



Mycoplasma hyorhinis

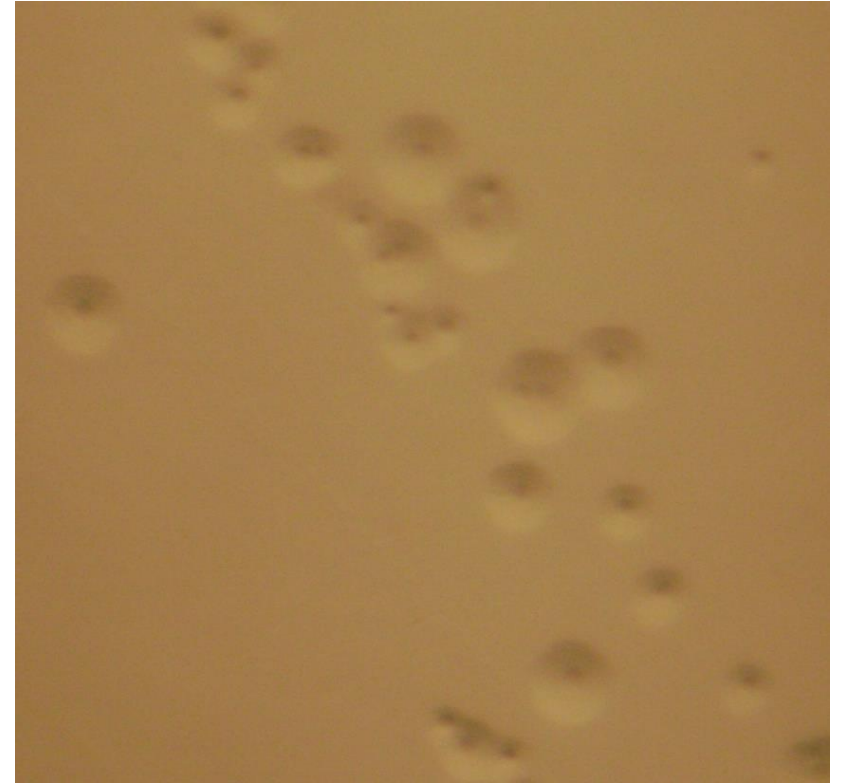
A Systemic Mycoplasmosis

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Topics

- Porcine Mycoplasmas
- *M. hyorhinis*
- Control and treatment of MHR



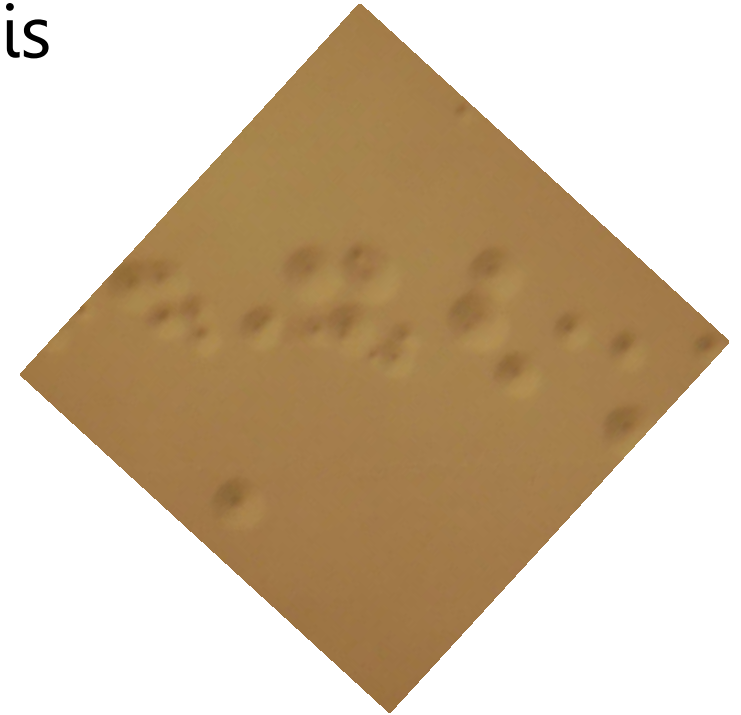


Porcine Mycoplasmas

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Porcine Mycoplasma: Variety

- *Mycoplasma hyopneumoniae* caused enzootic pneumonia
- *Mycoplasma hyorhinis* caused pneumonia and synovitis & arthritis
- *Mycoplasma hyosynoviae* caused arthritis
- *Mycoplasma suis* caused anemia



Porcine Mycoplasmas: Biology

- Class *Mollicutes*
- Family *Mycoplasmataciae*
- Mycoplasmas are the smallest self-replicating organisms and lack cell wall
- Mycoplasma is a high antigenic variation organism
- Mycoplasmas are limited biosynthesis and cannot process metabolism including amino acid metabolism, biosynthesis of cofactors and lipid metabolism: **need nutrients supported from hosts**
- The organism without cell wall is more sensitive to the osmotic change: **need the constant environment in host cells**

Porcine Mycoplasmas: General

- Mycoplasmas (except MH) are hidden in tonsils and lymph nodes. These carriers can be replacement breeders or outsourced piglets, which can carry the pathogen for 185 days after exposure.
- Culture and polymerase chain reaction are routinely used for epidemiological survey and diagnosis, however, culture is the gold standard
- Serological detection has no significant correlation to production and immunity.
- Porcine mycoplasmas seem to be a common cause of porcine pneumonia during late stage of fattening to slaughter pigs.

