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INTERSTITIAL PNEUMONIA ASSOCIATED WITH PRRS IN PIGLETS IN THE TRANSITION PHASE

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Abstract: The case of a piglet belonging to a farm with early losses of animals associated to respiratory problems is described. The methodology used to conclude the associated disease in the presentation of such losses is observed. The clinical case is documented, showing the characteristic lesions related to the etiological agent.
Keywords: intersticial pneumonia, prrs, piglets, diagnosis, histopathology.

INTRODUCTION

The most commonly observed health problems in swine are generally respiratory, especially in the initiation, growth and fattening phase; these are responsible for a high number of economic losses in swine farms due to loss of weight gain, feed conversion and high mortality (Vinuenza *et al*, 2024).

The causes of these diseases are multifactorial, there are many microorganisms such as bacteria, viruses, fungi, environmental and epidemiological factors that are responsible for their occurrence in swine facilities; currently it is accepted that there is a complex process that is the result of the interaction of factors known as "Porcine Respiratory Complex" (Lobo, 2005). This is characterized by a primary infection caused by an agent that causes immunosuppression, which can be a virus and/or Mycoplasma, and subsequently colonizes and interacts with a secondary bacterial agent as an opportunist (Favaro *et al*., 2014).

One of the main lesions observed is pneumonia, which can be defined as a pulmonary inflammatory lesion in response to the arrival of microorganisms to the distal airway and parenchyma. The histology of pneumonia depends on the time of evolution, the causative agent and certain host conditions (Martinez, 2019).

Interstitial pneumonias are considered chronic inflammations, whose proliferative response involves the alveolar walls and the stroma that supports them, however there may also be an acute diffuse lesion of the alveolar walls, this acute lung injury may be associated with severe viral pneumonia, cystic lung injury, pancreatitis, shock and sepsis. Frequently these lesions are accompanied by edema, emphysema or bronchopneumonia and the latter is known as broncho-interstitial pneumonias (Camargo, 2012).

In animals, most interstitial pneumonias are of infectious origin, as well as toxins entering via the digestive tract; it causes lung injury as a result of a systemic or blood infection (Camargo, 2012).

Pneumonic inflammatory processes are the most common lesions in swine lungs, morphologically and based on their texture, distribution, appearance and type of exudate, they are classified into four types: bronchopneumonia, embolic pneumonia, granulomatous pneumonia and interstitial pneumonia, the latter is the most difficult to diagnose macroscopically (Ramirez and Molin, 2019).

PROBLEM-ORIENTED CLINICAL EXAMINATION

REVIEW, MEDICAL HISTORY AND ANAMNESIS

Species: Swine	**Breed:** Pietrain/ Yorkshire	**Sex:** Female
Age: 2 months	**Weight:** 6-7 kg	Whole animal
Color: White with black spots	**Provenance:** Rancho "La Joya", south of the airport, Calera de Victor Rosales, Zacatecas, Mexico.	

She was vaccinated with "NEUMOBAC", an active vaccine against *Corynebacterium, Mannheimia haemolytica, Pasteurella multocida* A and B, *Salmonella chloreaesus* and *Streptococcus pyogenes; she* was also vaccinated with RHINAVAC, an active vaccine against atrophic rhinitis, *Bordetella bronchiseptica, Haemophilus parasuis, Mycoplasma hypneumoniae, Mannheimia haemolytica* and *Pasteurella multocida* type D.

Death was reported in the morning of March 08, 2023. The time elapsed between death and necropsy was 26 hours and 31 minutes, and the method of preservation of the carcass was by refrigeration at 4°C.

Weeks prior to the death, deaths of other piglets occurred. It is suspected that they were caused by the same clinical condition.

INITIAL DATABASE

Clinical signs: Inappetence, hyperventilation, temperature 40 °C, prostration and pallor.

a) List of problems

1.- Hyperventilation
2.- Temperature 40 °C
3.- Prostration
4.- Pallor
5.- Inappetence

b) master list

I. Respiratory system (1)
II. Cardiovascular system (2, 4)
III. Digestive system (5)
IV. Indefinite (3)

INITIAL PLAN/ DIAGNOSTIC PLAN/ THERAPEUTIC PLAN/ INFORMATIVE PLAN

Initial plan

The serological test "IDEXX PRRS X3 ELISA test" was performed.

