Original Article

PORCINE ENZOOTIC PNEUMONIA: RELATIONSHIP BETWEEN MICROSCOPIC LUNG AND KIDNEY LESIONS IN SANTA CATARINA, BRAZIL

PNEUMONIA ENZOÓTICA SUÍNA: RELAÇÃO ENTRE LESÕES MICROSCÓPICAS PULMONARES E RENAIS EM SANTA CATARINA, BRASIL

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ABSTRACT: In this work the relationship between lung lesions of pigs with Enzootic Pneumonia and kidney lesions during sanitary inspection at slaughter was investigated. For this purpose sixty-nine Enzootic Pneumonia positive lung samples and sixty-nine negative ones as well as kidneys from the same pigs were *post mortem* examined. Microscopic examination revealed that 54.28% of the pigs (58/138) had both lesions, an association significant by Chi-square ($P<0.05$). The intensity of this association, by "Odds ratio" value of 0.2267 was also significant (0.09045-0.5683). Such result indicates that Porcine Enzootic Pneumonia positive pigs are more likely to develop nephritis. Although the relationship between lesions is uncertain, immunodepression caused by Porcine Enzootic Pneumonia is a probable cause of the concomitant renal disease.

KEYWORDS: Porcine Enzootic Pneumonia. Nephritis. Swine slaughtered. Refrigerated slaughterhouses.

INTRODUCTION

One of the biggest problems faced by the pig industry, worldwide, are the diseases that involve the respiratory system of these animals (STAKENBORG et al., 2005). Among the main microorganisms involved in Porcine Respiratory Disease Complex (PRDC), stands out *Mycoplasma hyopneumoniae*, the etiological agent of the Porcine Enzootic Pneumonia (PEP) or Porcine Mycoplasmal Pneumonia (COSTA, 2002).

After inhalation, the *M. hyopneumoniae* primarily attacks the ciliated epithelium of the trachea, bronchi and bronchiole, and subsequently, causes damage to the ciliated epithelium cells by adhering to the superficial walls of the cilium and epithelium (HAESEBROUCK et al., 2004). The functional alterations of these structures can lead to adverse consequences, provoking suppressing effects in the alveolar macrophages, which are the main cells of the immunological pulmonary defense against infectious agents (TIMENETSKY, 2005), causing immunodepression (ADEGBOYE, 1978). As a consequence of immunodepression, there is a decrease in the resistance to other infectious agents, causing secondary infections (SUTER et al., 1985).

Wilkie and Mallard (1999) reported that, besides the highly probable immunodepression caused by the *M. hyopneumoniae*, the production of high levels of pro-inflammatory cytokines by the macrophages is capable of causing decrease on growth rate, resulting in a retarded pig growth. The percentage of condemnation during slaughter of these animals is much higher than in apparently healthier ones (MARTÍNEZ et al., 2007). As pointed out, slaughtered swines with multifocal interstitial nephritis (usually called "white spotted" kidneys) also present lower growth. The main causing pathogens of nephritis in pigs were searched and none of the infectious agents detected could directly be assigned as the primary cause of nephritis studied (MARTÍNEZ et al., 2006).

Even thought the relationship between lung and kidney lesions in the literature is not clear, it has been observed a rather high prevalence of kidney lesions in pigs with lung lesions characteristic of PEP in the Jefferson Andrade dos Santos Pathological Anatomy Laboratory of the Universidade Federal Fluminense, Rio de Janeiro, Brazil (Rogerio Tortelly, "Personal Communication"). Moreover, there is no information in the literature linking lung and kidney lesions in the same animal.

As pointed out, the present study had the objective of statistically analyze the association between lung ascribed as PEP and kidney lesions in slaughtered swine, under sanitary inspection.

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MATERIAL AND METHODS

In the present study, lungs and kidneys samples of 138 pigs from the Western region of the State of Santa Catarina, Brazil, slaughtered under Official Sanitary Inspection were used. These pigs were about five to six months of age and had an average warm carcass weight of 84.33 Kg.

Out of those138 pigs, 69 were assigned positive for PEP while 69 had no apparent lung lesions, as diagnosed by the Official Inspection Service. After the alternated collection of positive and negative lung fragments for PEP, kidneys fragments from the same pigs were collected, and identified accordingly.

Lung and kidney fragments were individually stored in plastic flasks, properly name-tagged, containing 10% formaldehyde solution and then sent to the Jefferson Andrade dos Santos Pathological Anatomy Laboratory of the "Universidade Federal Fluminense" (Federal Fluminense University), where they were processed according to routines techniques, waxed and stained with Haematoxylin -Eosin.

In the microscopic diagnosis of PEP cases was based on the *score* classification criteria described by Van Alstine et al. (1996), Irigoyen et al. (1998) and Scofano (2006). Score zero, absence of lesion, including peribronchial mononuclear nodules; score 1, when small nodules were present in less than 25% of the bronchi, bronchioles and vessels; score 2, when small nodules were present in more than 25% of these same tissues and score 3, when they were present in over 75% of the structures or due to the presence of larger nodules. Lungs with microscopic scores 0 and 1 were presumptively considered negative for PEP while those with microscopic scores 2 and 3, were considered positive.

In the microscopic examination of the renal tissue, the cases were considered positive in the presence of alterations on the parenchyma, such as inflammatory infiltrate of mononuclear constitution (nephritis), which could have a focal or multifocal distribution and localization interstitial, perivascular or periglomerular. The cases without renal tissue alterations were considered negative.