Porcine Mycoplasmas: Occurrence & Diagnosis

Samples from slaughtered houses	No.	Positive samples (%)					
		<i>M. hyopneumoniae</i>		<i>M. hyosynoviae</i>		<i>M. hyorhinis</i>	
		Culture	Direct PCR	Culture	Direct PCR	Culture	Direct PCR
Lungs	270	42 ^a (15.6%)	85 ^a (31.5%)	0	0	49 ^c (18.1%)	14 ^c (5.2%)
Tonsils	266	0	0	21 ^b (7.9%)	18 ^b (6.8%)	169 ^d (63.5%)	14 ^d (5.3%)
Synovial fluid	188	0	0	0	3 (1.6%)	0	70 (37.2%)
Total	724	42 (5.8%)	85 (11.7%)	21 (2.9%)	21 (2.9%)	218 (30.1%)	98 (13.5%)

^{a,b,c,d} Cohen's Kappa Value (95%CI), *P* value of chi-square significance at $P < 0.05$

^a0.095 (-0.021-0.211) = disagreement, $P = 0.084$

^b0.309 (0.103-0.515) = agreement, $P < 0.001$

^c0.189 (0.047-0.331) = agreement, $P < 0.001$

^d0.025 (-0.013-0.063) = disagreement, $P = 0.269$

Makahnon et.al. 2012, Trop Anim Health Prod., 44(2):313-8.

Porcine Mycoplasmas: Occurrence & Diagnosis

Samples	No.	<i>Mycoplasma</i> spp. from culture (%)		
		<i>M. hyopneumoniae</i>	<i>M. hyosynoviae</i>	<i>M. hyorhinis</i>
Cross-sectional	270			
Nasal swab (nursery)	270	1 (0.4)	0 (0)	165 (61.1)
Longitudinal 1 y (2f) slaughter/necropsy	422			
Nasal swab (nursery)	60	0 (0)	0 (0)	29 (48.3)
Lung (nursery & slaughter)	130	10 (7.7)	2 (1.5)	63 (48.5)
Tonsil (nursery & slaughter)	99	0 (0)	1 (1)	82 (83.8)
Lymph node (nursery)	16	0 (0)	0 (0)	4 (22.2)
Synovial fluid & tissue (nursery)	115	0 (0)	0 (0)	9 (7.8)

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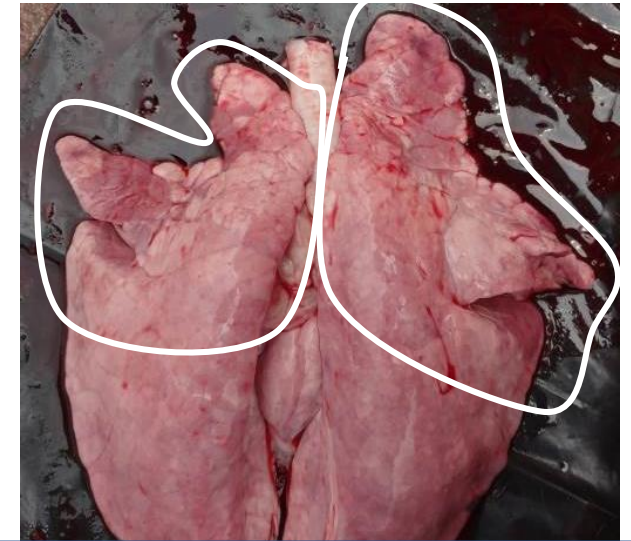
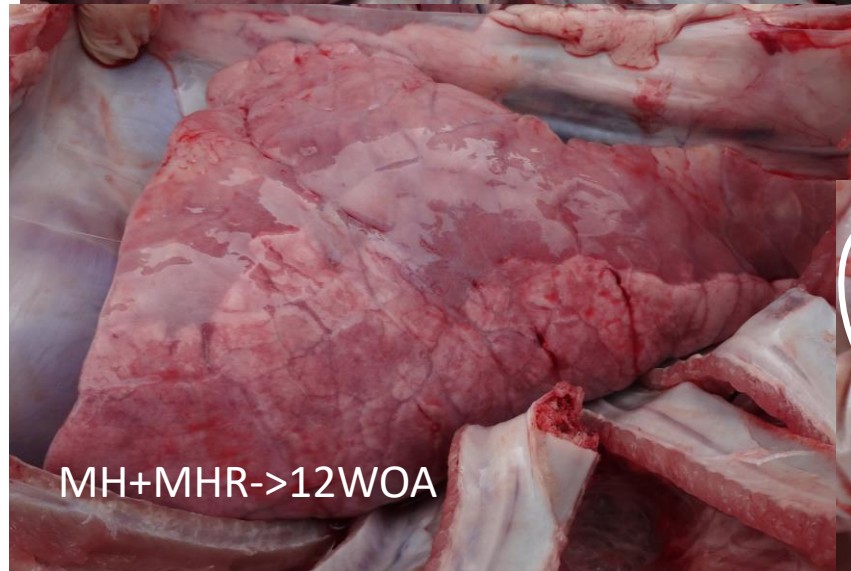
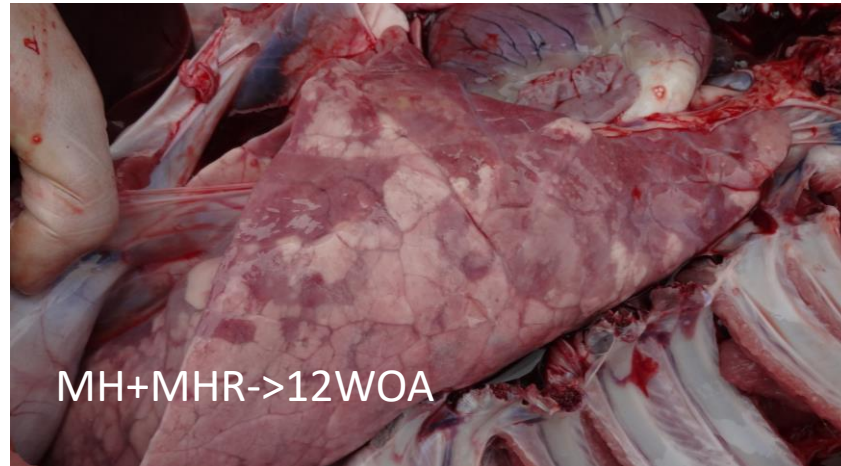
Mycoplasma hyopneumoniae (MH)