Diagnostic plan

Porcine Reproductive and Respiratory Syndrome Virus (Infectious)

Circovirus type 2 (Infectious)

Coronavirus (Infectious)

Swine Influenza (Infectious)

Enzootic pneumonia (*Mycoplasma hypneumoniae*) (Infectious)

Salmonella cholerasuis (Infectious)

Therapeutic plan

The treatment of choice by the veterinarian was: Gentamicin 10% (Tx etiology), (Euyacol forte) Chlorpheniramine maleate/ Bromhexine/ Eucalyptus/ Guaiacol, 14 mg/ 5 mg/ 20 mg/ 50 mg, (Tx symptomatology).

Information plan

The owner was advised to take extreme precautions, quarantine sick animals and respect the periods, restrict access to visitors and vehicles, as well as the use of biosecurity measures in the farm.

PROGRESS NOTES

There was no improvement in the piglets because the treatment was not indicated to treat the disease because there was no response to the treatment and no improvement in the affected animals, so a large number of piglets died because of the disease that could not be identified before the losses occurred.

CASE DEVELOPMENT

As external macroscopic findings, it was observed that the piglet was dehorned, had lesions on both ears, as well as in the region abdominal and on the snout (believed to have been caused by a fight between piglets); the abdomen was slightly red, it also had a hematoma on the right unilateral dorsum of size 26 cm x 8 cm of purple color (Figure 2) and the hoof of the right thoracic limb presented a purple coloration (Figure 3).

Congestion was found in the blood vessels of the brain (Figure 4).

The right turbinate presented a purple coloration and the left turbinate presented a red coloration. In both there was presence of white viscous substance (Figure 5).

The right submandibular lymph node presented an enlargement in size and a cherry coloration (Figure 6), when a transversal section was performed, white dots and hemorrhage were observed (Figure 7).

In the pulmonary bifurcation of the trachea there was presence of whitish and viscous substance (Figure 8).

The right lung presented a cherry coloration in 70-80% of the surface, there was presence of fibrinogen exudate in the right lateral part and it was attached to the walls of the cavity, in addition there was presence of white spots in the cranioventral location of the accessory lobe. On sectioning, the bronchi were observed and there was also presence of whitish, viscous substance (Figure 9). In transverse sections, hemorrhage was observed, complete alveolar spaces, there were white spots and a dark purple color tone and they were of firm consistency (figure 10).

In the left lung the coloration was pink with some slightly redder areas, there was presence of fibrinogen exudate, but it was not as noticeable as in the right lung (Figure 11); in the cross section, the lesions did not deepen.

The heart showed a purple coloration; the left ventricle was dilated and a cross section showed the difference between the right ventricular myocardium, which measured 0.2 mm and the left ventricle 1.3 cm, resulting in a very marked left ventricular dilatation, although the normal ratio is 1-3 and it was > 6 (Figure 12).

When the stomach was incised, petechial hemorrhages were observed in the mucosa (Figure 13).

In the small intestine, gas was present in the duodenum, in the jejunum there were areas of different coloration, being yellow, red and white (Figure 14), finally in the ileum there were red lines and the epithelium was wrinkled.

Microscopic findings, starting from cranial to caudal, beginning in the cerebellum, included choroid plexus (Figure 15), severe congestion, hemorrhages, inflammation, edema, glia cell accumulation (gliosis) (Figure 17), demyelination, dead neurons, neuronal degeneration, hyperchromasia, neuronophagia (Figure 18), satellitosis, severe meningitis and glia cells (Figure 16).

The heart presented hemorrhages, muscular degeneration and necrosis (Figure 19). There was also inflammation in the aorta artery adjacent to the blood vessel.

Similarly, the lymph node presented hemorrhage, lymphoid depletion and congestion (Figure 20).

In the lung, alveolar spaces, severe hemorrhage, congestion and emphysema were found (Figure 21). The bronchioles presented congestion, peribronchial inflammation and inflammation inside the lumen (figure 22).

Presence of necrosis (moderate to severe) and severe multifocal hemorrhage in the renal cortex (Figure 23).

Lymphoid depletion and dead erythrocytes were observed in the spleen (Figure 20).

The liver presented centrolobulillar and perilobular hemorrhage that worsens in the center of the hepatic lobule (Figure 24), there is degeneration of hepatic cells and there is also presence of hepatocytes with a cytoplasm with vacuoles and others with foamy appearance.

In the second portion of the small intestine (jejunum) necrosis and dead eosinophils were found (Figure 25).

DISCUSSION

Based on the findings it was determined that the definitive diagnosis was an Interstitial Pneumonia of viral origin and the etiological agents suspected are: Porcine Reproductive and Respiratory Syndrome Virus (PRRSV), belonging to the *Arteriviridae* family, PRRSV presents interstitial pneumonia as the main respiratory lesion (Senasa, 2020).

