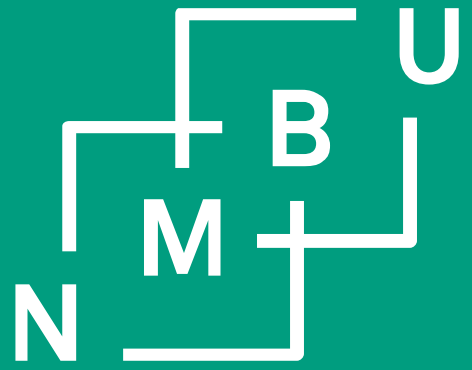


Norwegian University
of Life Sciences

Case presentation

An outbreak of respiratory disease and systemic infection caused by *Actinobacillus pleuropneumoniae* serovar 8 in a Norwegian farrow-to-finish SPF farm

ECPHM Resident workshop 9 May 2022

Marit G. Maaland

Norwegian University of Life Sciences

Norwegian pig population - health status

- **Freedom from:**
  - PRRSV
  - PRV
  - *M. hyopneumoniae*
  - IAV (except H1N1 pdm09
- **Specific Pathogen Free (SPF)** subpopulation, freedom from:
  - *A. pleuropneumoniae* (APP)
  - *M. hyopneumoniae*
  - toxin-producing *P. multocida*
  - *B. hyodysenteriae*
  - *S. scabei*

Case presentation - herd description

www.visitnorway.com

- Rogaland county, south-western Norway
- Farrow-to-finish SPF herd
- 70 sows
- 700 finishers/year
- 2000 piglets/year sold at ~30 kg to finishing operation
- Self recruiting, and purchasing of eight recruitment animals every 7 weeks

Case presentation - herd description

- One building, eight seperate units
- Pigs moved between units via open-air hallway
- Sluice with shower and farm clothing for guests/employees
- Mechanical ventilation with negative pressure, pressurized ceiling. Air inlet on one side of the farm, away from traffic.
- Neighbouring pig farm (500 m) recently lost SPF status
- Farmer on paternity leave – extra employee hired

Case presentation – anamnesis

October 4th:

One pregnant sow (sow 1) stopped eating. Temp.: 40,2 °C

October 5th:

Sow 1 found dead.

Five pregnant sows in same unit stopped eating. Sow 2: temp. 39,7 °C, cyanotic snout.

Farmer called herd veterinarian.

Treatment with penicillin initiated.

October 6th:

Sow 2 euthanized.

Sow 1 and 2 sent for necropsy

Sow 1: necropsied Oct. 6th

Sow 2: necropsied Oct. 7th

Sow 1, necropsy

Exterior
- Cyanosis of skin
- Blood-tinged froth

Abdomen
- Fibrin
- >3 L of red/brown serous fluid

Thorax
- Fibrin
- >1,5 L of yellow serous fluid

Lungs
- Edema and hemorrhage
- Focal area of necrosis, right and left caudal lung lobes

Differential diagnoses (Diseases of swine, 11th ed.)

Necropsy results: fibrinous peritonitis, pleuritis and necrotizing pneumonia

- *Actinobacillus suis*
- *Glaesserella parasuis*
- *Actinobacillus pleuropneumoniae* (APP)

- *Pasteurella multocida*
- *Streptococcus suis*
- *Mesomycoplasma hyorhinis*

Sow 1, bacteriology

- Growth of APP from lungs, pleura, peritoneum and uterus

Sow 2, necropsy and bacteriology

- Acute, fibrinonecrotizing pneumonia with fibrinous pleuritis
  - Bacteriology: negative (treated with penicillin)

Diagnosis sow 1 and 2: Acute APP infection

Disease development in the herd

- Disease spread to weaning and suckling piglets, later to finishers
- Symptomatic animals treated with penicillin
- Euthanasia of severely affected animals
- Finishers showing no clinical signs or mild cough slaughtered on October 11th

Clinical signs

- Fever
- Apathy
- Skin reddening/cyanosis
- Severe dyspnea with mouth breathing
- Bloody, foamy discharge from mouth and snout

