CLINICAL REPORT

Veterinary Research Forum. 2026; 17 (2): 135 - 139
doi: 10.30466/vrf.2025.2048945.4595
Journal Homepage: vrf.iranjournals.ir

Veterinary Research Forum

First report of acute reproductive disorder due to *Mycoplasma suis* in hyperprolific sows

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Article Info

Article history:

Received: 05 January 2025
Accepted: 19 July 2025
Available online: 15 February 2026

Keywords:

Hyperprolific sows
Mycoplasma suis
Porcine circovirus type 3
Reproductive failure

Abstract

Reproductive failure is the major problem in modern pig production, significantly affecting economic productivity. This study investigated factors associated with reproductive failure in the hyper prolific pig farms, focusing on abortion, mummification, stillbirth and sudden increased sow death. Seven individual sows with reproductive failure clinical signs were surveyed to evaluate the infection rate with related pathogens. Results showed the highest frequency of *Mycoplasma suis* infections with reproductive problems along with blood samples being 100% positive, fetal mummification rate of 33.33% and stillbirth rate of 25.00%. Additionally, 28.57% of the total blood samples exhibited porcine circovirus type 3 infection, while other pathogens were not detected. The percentage of concurrent infections with *M. suis* and porcine circovirus type 3 in reproductive sow was 28.57%. The partial 16S rRNA Porcine *Haemoplasma* is a trivial name for haemotropic *Mycoplasma spp.,* which can attach to the surface of red blood cells leading to deformity and anaemia in a wide range of mammalian animals including pigs. *Haemoplasma* sequences in this study was absolutely clustered into *Haemominutum* group. This study demonstrated the first case of acute reproductive disorder due to *M. suis* reported in imported hyper prolific sows.

Introduction

Mycoplasma suis, formerly known as *Eperythrozoon suis*, is the bacterium causing infectious anaemia in pigs.[1] The clinical signs included high fever anaemia, poor reproductive performance in sow leading to increased stillbirth rates and dysgalactia that were more or less severe depending on individual susceptibility, severity of infection and physiological stress response of each anima.[2] Eventhough *M. suis* infections have been described in several countries, some clinical aspects regarding their impact on reproductive performance of sows are still unknown. Therefore, the present study aimed to investigate the acute reproductive disorder due to *M. suis* reported in imported hyperprolific sows.

Case Description

A case study was reported in 5,600 sows, farrow-to-finish operation (2,269 presented sows belonged to Landrace, Yorkshire) in Vietnam. A full vaccination program for the whole farm herd had been carried out.

New breeding stock was imported from a single source and was kept in on-farm quarantine before being placed in the herd. The conception rate was decreased from March 2023 to June 2023, and pregnant sow deaths at nearly farrowing time was increased from July 2023 to August 2023 (Fig. 1). Mummified and stillbirth fetuses was accounting for 50.00% of the total farrowing sows on the farm (100 farrowing sows *per* week), (Fig. 2). Piglets were wasted and had poor growth after weaning.

History and sample collection. Clinical signs and necropsy lesions were recorded in sows with reproductive disorders. All the information was collected to assess the reproductive productivity of the examined farm. Whole blood and tissue from aborted fetuses were collected in seven sows with relevant clinical signs of reproductive disorders and were then transported to the laboratory for further analysis.

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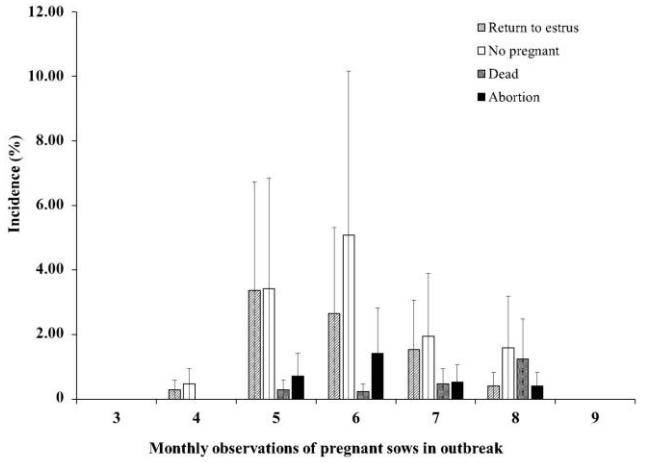

Fig. 1. Abortion rate and mortality rate in sow from March 2023 to September 2023.