Swine circovirosis is caused by *porcine circovirus type 2* (PCV2). PCV2 is a common component of the porcine respiratory complex in association with other agents including PRRSV, influenza virus and Mycoplasma hyopneumoniae. Interstitial pneumonia with inter lobar pulmonary edema is observed (Camacho, s, f).

Blue eye disease is caused by porcine rubulavirus, also called paramyxovirus. It is characterized by encephalitis and respiratory disease in piglets, reproductive failure in adult animals and occasionally corneal opacity at all ages. The most frequently observed lesions are pneumonia (1-5%) and meningeal congestion; histologically there are non-suppurative encephalitis and areas of interstitial pneumonia (Rosales and Correa, 1989).

As mentioned by Alpizar (2015), the characteristic microscopic lesion commonly observed in the three diseases mentioned above is interstitial pneumonia, although respiratory signs are nonspecific and often, when necropsies are performed mortality is apparently associated with other processes, most frequently bacterial and other agents.

CONCLUSIONS

Respiratory diseases associated with porcine reproductive and respiratory syndrome (PRRS), Circovirus and Rubulavirus cause great losses in the swine industry due to their effect on the production area.

The characteristic signs are, first, reproductive, which include premature births, abortions, pigs born weak and an increase in the number of dead and mummified piglets. The second sign is respiratory disorders which are also important in neonatal pigs in which dyspnea is a major characteristic.

These diseases are of widespread concern among producers, given the growing popularity of the use of artificial insemination, since this is a form of transmission, which sometimes can be controlled, but sometimes not, since semen from artificial insemination centers can be contaminated if it does not have a good sanitary and hygienic control (Bavera, 2006).

Currently, there are several laboratory tests to make an accurate diagnosis to know if there are sick animals on a farm, as is the case of the IDEXX PRRS X3 ELISA test, so a timely diagnosis can reduce economic losses in producers.

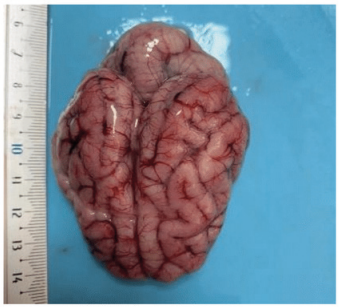
The implementation of good swine production practices (biosecurity) is of great importance to avoid the occurrence of these and other associated diseases on farms, as well as a constant monitoring of the herd would help to implement vaccination programs according to the needs of each farm.

APPENDIX 1. PHOTOGRAPHIC ARCHIVE

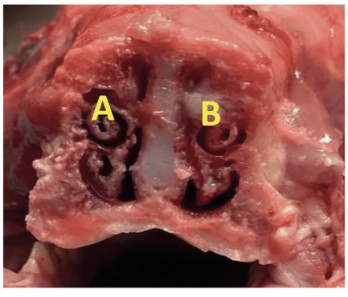
(Figure 1) Piglet in right lateral decubitus.

(Figure 2) Hematoma on the dorsum, purple color, unilateral right. 26 cm x 8 cm.

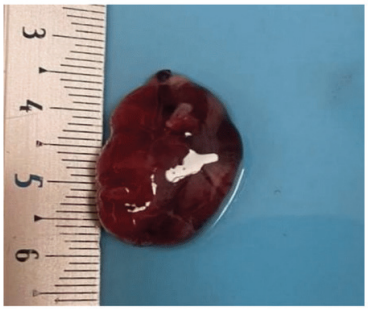
(Figure 3) Right thoracic limb hoof, purple in color.



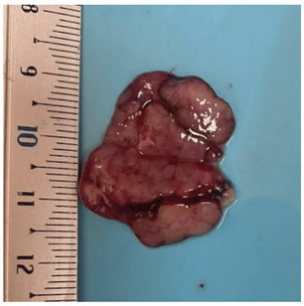
(Figure 4) Dorsal view of the brain, congestion of blood vessels is observed.



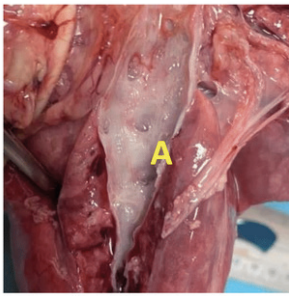
(Figure 5) Cross section of the nose, showing the changes in color of the nasal turbinates (right: purple, left: red).