- Mucosal pathogen located on epithelium of respiratory tract and destroy cilia
- Binding with *M. hyopneumoniae* adhesins, such as P97, causes the cilia alteration and damage: including tangling, clumping and longitudinal splitting of cilia
- Clinical signs: dry coughing, poor growth performance
- Lung lesion: cranioventral pneumonia, consolidation
- Transmission: direct contact and aerosol, no vertical transmission
- Vaccine is effective to reduce lung lesions and increase ADG

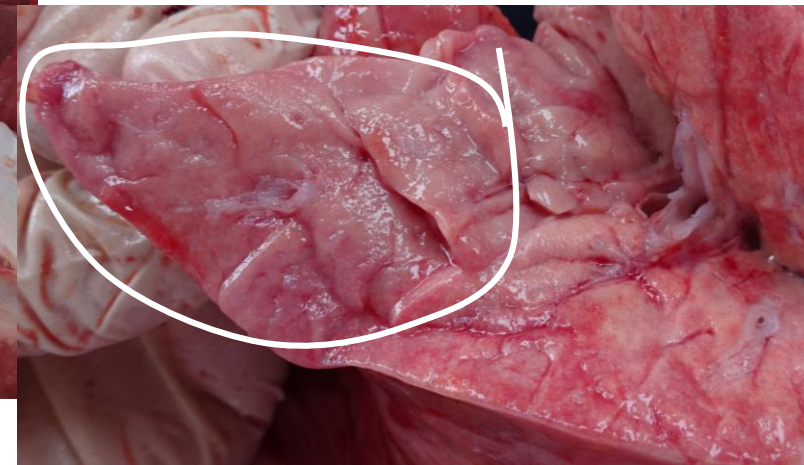
Mycoplasma hyopneumoniae (MH)



Dry coughing & poor performance



Cranioventral pneumonia



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Mycoplasma hyopneumoniae (MH)

Risk factor	<i>M. hyopneumoniae</i> occurrence by culture		
	%	Odd Ratio (95% CI)	P-value
One-site management	24.8	1.3 (1.2-1.4)	<0.001
No all-in-all-out in fattening	21.5	1.9 (1-3.8)	0.05
Gilt acclimatization by sow donor	26.3	4.6 (2.2-9.5)	<0.001
Co-infection with PRRSV	20.2	3.6 (1.4-9.0)	0.003
No <i>M. hyopneumoniae</i> vaccination in piglets	61.5	13.3(5.5-32.3)	<0.001

MH vaccination in young pigs can reduce the risk of MH occurrence at slaughter 13.3 times

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Mycoplasma hyorhinis

Mycoplasma hyorhinis (MHR)

- A systemic mycoplasma
- MHR caused fibrinous polyserositis and arthritis, pneumonia, and otitis/eustachitis
- The most susceptible group is weaning and nursery from 3-10 WOA, however, the recent studies reported that the clinical signs from *M. hyorhinis* can be found from 3-15 WOA
- MHR was considered as the common organism in swine and being the secondary pathogen.
- Recently, more reports indicated that *M. hyorhinis* is concerned as one of the main organisms in swine caused morbidity and mortality in post-weaning pigs
- Co-infection with other organisms such as *Haemophilus parasuis*, *Streptococcus suis*, and other porcine mycoplasmas.
- The recent study reported the synergistic pathogenicity between *M. hyorhinis* and PCV2. The co-infection induced more severe respiratory diseases and lesions