Fig. 2. Clinical signs of sow with reproductive failure. **A)** Abortion in early stage, **B)** Mummified fetuses, **C** and **D)** Stillbirth.

Polymerase chain reaction (PCR)/reverse transcription PCR (RT-PCR). DNA/RNA was extracted from the samples using GeneJET Genomic DNA/RNA Purification kit (Thermo Fisher Scientific, Waltham, USA) according to the manufacturer's instructions.[3] The PCR/RT-PCR reaction and thermal cycling protocols used in this study were referenced from previous studies, specifically for detection of porcine reproductive and respiratory syndrome virus,[4] classical swine fever virus,[5] african swine fever,[6] porcine circovirus (PCV)2,[7] PCV3,[8] Pseudorabies virus (PRV), Porcine parvovirus (PPV), Japanese encephalitis virus (JEV)[9] and *M. suis.*[10]

***Porcine Hemoplasma* sequencing and genetic analysis.** The 16S rRNA of *Porcine Hemoplasma* was amplified using primer pairs, from previous studies.[11] Phylogenetic trees were constructed on the basis of the sequences with the MEGA Software (version X; Biodesign Institute, Tempe, USA) using the maximum likelihood method with boostrap 1,000 replicates.

Results

From March to September 2023, the total number of sows on the farm was 1,693, out of which 442 were found clinically to have reproductive disorders (26.10%) due to specific clinical signs observed in the days before. Some sick sows had pale skin that resembled blood loss, but this was not recorded accurately. The irregular return to estrus rate and repeated artificial insemination rate was ranged from 9.00 to 16.00%, the largest group was pregnant sows at 3 to 5 weeks of gestation (16.00%). Ultrasonographic examination showed that 17.00% sows on the farm expressed failure to be pregnant and loss of pregnancy (3.00%) happened at the 4th week. Pregnant sows died at 13 to 16 weeks of gestation (Fig. 3).

The successful farrowing rate was between 72.20 and 76.30%. There was an average of 8.90 piglets born alive *per* L, 1.10 piglets *per* L died just after parturition due to asphyxiation, the number of mummies and stillbirths *per* L was 4.80 and the number of weak-born piglets *per* L was 0.30 (Fig. 4).

Gross lesions in sudden-death sows included pleuropneumonia, lung abscess, lobar pneumonia, cardiac fibrosis and gastrointestinal bleeding (Fig. 5). To detect the presence of pathogens, screening tests were performed on the farm and indicated that the farm was positive for PCV2, PCV3, *M. suis,* and *Pasteurella multocida*. The farm proposed a treatment regimen with antibiotic and husbandry management during outbreak. Consequently, problems related to acute reproductive failure in sows were controlled, but some reproductive performance parameters were still not completely solved. More research focused on the individual reproductive performance of *M. suis* positive sows was undoubtedly required, as the clinical assessment of sows was carried out solely once on the day of farrowing and reproductive success was only evaluated at the farm level and not from individual animals.

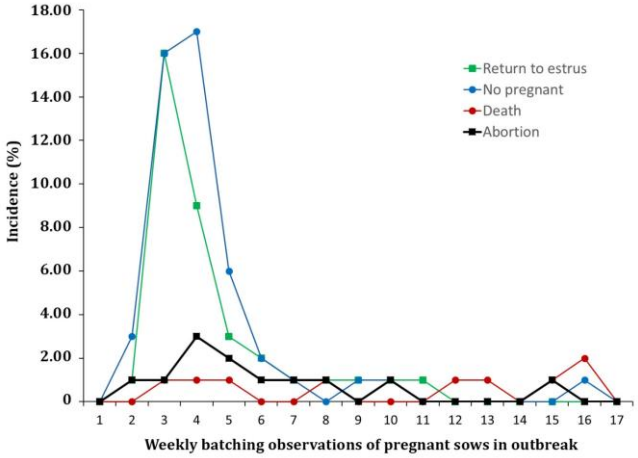

Fig. 3. Clinical parameters monitoring in pregnant sow during 17 weeks in studied pig farm.