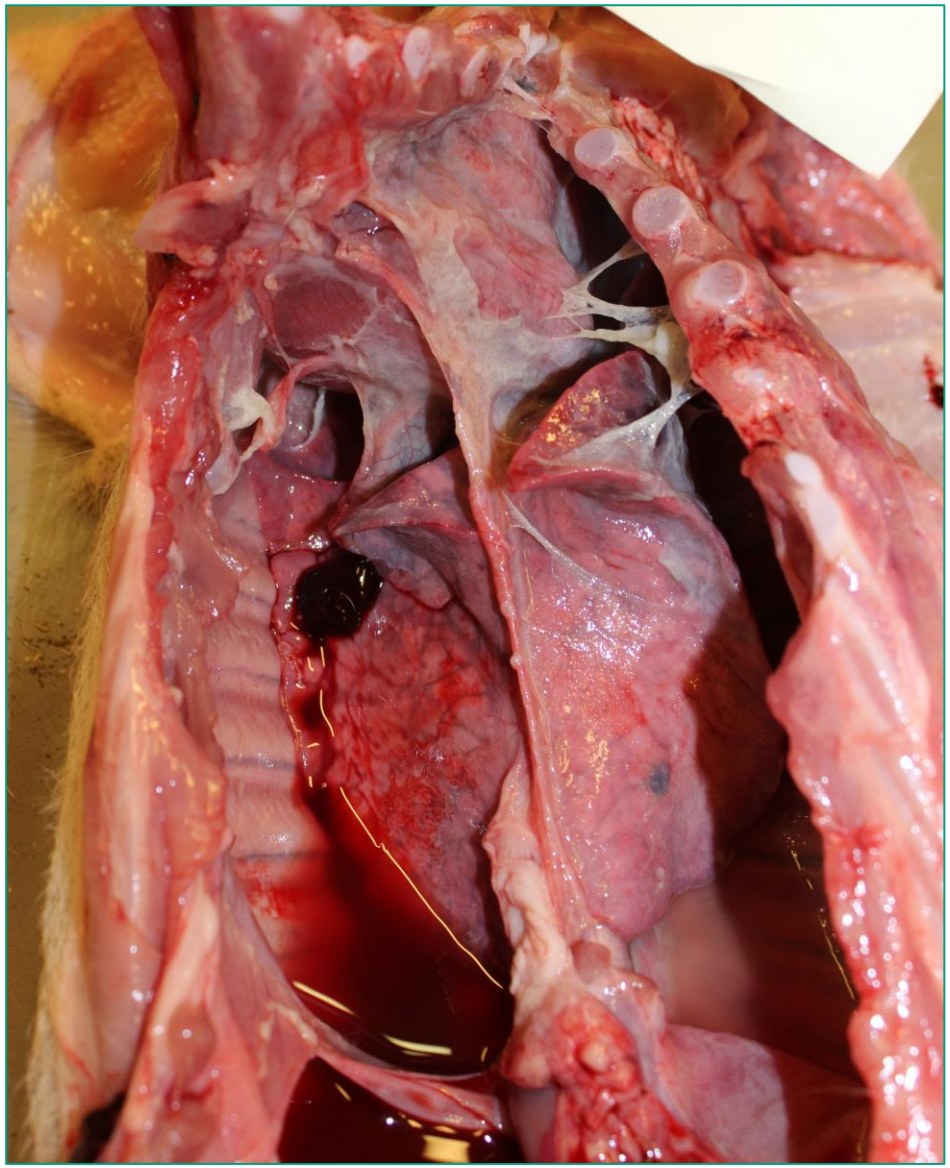
Additional diagnostic investigation

- Necropsy and histopathology: 2 suckling piglets, 4 weaning piglets and 14 lung halves (slaughter material)
- Bacteriology: Lungs, pleura, internal organs
- PCR analyses:
  - Lung tissue: IAV, PRRSV, PCV2, PRCV, PCMV, *M. hyopneumoniae, M. hyorhinis, G. parasuis*
  - Bacterial isolate: APP serovar and toxin genes