Mycoplasma hyorhinis (MHR)

Nose to nose

Tonsil & Blood circulation

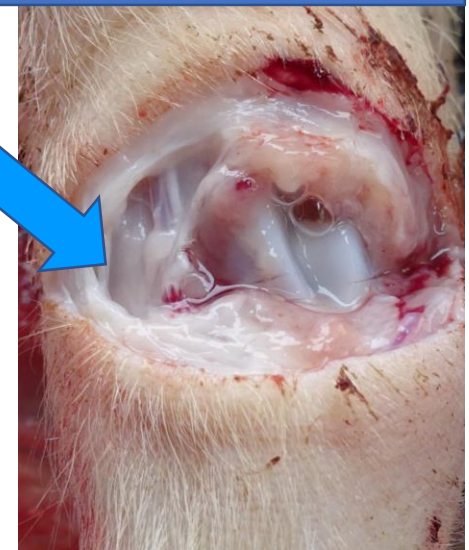
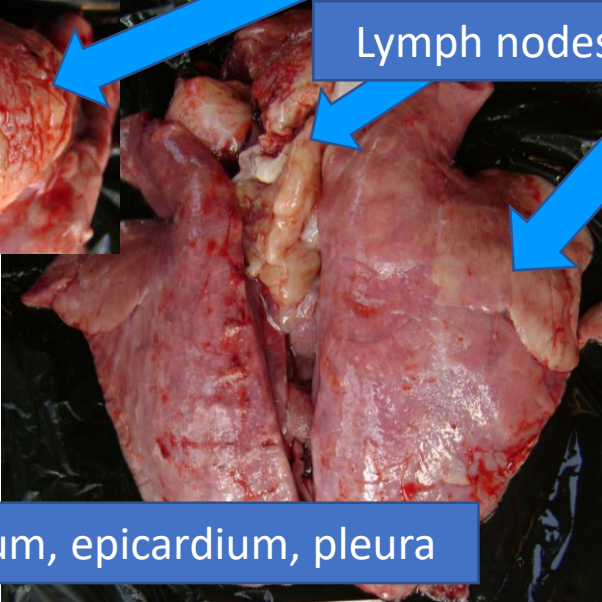
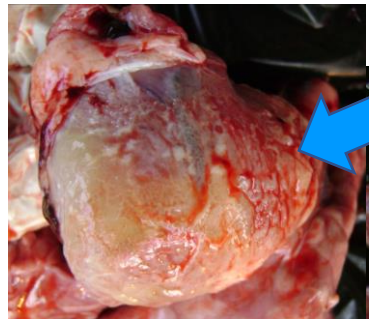
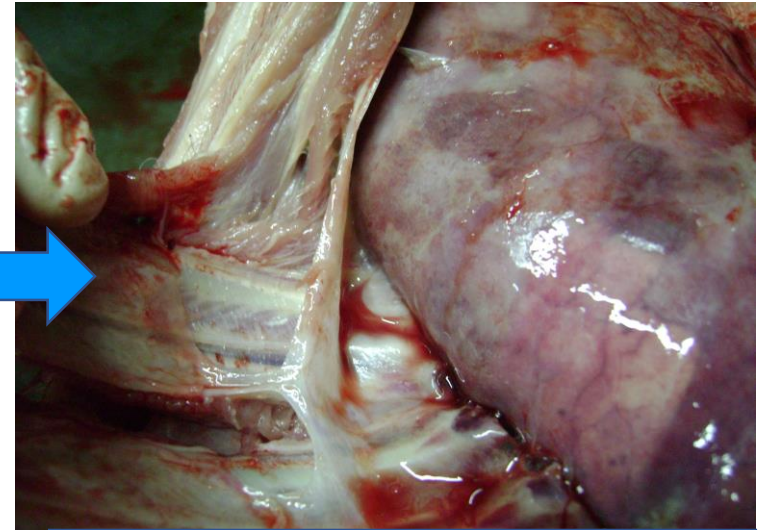
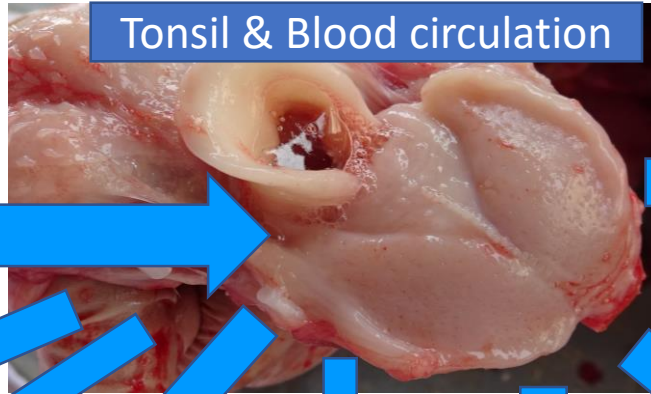
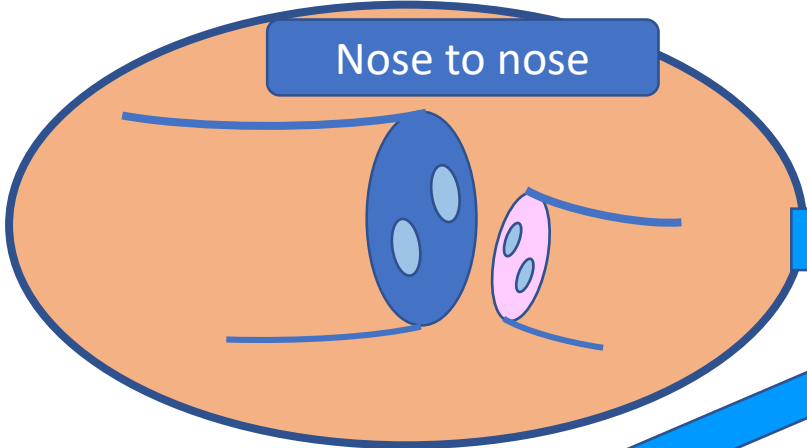
Synovial tissue and fluid