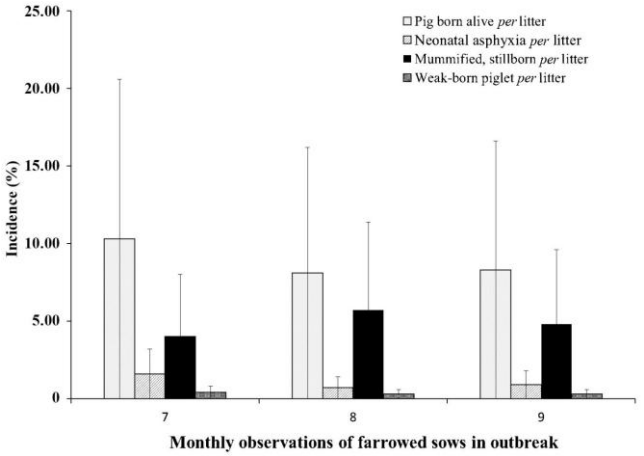

Fig. 4. Clinical parameters of reproductive performance of sows from July 2023 to September 2023.

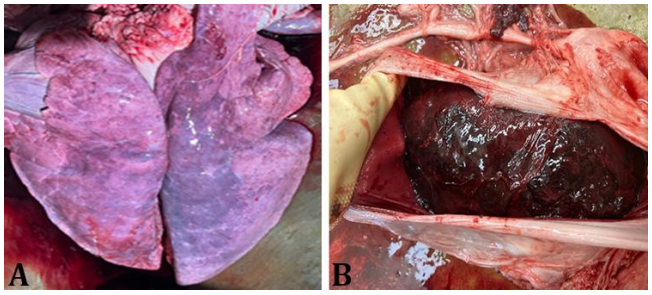

Fig. 5. Sudden death in pregnant sows with **A)** Lobar pneumonia and **B)** Gastrointestinal bleeding.

To determine the prevalence of concurrent infection of *M. suis* with some other important pathogens, blood, mummified and stillbirth fetuses samples of seven sows with reproductive failure clinical signs were gathered and examined the vertical transmission from sow to their offspring during pregnant period. Out of seven clinical cases examined, 2/7 (28.57) blood samples were positive for PCV3 and none of the mummified and stillbirth samples were positive with PCV3. In addition, the results tested with *M. suis* were as follows: Blood samples positive, mummified positive and stillbirth positive rate at the farm level were 100% (7/7), 25.00% (1/4) and 33.33% (1/3), respectively (Tables 1 and 2). None of these samples were positive for PCV2, PRV, PPV, porcine reproductive and respiratory syndrome virus, classical swine fever virus and JEV. A fragment of 16S rRNA genes of *Porcine Hemoplasma* strains was sequenced and used to construct a phylogenetic tree. Phylogenetic analysis showed that the clinical strain was clustered into *Haemominutum* group (Fig. 6). Furthermore, the nucleotide similarity between strains within the *Haemominutum* group was ranged from 96.42 to 99.34%. To establish the relationship between DTD-D4/ ThanhHoa2023 and other *Mycoplasma* species, the obtained 16S rRNA sequence of the *M. suis* was analyzed along with the previously published sequences of *Haemofelis* group and *Mycoplasma pneumoniae* group.

Table 2. Single- and co-infection between *Mycoplasma suis and* porcine circovirus type 3 (PCV3) with the sample types.

Pathogens	Sow (n = 7)	Stillbirth (n = 3)	Mummies (n = 4)
M. suis	7/7 (100%)	1/3 (33.33%)	1/4 (25.00%)
PCV3	2/7 (28.57%)	0.00	0.00
PCV3 + *M. suis*	2/7 (28.57%)	0.00	0.00

Discussion

According to a study conducted in China, sows with a history of reproductive failure had a higher percentage of PCV3 genome in serum (39/85, 45.88%) *versus* healthy sows (23/105 *vs.* 21.90%).[12] In this study, PCV3 was only detected in serum from primiparous sows, mainly close to farrowing time. These findings were also consistent with a Spanish study that found low-parity sow serum had a greater PCV3 virus load than older parity sow serum.[13]

Table 1. Real-time polymerase chain reaction results of reproductive failure related pathogen detected in seven sows and fetuses.

No.	Conditions	Sample types	DNA viruses				RNA viruses				Bacteria
			PCV3	PCV2	PRV	PPV	ASFV	PRRS	CSFV	JEV	*M. suis*
1	Stillbirth	WB	+	-	-	-	-	-	-	-	+
		Tissue	-	-	-	-	-	-	-	-	+
2	Stillbirth	WB	-	-	-	-	-	-	-	-	+
		Tissue	-	-	-	-	-	-	-	-	-
3	Stillbirth	WB	+	-	-	-	-	-	-	-	+
		Tissue	-	-	-	-	-	-	-	-	-
4	Mummified fetuses	WB	-	-	-	-	-	-	-	-	+
		Tissue	-	-	-	-	-	-	-	-	+
5	Mummified fetuses	WB	-	-	-	-	-	-	-	-	+
		Tissue	-	-	-	-	-	-	-	-	-
6	Mummified fetuses	WB	-	-	-	-	-	-	-	-	+
		Tissue	-	-	-	-	-	-	-	-	-
7	Mummified fetuses	WB	-	-	-	-	-	-	-	-	+
		Tissue	-	-	-	-	-	-	-	-	-