Necropsy results

Thorax

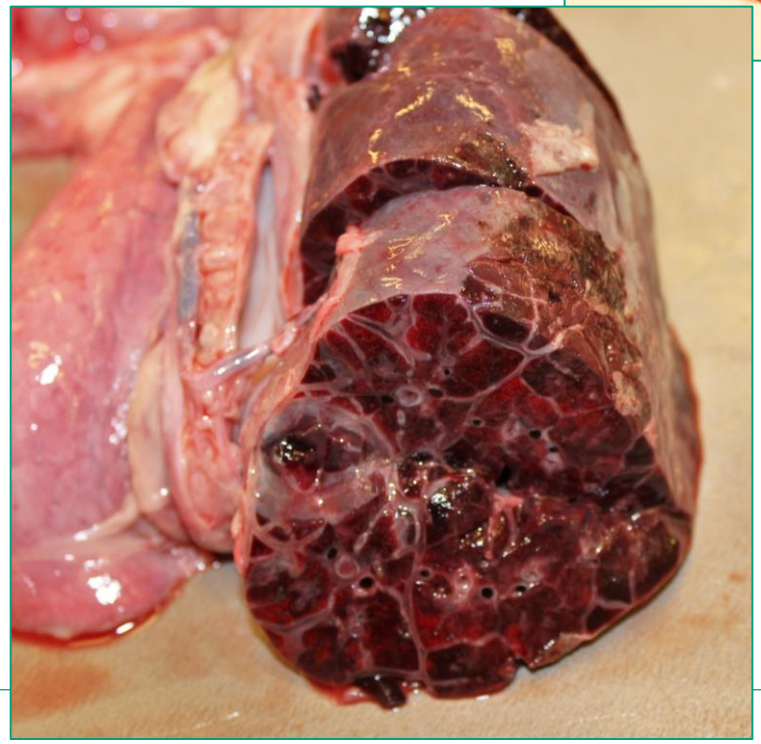
- Fibrinous pleuritis and fluid (6/6)

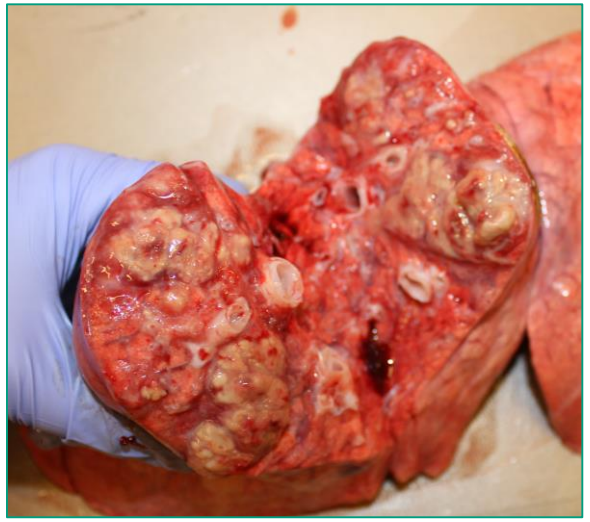


Necropsy results

Lungs

- Hemorrhagic and necrotizing bronchopneumonia with fibrinous pleuritis
- 6 necropsied animals: Peracute – acute lesions
- 14 lung halves: subacute – chronic lesions





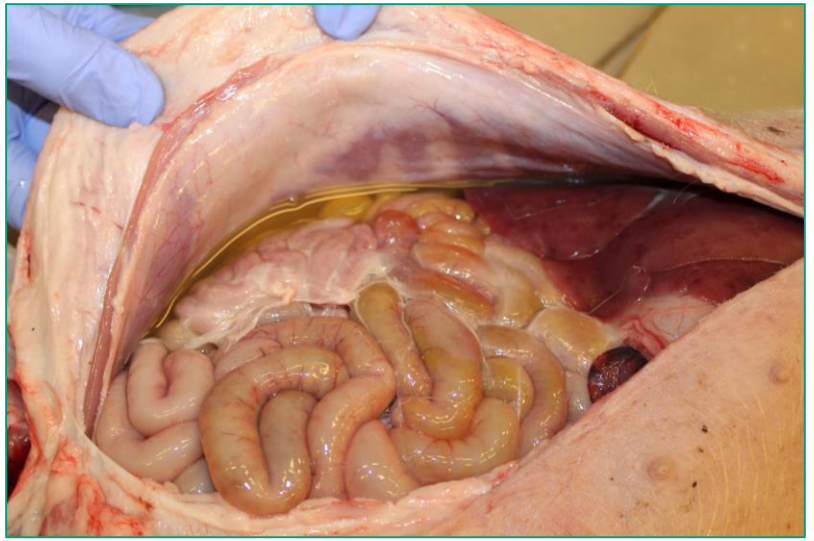
Necropsy results

Heart

- Fluid in pericardium (5/6)
- Fibrinous pericarditis (4/6)