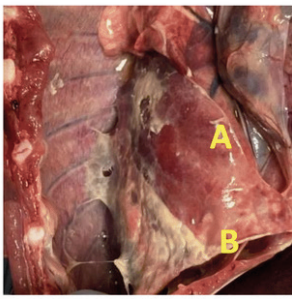
(Figure 6) Right submandibular lymph node with swelling and cherry color.



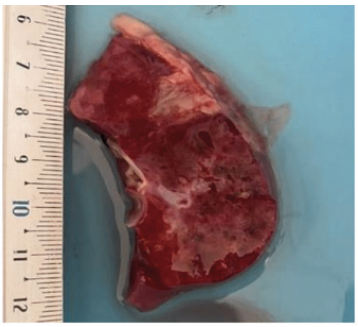
(Figure 7) Internal aspect of the lymph node showing hemorrhage and white spots



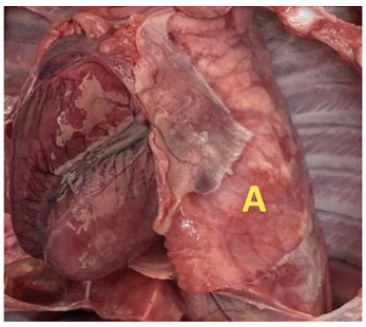
(Figure 8) Pulmonary bifurcation of the trachea with thick white mucus.



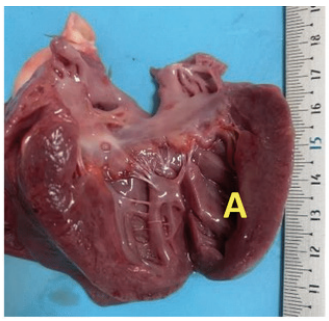
(Figure 9) Right lung with cherry color and white spots (ventral side).



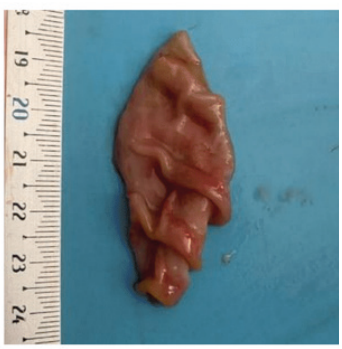
(Figure 10) Cross section of the right lung where it can be seen that the lesions are deepening ( ).



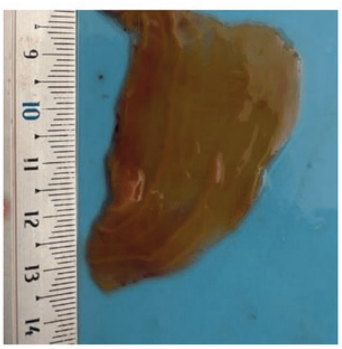
(Figure 11) Left lung in thoracic cavity, ventral side.



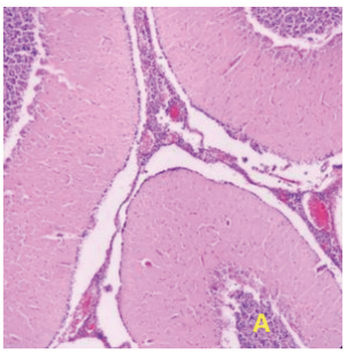
(Figure 12) Longitudinal section of the heart showing the myocardium of the dilated left ventricle.



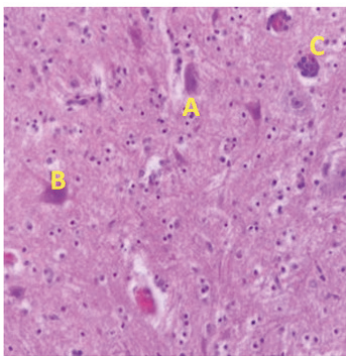
(Figure 13) Cut of the stomach where petechial hemorrhages are present.



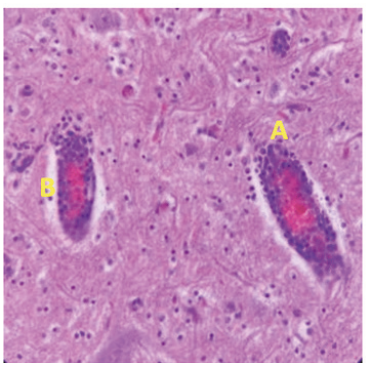
(Figure 14) Cut of the small intestine (jejunum) where there was color change to a yellow tone.