WB: Whole blood; PCV: Porcine circovirus; ASFV: African swine fever; PRRS: Porcine reproductive and respiratory syndrome; CSFV: Classical swine fever virus; PRV: Pseudorabies virus, PPV: Porcine parvovirus, and JEV: Japanese encephalitis virus.

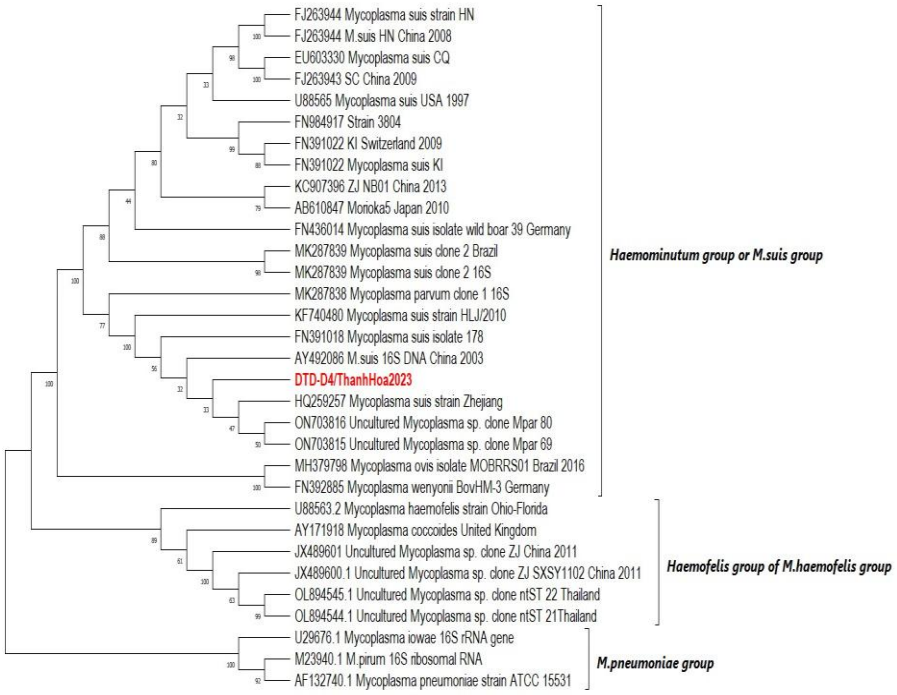

Fig. 6. A neighbor-joining phylogenetic tree based on the alignment of 32 nucleotide sequences of three *Mycoplasma* species. The phylogenetic tree was constructed in MEGA Software (version X; Biodesign Institute, Tempe, USA) using bootstrap analysis with 1,000 replicates.

Mycoplasma suis was detected in 100% of blood samples, 33.33% of stillbirth samples and 25.00% of mummified fetuses. As started by Henderson *et al.*, only a proportion of newborn piglets were infected from the dam via uterine transmission, which may explain the negative results on stillbirth and fetal samples.[14] This survey also found that the co-infection between PCV3 and *M. suis* was 28.57%, which was considered as the new findings. *M. suis* was detected in sow with clinical reproductive disorders but there was strong evidence of a co-infection between *M. suis* and PCV3.[15] Furthermore, the consequences of *M. suis* infection could be very significant, especially in the late stages of pregnancy.[16] *M. suis* positive farms had a significantly higher number of stillbirths compared to *M. suis* negative farms.[17] High stillbirth rates were presented in the positive cases, however, it was not possible to relate the occurrence of reproductive failure in sows with the presence of *M. suis* in the fetuses. Together with data obtained recently worldwide, our findings highlighted the impact of *M. suis* currently in sow herds and fetuses although its role should be clarified.

Hematological and blood chemistry findings and pathogen load are indicators of pathology due to *M. suis* but were not analyzed in this case. However, 2/7 of the sows blood sent for Giemsa staining and hematological and blood chemistry testing at the human medical laboratory showed anemia when compared to a biochemical reference pig blood and the presence of *M. suis* on the surface of red blood cells (data not shown). These parameters could explain the clinical signs of many sick sows on the farm showing anemic pale skin, but were not recorded in detail.