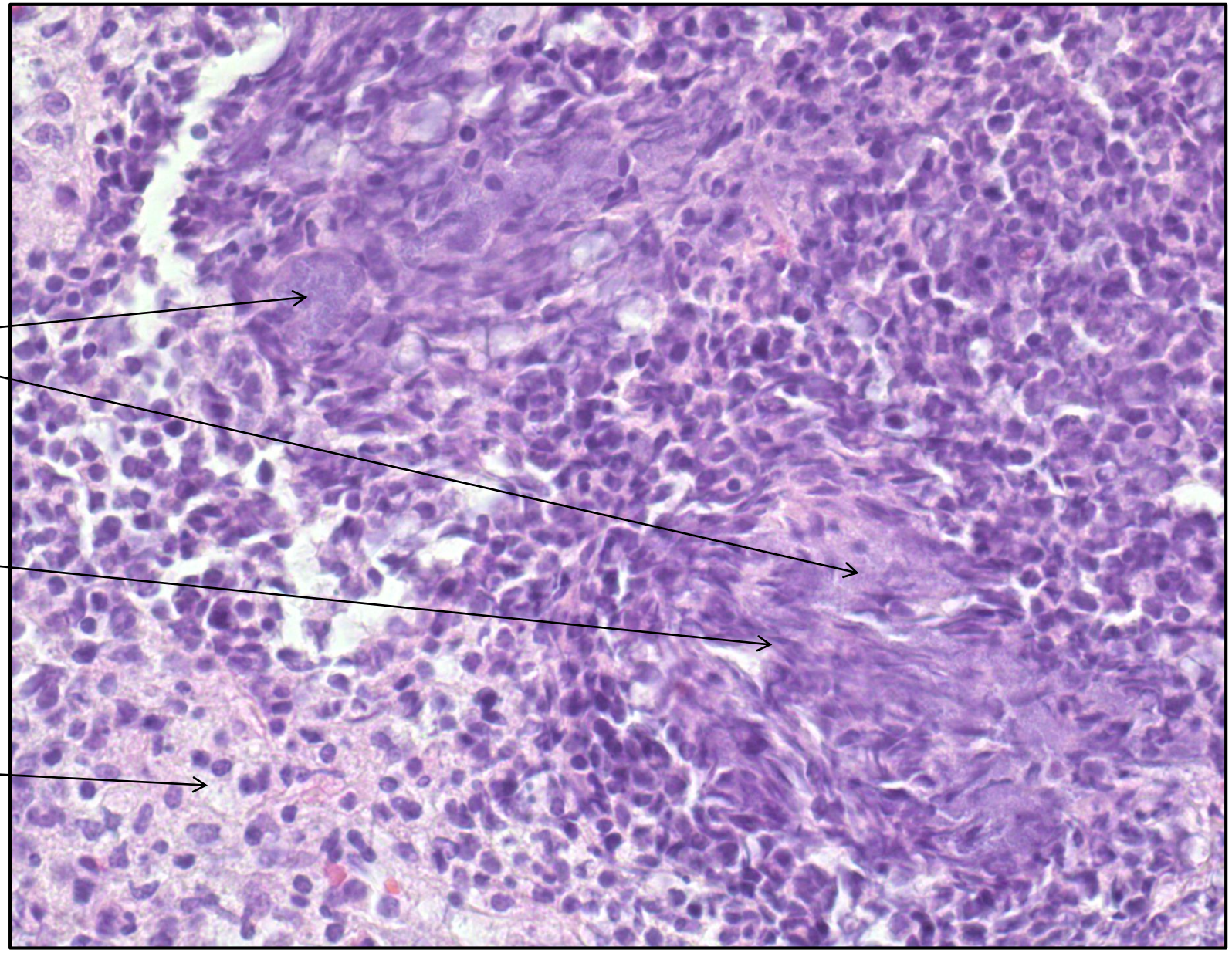
Abdomen

- Fibrinous peritonitis (2/6) and fluid (1/6)
- Multifocal dark areas in spleen (3/6), liver (1/6) or kidney (1/6)



