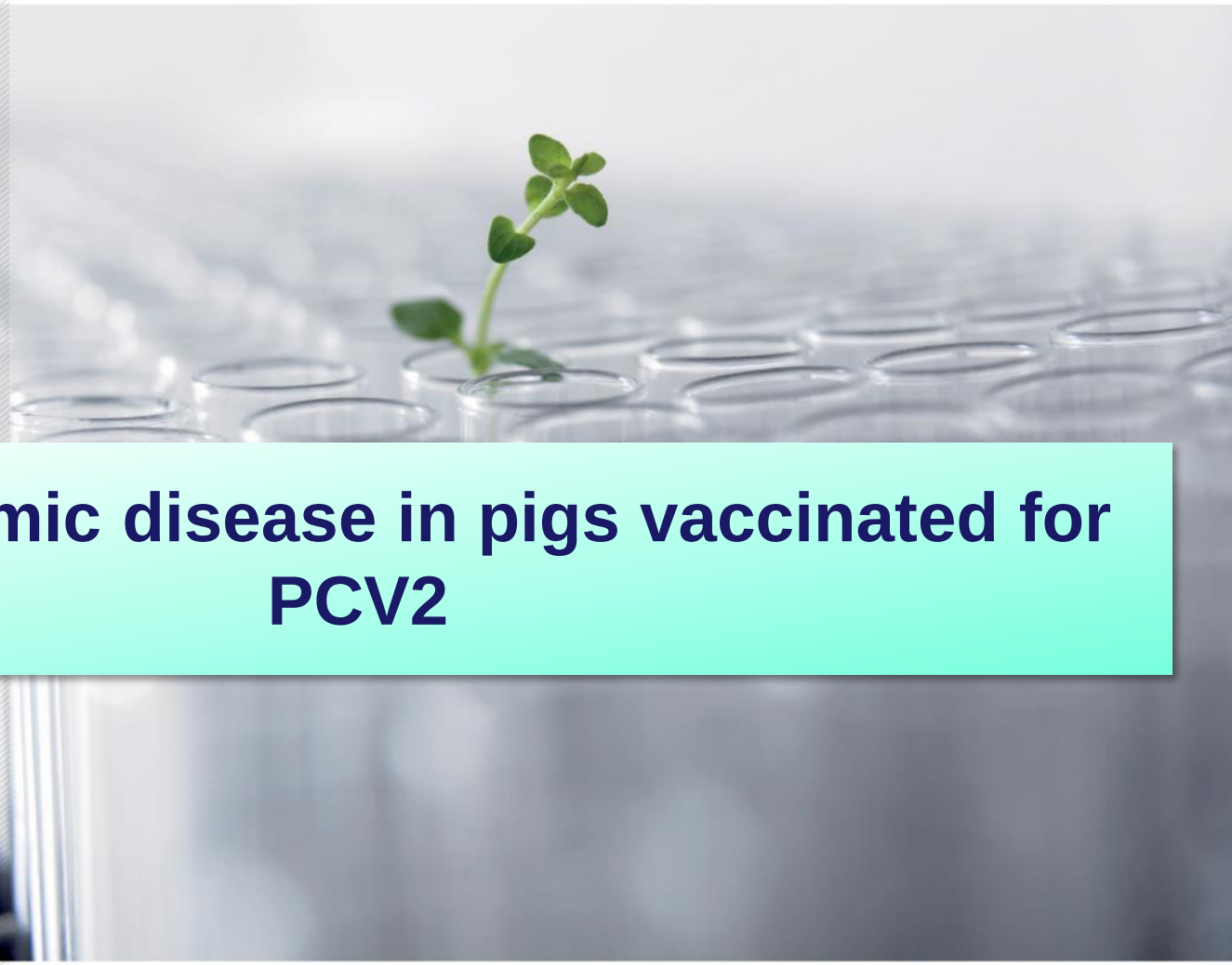
ISTITUTO ZOOPROFILATTICO SPERIMENTALE
DELLA LOMBARDIA E DELL'EMILIA ROMAGNA
"BRUNO UBERTINI"
ENTE SANITARIO DI DIRITTO PUBBLICO

LA NOSTRA ESPERIENZA, LA VOSTRA **SICUREZZA**.



PCV2 systemic disease in pigs vaccinated for PCV2

Giorgia De Lorenzi
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Introduction

The aim of this report is to describe an outbreak of PCV2-SD in a site 3 of a multisite Italian pig herd, located in the Lombardia region, in Northern Italy.