Lymph nodes

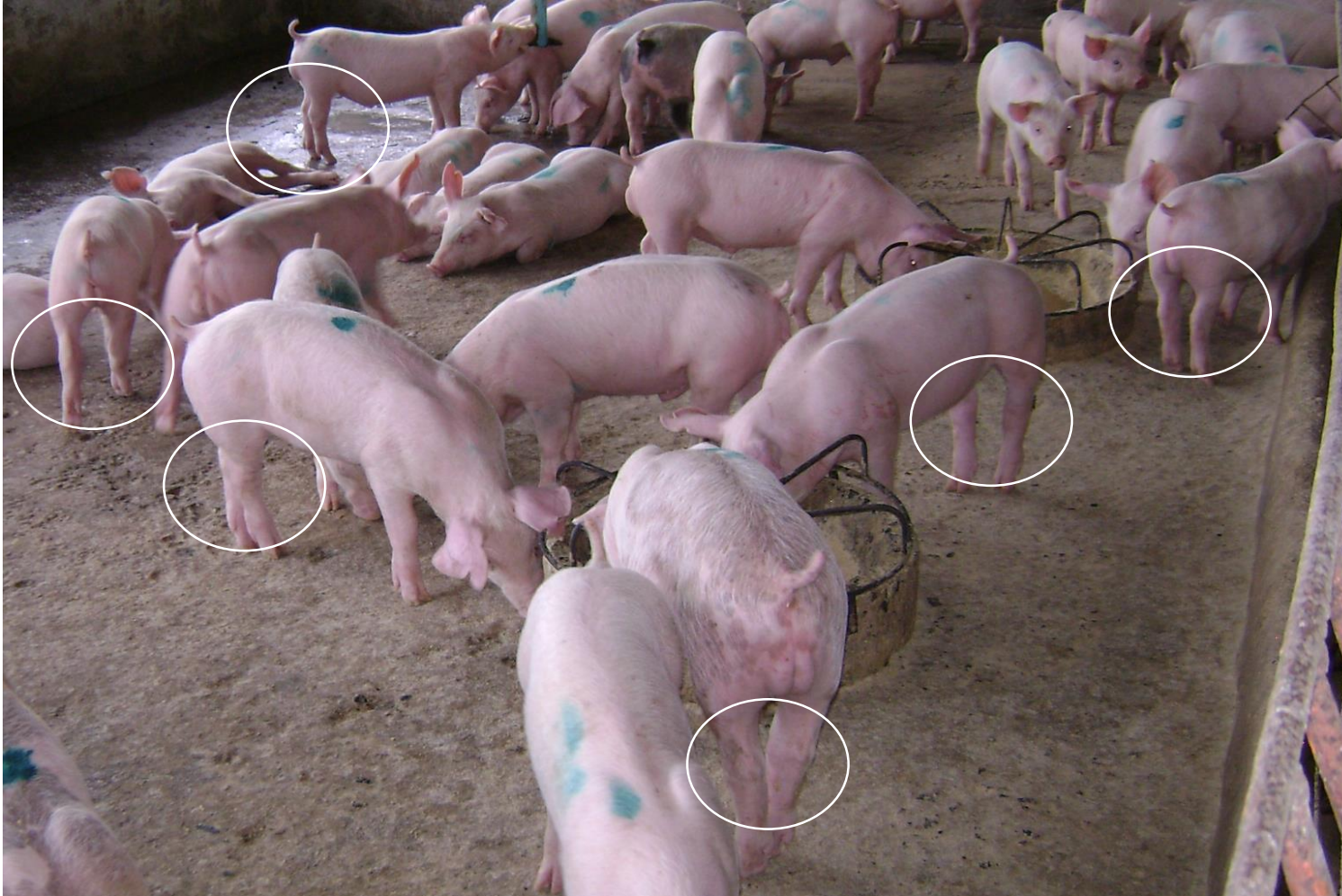
Eustachian tube

Pericardium, epicardium, pleura

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Mycoplasma hyorhinis (MHR)



- swelling joints & lameness
- reluctance to move
- cough
- dyspnea
- fever

Dog sitting



Mycoplasma hyorhinis (MHR)