Histology, lung

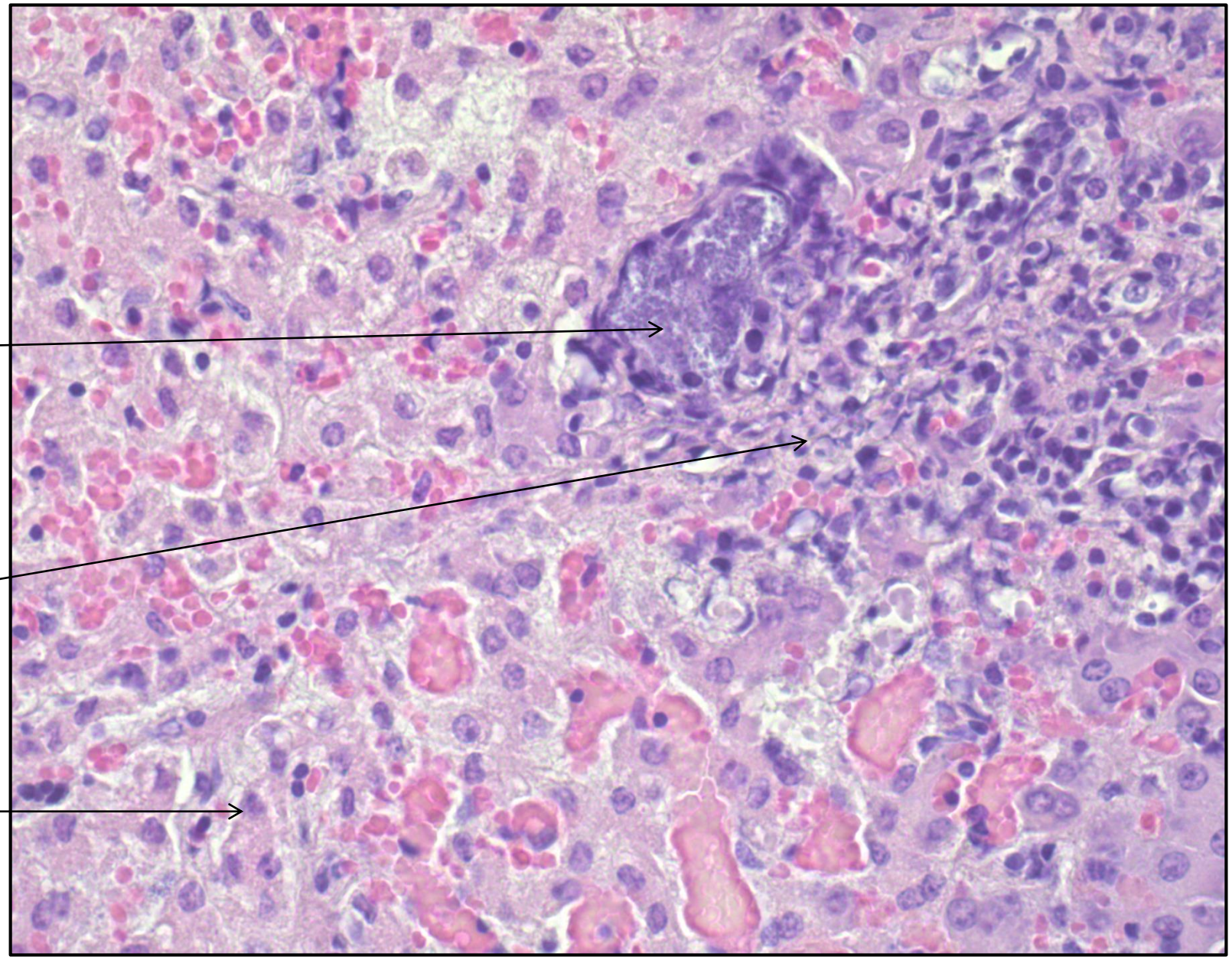
- Sow 1



Lung, hematoxylin and eosin, 40X

Histology, liver

- Weaning piglet



Liver, hematoxylin and eosin, 40X

Bacteriology results – follow up

Bacteriology - organs								
Sample info	**Lung**	**Pleura**	**Liver**	**Spleen**	**Brain**	**Kidney**	**Peritoneum**	**Pericardium**
Suckling piglet 1	APP	APP	APP	APP	neg	neg	-	-
Suckling piglet 2	APP	APP	neg	neg	neg	APP	-	-
Weaned piglet 1	APP	APP	neg	neg	neg	-	-	-
Weaned piglet 2	APP	APP	APP	APP	neg	-	APP	APP
Weaned piglet 3	APP	-	APP	APP	APP	neg	-	-
Weaned piglet 4	APP	-	APP	APP	APP	neg	-	-
APP pos./total	6/6	4/4	4/6	4/6	2/6	1/4	1/1	1/1

No. of APP positive/total samples from slaughter house material: Lungs: 6/14, pleura: 3/4

Molecular analyses, APP isolate

Serotyping by PCR:

- **Serovar 8 (APP8)**

Apx toxin gene profile:

- ***apxII, apxIII*** and ***apxIV*** → moderate virulence

Molecular analyses of lung tissue

	Multiplex PCR screening - lung							PCR - lung
Sample info	**IAV**	**PRRSV**	**PCV2**	**PRCV**	**PCMV**	***M. hyopn.***	***M. hyorh.***	***G. parasuis***
Sow 1	neg	neg	(pos)	neg	neg	neg	neg	neg
Sow 2	neg	neg	neg	neg	neg	neg	neg	-
Suckling piglet 1	neg	neg	neg	neg	neg	neg	neg	-
Suckling piglet 2	neg	neg	neg	neg	neg	neg	neg	-
Weaned piglet 1	neg	neg	neg	neg	neg	neg	neg	-
Weaned piglet 2	neg	neg	neg	neg	neg	neg	neg	neg
Finisher 5	neg	neg	neg	neg	POS	neg	neg	-
Finisher 3	neg	neg	neg	neg	POS	neg	neg	-
Finisher 13	neg	neg	neg	neg	neg	neg	neg	-

Outcome of the case

- Total depopulation/repopulation
- Very thorough cleaning and disinfection of premises, empty for >3 weeks