The main aspects of interest of the clinical case are:

- Diagnosis of PCV2-SD fullfilling the diagnostic criteria for PCVDs (Segalés et al., 2022)
- The outbreak of PCV2-SD occurred in a vaccinated herd for PCV2

General information/herd management

Multisite farm

Site 1: 1200 piglets were weekly weaned at 28 days and 7 kg bw

Site 2: 9000 pigs on average. From 90 days of life moved to site 3

Site 3: 2000 fatteners on average

Replacement gilts and semen were purchased from PRRS-free herds

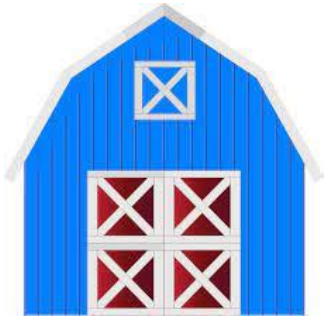
Site 2 had an “all-in, all-out” management by sectors

Site 3 had an “all-in, all-out “ management, cleaning and disinfecting regularly between batches

SOWS	PIGS
• PRRSV (MLV): 3/year • PCV2: 2/year • SIV (H1N1, H1N2, H3N2): 2/year • Atrophic rhinitis: 70 and 90 days of gestation • PPV and *E. rhusiopathiae*: every 4 months	Combined MHYO/PCV2: 3 weeks

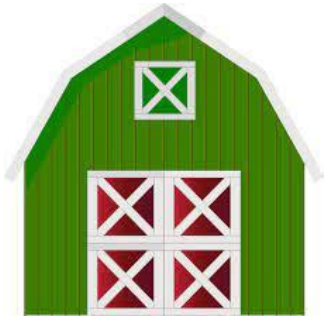
Case history

Site 1



June 2022
Piglets: PRRSV gradual virological and serological negativisation

Site 2



Seronegative piglets for PRRSV entered in site 2:

One week after entering site 2
- PRRSV viraemia
- Fever (40 - 40,5°C)
- Mortality: 10%

Site 3

August 2022:
One week after entering site 3:
dry cough, dyspnea, wasting syndrome

Clinical signs

In **August 2022** the practitioner veterinarian called the laboratory reporting in fatteners in the Site 3:

- dry cough
- dyspnea
- wasting
- weight loss

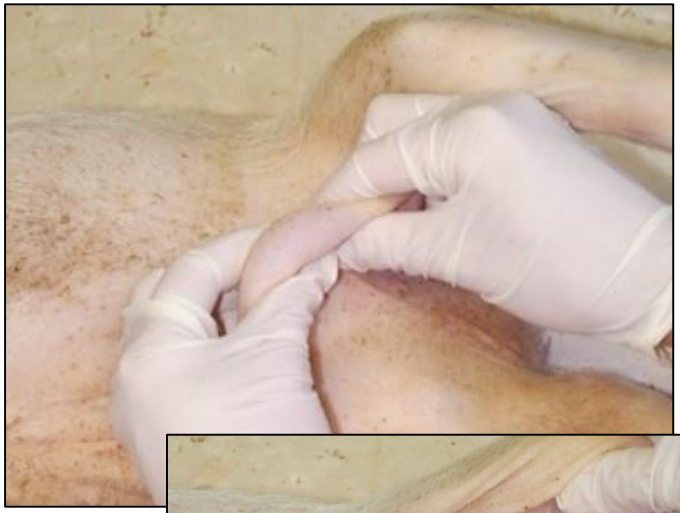
Morbidity: 15%

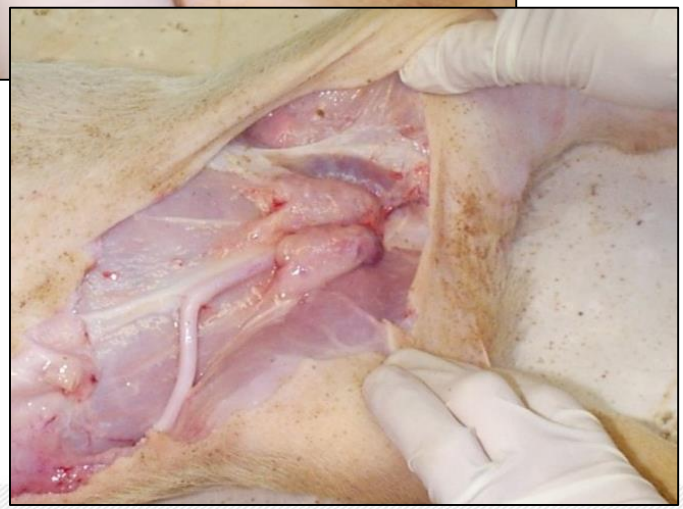
Mortality: 5%

Necropsy findings and gross lesions evaluation

Two pigs of Site 3 with wasting and respiratory symptoms were conferred to the laboratory for necropsy examination