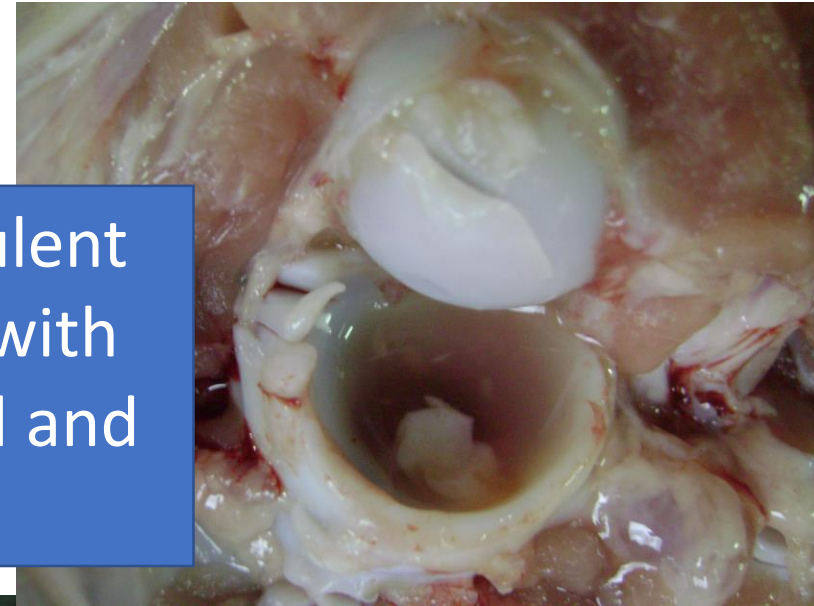
Non-purulent
arthritis with
huge fluid and
fibrin



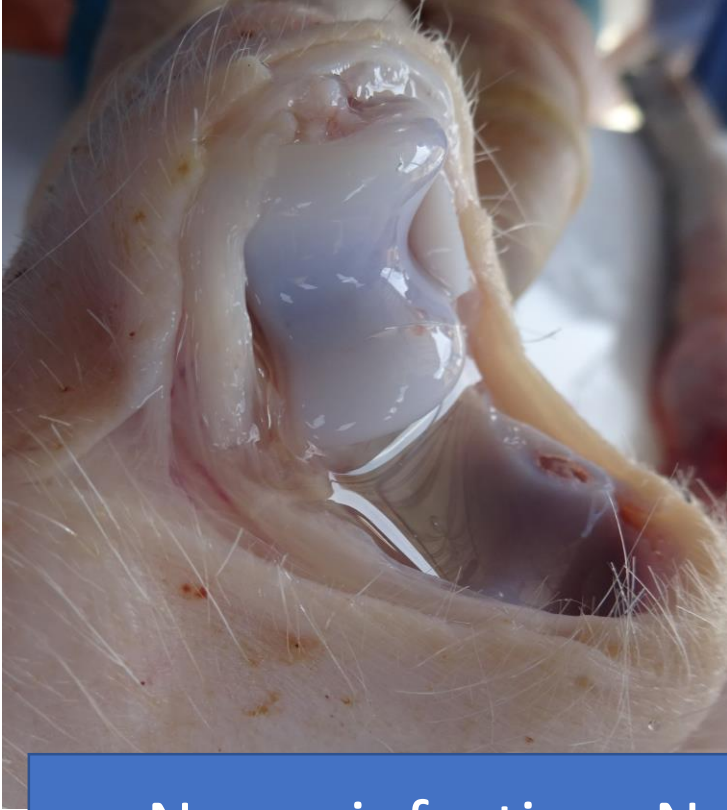
Soft swelling joints



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Mycoplasma hyorhinis (MHR)