After data collecting, all information were transferred to a data bank for further statistical analysis at 5% level. The Chi-square test was used to test the frequency between renal and lung lesions by microscopy (positive and negative) and nephritis. Chi-squared was also used to verify the association between lung lesions scores (0, 1, 2 and 3) and the nephritis diagnosis (positive and negative) (THRUSFIELD, 2004).

RESULTS

Results on lung lesions score association and nephritis are described on Tables 1 and 2. On table 1, where lung lesions scores and nephritis were microscopically associated, we could notice that only 21.21% of the animals with negative diagnosis for nephritis presented positivity for PEP. However, 57 pigs, 54.28% concomitantly, had the two injuries, being this association significant by Chi-square ($P<0.05$). The "Odds Ratio" obtained was small 0.2267 (0.09045-0.5683), but significant. On table 2, this association in relation to lung score lesions was also obtained by the chi-square ($P< 0.05$) which implies that as ling lesion scores increase, more nephritis are encountered.

Table 1. Relationship between lung and kidney lesions in pigs slaughtered under Official Sanitary Inspection, according to Porcine Enzootic Pneumonia (PEP) microscopic diagnosis[a], in Western region of the state of Santa Catarina, Brazil, March, 2007.

Nephritis	Microscopic Diagnosis PEP		Total (%)
	Negative (%)	Positive (%)	
Positive	48 (45.71)	57 (54.8)	105 (100)
Negative	26 (78.78)	07 (21.21)	33 (100)
TOTAL	74 (53.62)	64 (46.37)	138 (100)

[a] Chi-Square significant (P=0.0018); OR: 0.2267 (0.09045-0.5683) also significant.

Table 2. Relationship between lung and kidney lesions, in pigs slaughtered under Official Sanitary Inspection according to Porcine Enzootic Pneumonia (PEP) lung lesion score[a], in Western region of the state of Santa Catarina, Brazil, March, 2007.

Nephritis	PE Microscopic Score				Total (%)
	0 (%)	1 (%)	2 (%)	3 (%)	
Positive	28 (26.66)	20 (19.04)	16 (15.23)	41 (39.04)	105 (100)
Negative	13 (39.39)	13 (39.39)	03 (9.09)	04 (12.12)	33 (100)
TOTAL	41 (29.71)	33 (23.91)	19 (13.77)	45 (32.60)	138 (100)

[a]Chi-square significant (P< 0.05)

DISCUSSION

Results from this work show for the first time that pigs with PEP characteristic lesions (microscopic scores 2 and 3) are more likely to develop nephritis. According to the "Odds Ratio" (OR) obtained it can be stated that pigs with PEP lesions were at a 2.3 higher risk of developing nephritis higher than pigs without lung lesions.

This relationship might be explained due to the fact that the *M. hyopneumoniae* is capable of suppressing phagocyte activities of the alveolar macrophage, main pulmonary defense cell against infectious agents, causing immunodepression in the host.

Ro and Ross (1983) verified that the lymphocytes of pigs infected with *M. hyopneumoniae* presented reduction in their ability to produce antibodies for non-related antigens. Ferreira and Sousa (2002) affirm that a specific microorganism can act over an animal's general health status, causing immunodepression. Adegboye (1978) and Piffer et al. (1998) presented some evidences in which this phenomenon occurs with *M. hyopneumoniae.* Thanawongnuwech et al. (2004) also attributed to the agent, the inhibition of neutrophil function, which could contribute to the development of secondary infections in the organism of these animals.

Inflammatory reactions can lead to high production of pro-inflammatory cytokines by the macrophages resulting in a retarded pig growth, which can increase total condemnation during slaughter (WILKIE; MALLARD, 1999), as well as swine carriers of multifocal interstitial nephritis, usually called "white spotted" kidneys" (MARTÍNEZ et al., 2006).

Drolet and Dee (1999) affirm that the cases of interstitial nephritis can be induced by many bacterial and viral pathogens in pigs. Martínez et al. (2006) searched the main causing pathogens of nephritis in pigs with retarded growth and the authors conclude that none of the infectious agents detected could be directly attributed as the primary cause of nephritis ("White spotted" kidneys) in the animals analyzed. Maxie (1993) also adds that, since the lesions are not specific, it is rarely possible to attribute them to their etiological agent. So, Drolet et al. (2002) attributes the lesions caused by nephritis to a non-specific immunological response, prolonged in the place of antigenic stimulation and therefore, the potential infectious causes of nephritis in chronically affected pigs, can rarely be defined.

In this way, it can be presumed that the *M. hyopneumoniae* can cause immunodepression in pigs, predisposing it to nephritis.

CONCLUSION

A positive association exists between PEP lung lesions and renal nephritis in pigs slaughtered in the western region of the State of Santa Catarina, Brazil.

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RESUMO: O objetivo deste trabalho foi verificar a relação entre lesões pulmonares de Pneumonia Enzoótica e renais pelo Serviço de Inspeção Sanitária em suínos abatidos. Foram utilizadas amostras de pulmões com lesão de pneumonia enzoótica de 69 suínos e amostras negativas de igual quantidade de animais. Foram coletados também amostras de rins dos 138 suínos estudados. O exame microscópico dos suínos com e sem lesão pulmonar revelou que 54,28% (57/138) estavam concomitantemente com lesões nos pulmões e rins, sendo esta associação significante pelo Qui-Quadrado (P<0,05). A intensidade desta associação por "Odds ratio" foi de 0,2267, também significante (0,09045-0,5683). Pôde-se concluir que existe associação entre lesões pulmonares e renais, significando que animais com lesões presuntivas de pneumonia enzoótica têm maior predisposição para desenvolverem um quadro de nefrite.

PALAVRAS-CHAVE: Pneumonia enzoótica suína. Nefrite. Suínos de abate. Matadouro-frigorífico.

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