- Additional measures to increase external and internal biosecurity
  - Pigs moved between units in indoor hallway
  - Change of footwear between units
  - Personnel given thorough instructions on importance of adhering to biosecurity measures
  - No personal cell phones allowed

- Goal: renewal of SPF status

Discussion

- Systemic spread of APP observed in sows and piglets
  - Systemic spread of APP7 after experimental infection (Hoeltig et al. 2018)
  - APP2/APP8 isolated from systemic sites (Schuwerk et al. 2021)
  - Fibrinous pericarditis and granulomatous hepatitis in slaughtered pigs, APP2/APP6 (Buttenschøn et al. 1997, Ohba et al. 2008)
  - Osteomyelitis and arthritis, meningitis and nephritis, APP2/APP6 (Jensen et al. 1999, Madsen et al. 2001)
- Fibrinous peritonitis and acute hepatitis associated with APP8 not previously reported
- APP 8 major serovar causing clinical disease in Norway (Cohen et al. 2020, Grøntvedt et al. 2020)
- Expected composition of toxin genes in APP8 isolate

Discussion

- APP mode of transmission to farm unknown
  - Introduction of carrier animals
    - No clinical signs in animals from SPF multiplier herd
  - Indirect transmission via people or equipment (Assavacheep and Rycroft, 2013)
    - New employee
  - Air-borne transmission (Fussing et al. 1998)
    - Transport vehicles – should be empty, clean and disinfected
    - Pressurized ceiling with insulation material
    - Pigs exposed to open air when moved between units

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Thank you for your attention!