- Loss of body condition
- Rough and long hair
- Enlargement of the inguinal lymph nodes
- Interstitial pulmonary oedema
- Chatarral bronchopneumonia involving the apical and cardiac lobes of both lungs and enlargement of the tracheobronchial lymph nodes





Differential diagnosis

Based on clinical signs and gross lesions observed at the necropsy four ethiological agents were considered:

- **PCV2**
- **PRRSV**
- **Swine Influenza Virus**
- ***Mycoplasma hyopneumoniae***

Diseases that cause wasting, by Harding JC and Clark EG. 1997. J Swine Health Prod 5: 201–203
Cited in Diseases of swine, 2019

LABORATORY ANALYSIS AND RESULTS

LABORATORY ANALYSIS	SAMPLE	METHOD	RESULTS
Bacteriology	Lungs, kidney, spleen	Spleen and kidney were cultured on blood agar and Gassner agar incubated at 37°C for 48 hours in an aerobic atmosphere. Lungs were cultured on blood agar supplemented with NAD and Gassner agar incubated at 37°C for 48 hours in 5-10% CO_2 atmosphere	Negative
Real-time PCR PRRSV	Lungs	Commercial kit	Negative
Real-time PCR Influenza	Lungs	IZSLER home made method	Negative
Real-time PCR Mhyo	Lungs	Marois et al., 2010	Positive
Real- time PCR PCV2	Pool of lymph nodes	Opriessnig et al., 2003	**1) 1,4 x 10^{13} viral copies/g*** **2) 5,3 x 10^{14} viral copies/g***
Genotyping PCV2 (sequencing ORF2)	PCV2 DNA	IZSLER home made method	**Genotype D**

* qPCR thresholds in lymphoid and non-lymphoid tissues proposed by Harding et al., 2008: $10^{6.8\text{-}8.4}$ viral copies/g tissue

LABORATORY ANALYSIS AND RESULTS

LABORATORY ANALYSIS	SAMPLE	METHOD	RESULTS
Histopathology	Lungs, liver, kidney, spleen, inguinal, submandibular, mesenteric, tracheobronchial limph nodes, tonsils, heart, skeletal muscle, ileum, brain	Histo-morphological evaluation of the tissues stained with hematoxylin-eosin, after fixation of the samples in 10% formalin	Lymphoid depletion, macrophage-histiocytic cell infiltration with the presence of epithelioid and multinucleated giant cells in the center of the follicles. Interstitial pneumonia with thickening of the alveolar septa due to lymphocytes and macrophages infiltration
IHC	Inguinal limph nodes, spleen, lungs	Immunohistochemical evaluation of tissues using a monoclonal anti-PCV2 antibody	Immunopositive cytoplasm of macrophages in: • lymph nodes • spleen • lungs

LABORATORY ANALYSIS AND RESULTS

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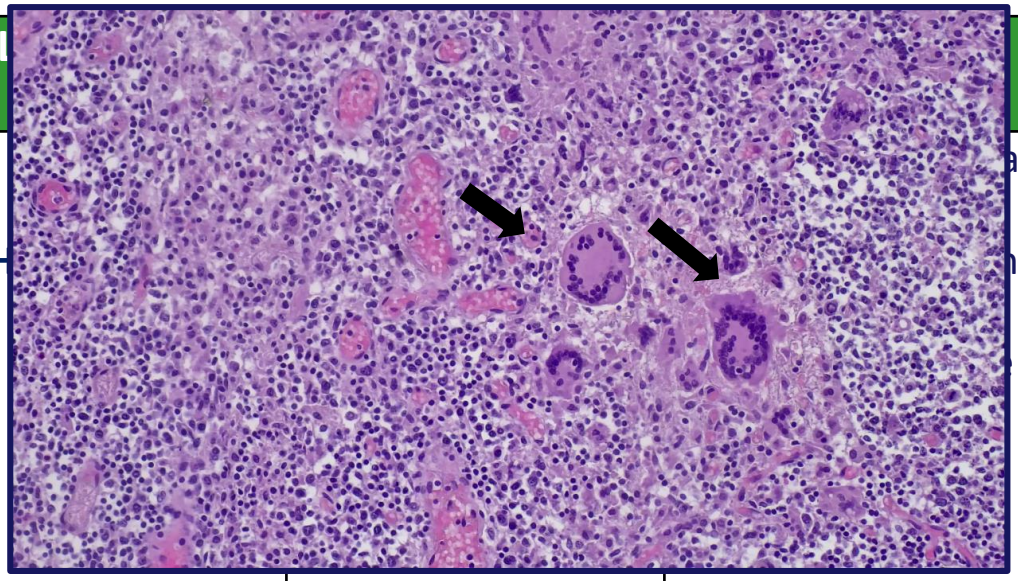

