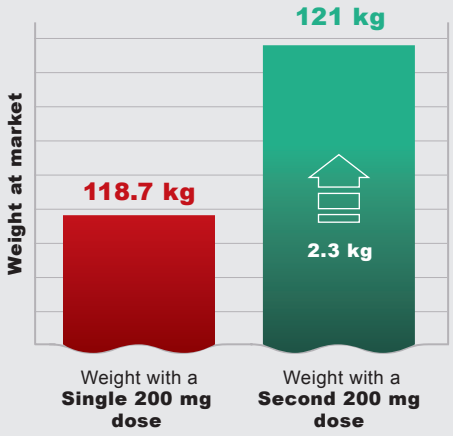

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3 The economocs of iron deficiency anemia on swine production: Olsen C. ESPHM 2019. p252.

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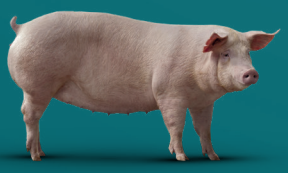

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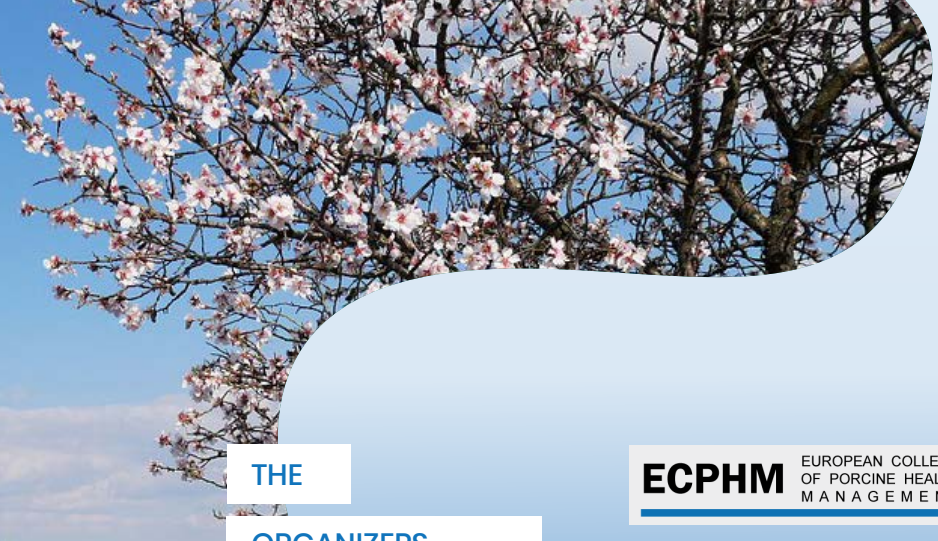

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