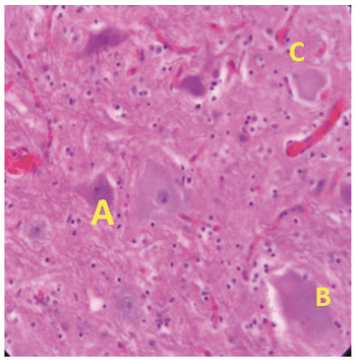
(Figure 15) Inflammation in choroid plexus (A).



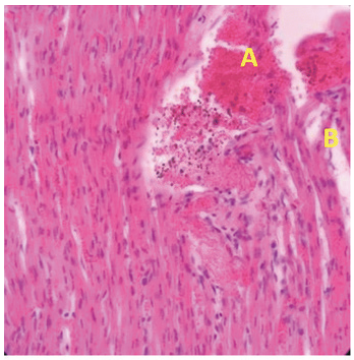
(Figure 16) Demyelination (A), neurons lacking nuclei (B) and satellitesis (C).



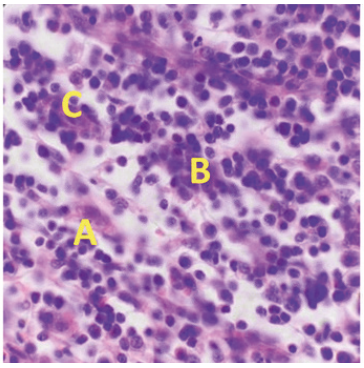
(Figure 17) Perivascular lymphocytic inflammation (A) and accumulation of glia cells (B).



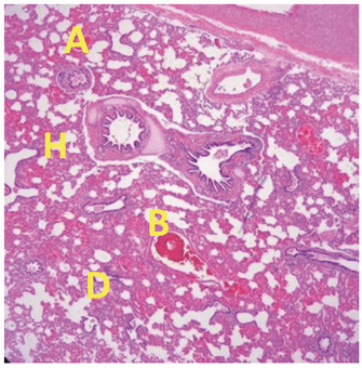
(Figure 18) Neuronal hyperchromasia (A), neuronal degeneration (B) and neuronophagia (C).



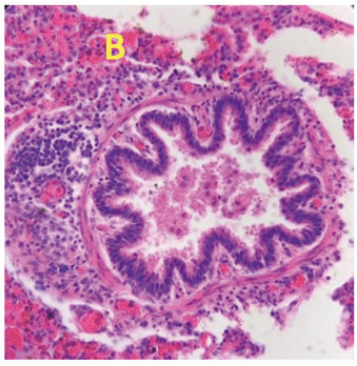
(Figure 19) Hemorrhages (A) and degeneration of heart muscle fibers (B).



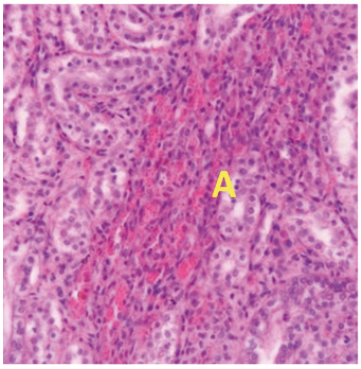
(Figure 20) Hemorrhage (A), lymphoid depletion (B) and congestion (C) in lymph node.



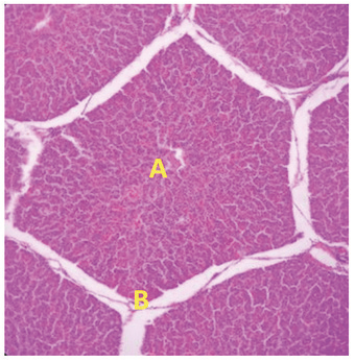
(Figure 21) Alveolar spaces (A), severe hemorrhage (B), congestion (C) and emphysema (D) in lungs.



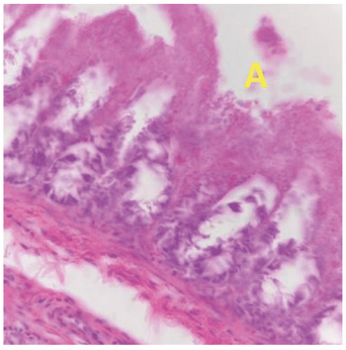
(Figure 22) Peribronchial inflammation and inflammation inside the bronchial lumen.



(Figure 23) Severe multifocal hemorrhage in kidney (A).



(Figure 24) Centrolobulillar (A) and perilobular (B) congestion.



(Figure 25) Necrosis of the villi (A) in jejunum region.

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