LABORATORY ANALYSIS AND RESULTS

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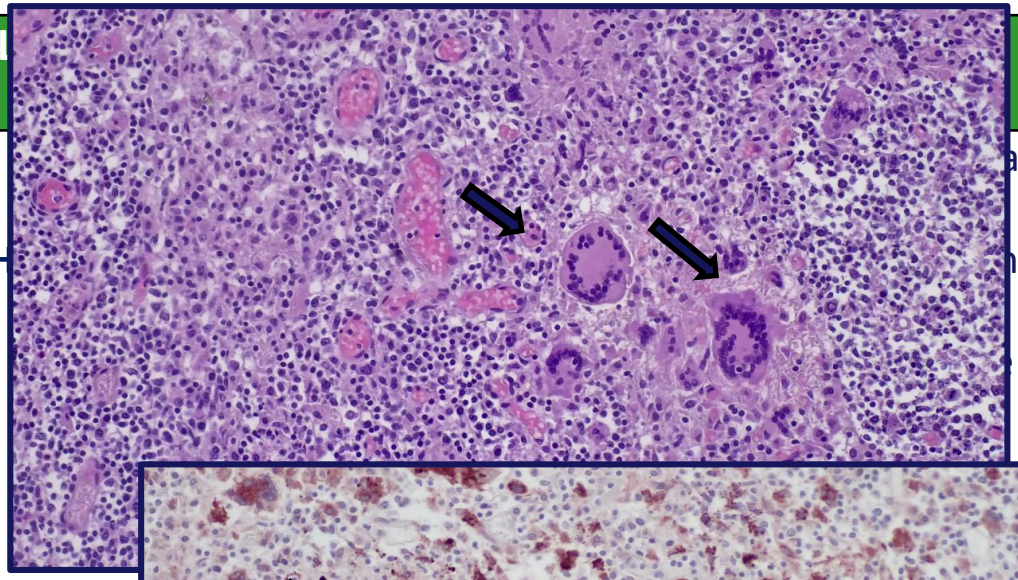

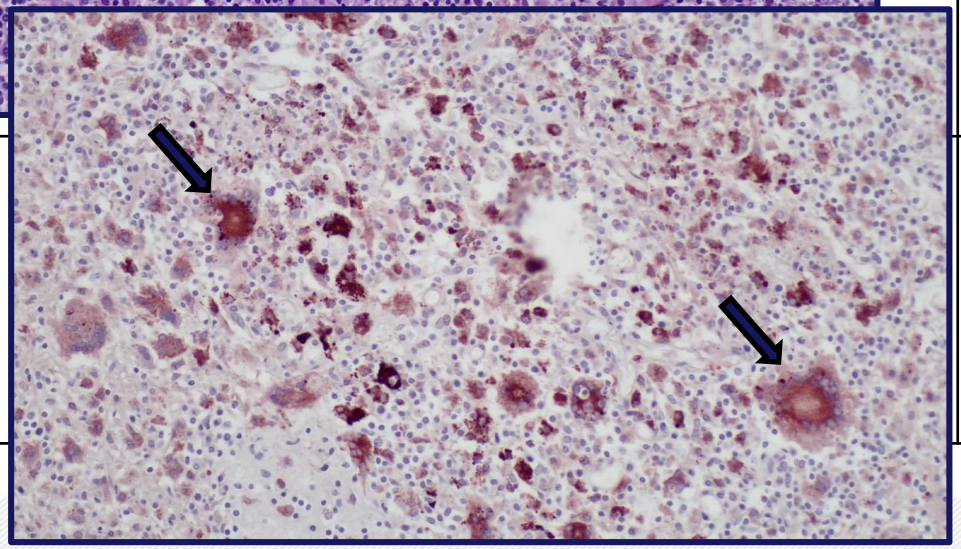

DIAGNOSIS

PCV2-SD diagnosis is based on 3 diagnostic criteria (Segalés et al., 2005; Segalés et al., 2022)

1- **Clinical signs and gross pathological appearance** (retarded growth, wasting and respiratory and/or digestive disorders)

2- **Presence of specific moderate to severe histological lesions in target tissues** of affected pigs (lymphocyte deplection with granulomatous inflammation of lymphoid tissues and eventually in other tissues)