Overall, this case was the first example of an acute reproductive disorder related to *M. suis* in imported hyperprolific sows, reflected the disease dynamics, challenges of disease control and the vulnerability of breeding sows to pathogens present on the farm and local epidemiology.

Acknowledgments

This work was the study of a project funded by the Ministry of Education and Training, Hanoi, Vietnam (B2023-NLS-04). The authors thank the Animal Biomedical Research Laboratories, Nong Lam University HCMC, Ho Chi Minh City, Vietnam, for the support with providing testing facilities.

Conflict of interest

The authors declare no conflicts of interest.

References

1. Messick JB. Hemotrophic mycoplasmas (hemoplasmas): a review and new insights into pathogenic potential. Vet Clin Pathol 2004;33(1):2-13.
2. Bordin LC, Gava D, Sonalio K, et al. Investigation of

hemotropic Mycoplasmas in fetuses and sows with reproductive failure. Vet Anim Sci 2021; 12:100175. doi: 10.1016/j.vas.2021.100175.
3. GeneJET Genomic DNA Purification Kit. Available at: https://www.thermofisher.com/order/catalog/product/K0721. Accessed May 12, 2024.
4. Do DT, Park C, Choi K, et al. Nucleotide sequence analysis of Vietnamese highly pathogenic porcine reproductive and respiratory syndrome virus from 2013 to 2014 based on the NSP2 and ORF5 coding regions. Arch Virol 2016; 161(3): 669-675.
5. Lowings P, Ibata G, Needham J, et al. Classical swine fever virus diversity and evolution. J Gen Virol 1996; 77(Pt 6): 1311-1321.
6. King DP, Reid SM, Hutchings GH, et al. Development of a TaqMan PCR assay with internal amplification control for the detection of African swine fever virus. J Virol Methods 2003 Jan;107(1):53-61.
7. Dinh PX, Nguyen MN, Nguyen HT, et al. Porcine circovirus genotypes and their copathogens in pigs with respiratory disease in southern provinces of Vietnam. Arch Virol 2021 Feb;166(2):403-411.
8. Chen GH, Mai KJ, Zhou L, et al. Detection and genome sequencing of porcine circovirus 3 in neonatal pigs with congenital tremors in South China. Transbound Emerg Dis 2017; 64(6):1650-1654.
9. Xu XG, Chen GD, Huang Y, et al. Development of multiplex PCR for simultaneous detection of six swine DNA and RNA viruses. J Virol Methods 2012; 183(1): 69-74.
10. Hoelzle LE, Adelt D, Hoelzle K, et al. Development of a diagnostic PCR assay based on novel DNA sequences for the detection of Mycoplasma suis (*Eperythrozoon suis*) in porcine blood. Vet Microbiol 2003; 93(3): 185-196.
11. Thongmeesee K, Kamkong P, Thanee S, et al. Molecular detection and genetic analysis of porcine hemoplasmas in commercial pig farms from Thailand reveal a putative novel species. Transbound Emerg Dis 2022; 69(5): e2028-e2040.
12. Zou Y, Zhang N, Zhang J, et al. Molecular detection and sequence analysis of porcine circovirus type 3 in sow sera from farms with prolonged histories of reproductive problems in Hunan, China. Arch Virol 2018; 163(10): 2841-2847.
13. Saporiti V, Martorell S, Cruz TF, et al. Frequency of detection and phylogenetic analysis of porcine circovirus 3 (PCV-3) in healthy primiparous and multiparous sows and their mummified fetuses and stillborn. Pathogens 2020; 9(7): 533. doi: 10.3390/pathogens9070533.
14. Henderson JP, O'Hagan J, Hawe SM, et al. Anaemia and low viability in piglets infected with *Eperythrozoon suis*. Vet Rec 1997; 140(6): 144-146.
15. Stadler J, Jannasch C, Mack SL, et al. Clinical and haematological characterisation of Mycoplasma suis infections in splenectomised and non-splenectomised pigs. Vet Microbiol 2014; 172(1-2): 294-300.
16. Hoelzle LE, Zeder M, Felder KM, et al. Pathobiology of Mycoplasma suis. Vet J 2014; 202(1): 20-25.
17. Stadler J, Willi S, Ritzmann M, et al. Detection of Mycoplasma suis in pre-suckling piglets indicates a vertical transmission. BMC Vet Res 2019; 15(1): 252. doi: 10.1186/s12917-019-2001-y.