No-co-infection: Non-purulent arthritis with huge fluid and fibrin

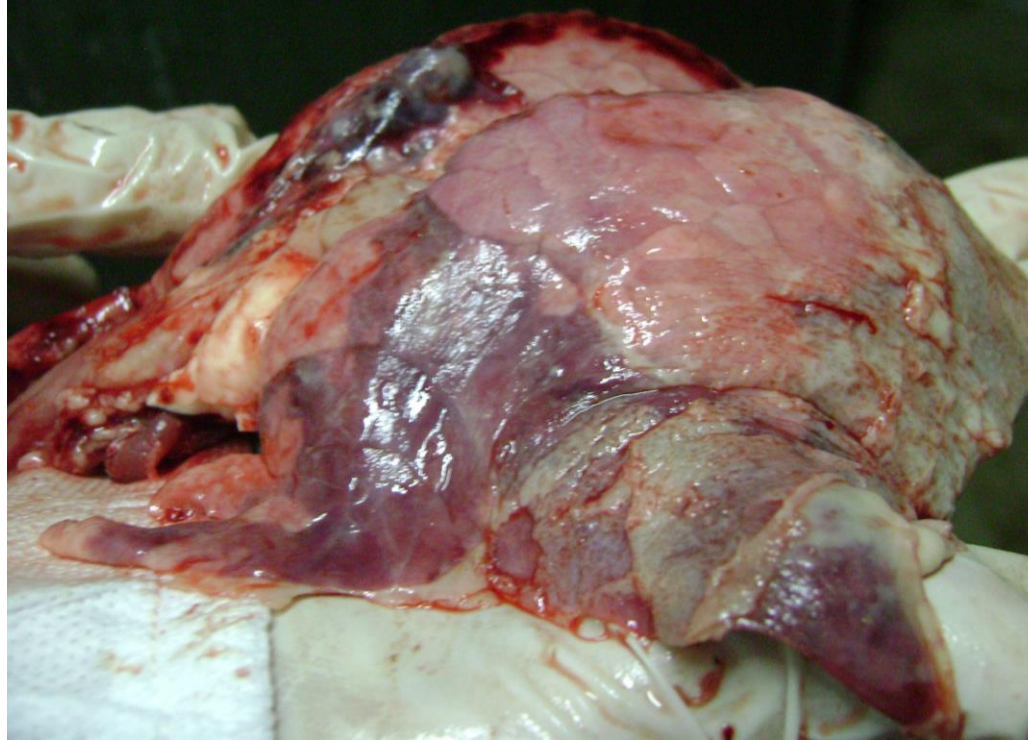


Co-infection with *Haemophilus parasuis* or *Streptococcus* may cause purulent fluid

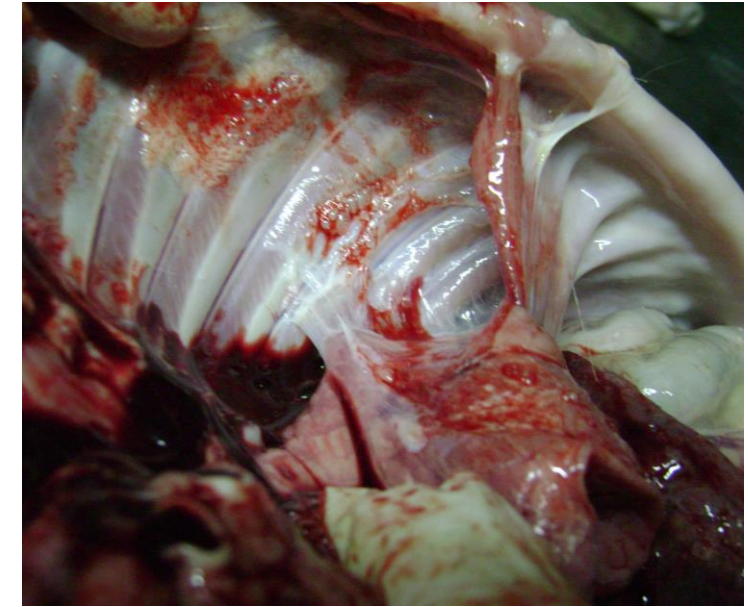


Mycoplasma hyorhinis (MHR)

Peri-, epicarditis

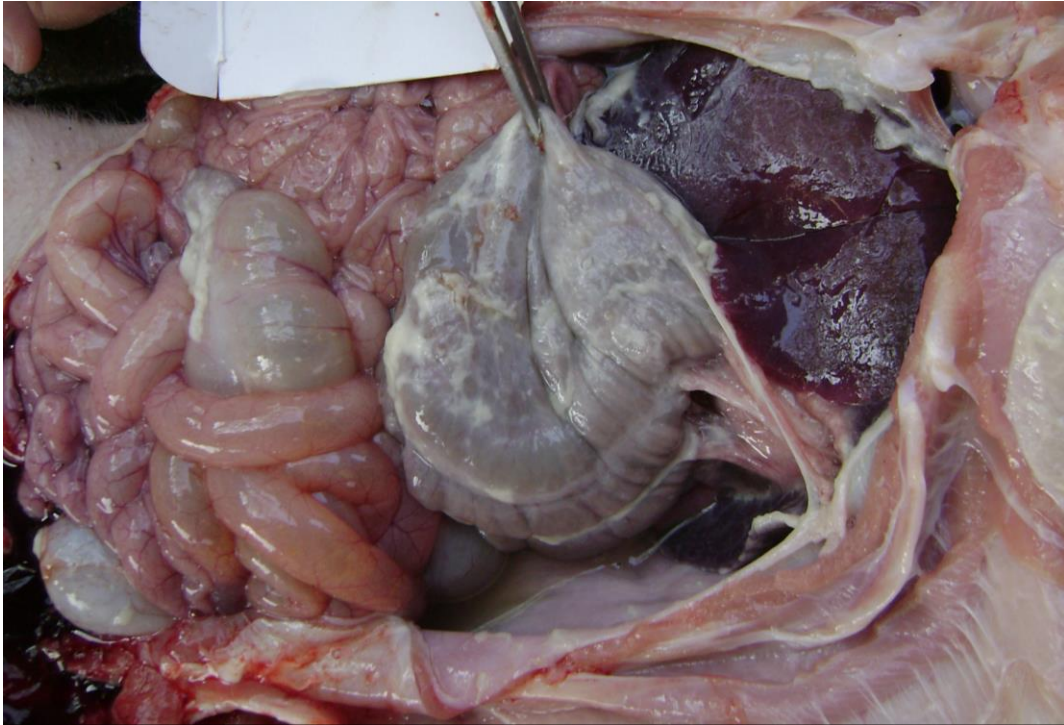


Lung consolidation and pleuritis



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Mycoplasma hyorhinis (MHR)