3- **Moderate to high amount of PCV-2 in lymphoid tissues** (the amount in the rest of affected tissues can be variable)

Etiological diagnosis:

PCV2-SD caused by **genotype D**

Management, treatment, prevention and follow up

- PRRSV vaccination was implemented in 10-15 day old piglets in site 1
- An additional PCV2 vaccination was implemented in site 3 in animals of approximately 90-110 days
- Mortality at site 3 decreased from 5% to 2,5%
- No more outbreaks of PCV2-SD were recorded in site 3 after implementing the vaccination in site 1 for PRRSV and for PCV2 in site 3

Discussion

- PCVDs are **multifactorial diseases**: overt disease occurs in the presence of **PCV2 infection** and disease **triggering factors**
- **PCV2-SD** have been occasionally described in **PCV2-vaccinated herds**
- The detection of **PCV2 genD** in vaccinated herds is not an unusual finding and the perception of a higher PCV2 genD frequency in these herds may be influenced by its increasing global prevalence
- Experimental studies demonstrated that PCV2 genD doesn’t elude the immunity conferred by vaccines based on the PCV-2a genotype (Opriessnig et al., 2013; Park et al., 2019), showing virulence comparable to that of PCV-2a and PCV-2b (Cho et al., 2020)

Discussion

There are several reasons by which a PCV2-vaccinated herd experiences PCV2-SD:

- Inadeguate vaccination or vaccine **management** (storage, dose, etc.)
- **Vaccination timing**:
  - **Late** PCV2 vaccination → vaccine is applide once the natural viral infection is already established
  - **Early** PCV2 vaccination → in very young animals high levels of maternally derived antibodies can interfere with active seroconversion following vaccination / lack of mature piglet immune system
- **Concomitant infections** by immunomodulatory pathogens

Conclusions

In this clinical case:

- Seronegative piglets for PRRSV entered in site 2 in which PRRSV was circulating
- Piglets entered in site 2 approximately 1 week after PCV2 vaccination at site 1
- If a “immune dysfunction” occurs at the time of vaccination, the vaccine may fail to induce an adequate immune response
- It cannot be excluded that **PRRSV infection** contracted **shortly after PCV2 vaccination** caused an incomplete protection and partially compromised PCV2 vaccine efficacy
- Vaccination of sows and piglets has been shown to be beneficial in the continuous control of PCVDs. In this protocol it is important to take into account the possible **interference of maternally derived immunity** upon PCV2 vaccine efficacy in piglets, that cannot be excluded

Thank you!

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Martelli *et al. BMC Veterinary Research* (2016) 12:77
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BMC Veterinary Research

RESEARCH ARTICLE Open Access

Impact of maternally derived immunity on piglets' immune response and protection against porcine circovirus type 2 (PCV2) after vaccination against PCV2 at different age

Paolo Martelli[1*], Roberta Saleri[1], Giulia Ferrarini[1], Elena De Angelis[1], Valeria Cavalli[1], Michele Benetti[1], Luca Ferrari[1], Elena Canelli[1], Paolo Bonilauri[2], Elena Arioli[3], Antonio Caleffi[3], Heiko Nathues[4] and Paolo Borghetti[1]

… This study demonstrates that even in a condition of high levels of MDA, piglets vaccination at 4, 6 or 8 weeks of age confer a protective immune response characterized by cellular immunity and a stable and long-lasting (until 34 weeks of age) antibody response. However, in the conditions of this study, **the combination of vaccination in sows at mating and in piglets at 6 weeks of age was more effective for controlling PCV2 natural infection, than other treatment schemas, thus sustaining that some interference of MDA with the induction of an efficient immune response could be considered.**

In conclusion, optimal vaccination strategy needs to **balance the levels of passive immunity, the management practices and timing of infection.**

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Concurrent vaccinations against PCV2 and PRRSV: Study on the specific immunity and clinical protection in naturally infected pigs

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[d] Vet Practitioner, Mantova, Italy

This study investigated the efficacy of the concurrent vaccination with a modified live PRRSV-1 vaccine and a PCV2 genotype a-based subunit vaccine under field conditions on clinical and virologic outcomes in a farm infected by PRRSV and suffering from the correlated clinical problems during nursery/growing phase as well as PCVD.
Concurrent vaccination with a single dose of a PRRSV-1 MLV and of a Cap-based PCV2 vaccine administered intramuscularly at 3 weeks of age has been demonstrated to reduce the clinical outcome of the disease. Vaccination of piglets against PCV2 with the test vaccine caused a prompt seroconversion regardless of the level of MDA as previously reported by Fort et al. (2009a,b) and Martelli et al. (2011).