Peritonitis with/without fluid



Mycoplasma hyorhinis (MHR): Arthritis factors

Clinical sign	Risk Factor	<i>M. hyorhinis</i> occurrence		
		%	OR (95% CI)	P-value
Swelling joint present		64.9	1.5 (0.9-2.5)	0.104
	+Gilt acclimatization with PRRSV vaccine	77	8.4 (3.8-18.4)	<0.001
	+Co-infection of PRRSV+PCV2	91.5	13.1 (5.2-32.9)	<0.001

Not every case with swelling joints may have MHR but using PRRSV-MLV or co-infection of PRRSV&PCV2 may increase MHR occurrence 8.4 and 13.1 times, respectively

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Mycoplasma hyorhinis (MHR): Risk factors

Risk factor	<i>M. hyorhinis</i> occurrence		
	%	Odd Ratio (95% CI)	P-value
One-site management	26.8	4.6 (2.1-10)	<0.001
No all-in-all-out in fattening	34.4	4.9 (2.6-9.5)	<0.001
No sow medication	34.4	2.8 (1.3-6.2)	0.011
No nursery medication	34.4	2.8 (1.3-6.2)	0.011

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Mycoplasma hyorhinis (MHR): Lung lesion

Mycoplasma spp.	Mycoplasma occurrence at slaughter	Lung score		Present lung lesion		
		Mean \pm SD (%)	P-value	No. (%)	Odd Ratio (95%CI)	P-value
<i>M. hyopneumoniae</i>	no	6.5 \pm 10.3	0.776	10/86 (11.6)	1.6 (0.7-3.4)	0.223
	yes	6.0 \pm 7.4		32/184 (17.4)		
<i>M. hyorhinis</i>	no	5.3 \pm 8.3	<0.001	9/86 (10.5)	2.4 (1.1-5.2)	0.025
	yes	11.6 \pm 14.2		40/184 (21.7)		

Mean % lung score and %lung with lesion have significant relation to MHR>MH



Control and Treatment

Mycoplasma hyorhinis



Control and Treatment

- Get rid of the risk factors
- Antimicrobial treatment
- Vaccination

Control and Treatment

- Get rid of the risk factors
 - Multiple sites: separating breeder and fattening units
 - All-In-All-Out after weaning till slaughter
 - Control PRRSV and PCV2 co-infection
 - Control MHR carriers: sow and gilt, nursery from carrier sows (sow and nursery medication)

Control and Treatment

- Antimicrobial treatment
 - Susceptibility study showed that MHR is more resistant than other mycoplasmas
 - Doxycycline, Tiamulin, and Valnamulin are the most susceptible AM

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^a MH=*M. hyopneumoniae*; MHS=*M. hyosynoviae*; MHR=*M. hyorhinis*, at N= 26, 13, and 170 strains, respectively

Control and Treatment

Antimicrobials	Species	Susceptibility (%)		P-Value
		Susceptible	Resistant	
Doxycycline	MH	25/26 (96.2)	0/26 (0)	<0.001
	MHS	2/13 (15.4)	6/13 (46.2)	
	MHR	148/170 (87.1)	0/170 (0)	
Enrofloxacin	MH	10/26 (38.5)	9/26 (34.6)	<0.001
	MHS	4/13 (30.8)	0/13 (0)	
	MHR	7/170 (4.1)	71/170 (41.8)	
Lincomycin	MH	26/26 (100)	0/26 (0)	0.436
	MHS	13/13 (100)	0/13 (0)	
	MHR	159/170 (93.5)	11/170 (6.5)	
Tiamulin	MH	26/26 (100)	0/26 (0)	-
	MHS	13/13 (100)	0/13 (0)	
	MHR	170/170 (100)	0/170 (0)	
Tylosin	MH	26/26 (100)	0/26 (0)	<0.001
	MHS	3/13 (23.1)	1/13 (7.1)	
	MHR	15/170 (8.8)	83/170 (48.8)	
Valnemulin Makhanon, 2012, Doc. Thesis, Chulalongkorn University, Thailand	MH	26/26 (100)	0/26 (0)	-
	MHS	13/13 (100)	0/13 (0)	
	MHR	170/170 (100)	0/170 (0)	

Control and Treatment

- Commercial inactivated vaccine is registered
- A report of vaccination for 3 weeks old CDCD pigs and challenged at three weeks post vaccination showed the efficacy to reduce lameness, pericarditis, and polyserositis
- However, the vaccination in field condition is needed to evaluate the efficacy

Take Home Message

- *M. hyorhinis* caused several clinical signs and lesions in pigs by the pathogen itself and by co-infection with other bacteria and virus.
- The immunization and treatment of *M. hyorhinis* becomes important and should be concerned as well as its diagnosis in field cases.
- In conclusion, this mycoplasma is not just the commensal organism in pig farms and becomes one of the key pathogen, especially, in young pigs.

Thank You



Metta Makhanon