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Sero-Occurrence of Porcine Reproductive and Respiratory Syndrome Antibodies among Swine Presented for Slaughter at Valencia and Malaybalay City Abattoirs

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ABSTRACT

The study aimed to determine the sero-occurrence of PRRS among swine presented for slaughter at Malaybalay and Valencia City abattoirs. Specifically, the study aimed to determine the presence of PRRS antibodies using the Civtest Suis PRRS between commercial- and backyard-raised swine regardless of age; and to evaluate the gross pathology of lungs at slaughter using the scoring system adapted from the study of Leneveu *et al*. The study dealt only with the results of serological examination for the presence of PRRS antibodies in unvaccinated pigs. A total of 200 samples were obtained and tested for the presence of PRRS E/S antibody test kit. Evaluation of lungs of pigs at slaughter was done limited to the gross appearance of lung surfaces. Results revealed that 9.5% (19 0f 200) of samples were positive for the presence of PRRS antibodies: 10% (10 of 100) in commercial and 9% (9 of 100) in the backyard. There was no significant difference in the occurrence of PRRS between commercial and backyard ($P>0.05$). Evaluation of the lungs revealed that pneumonia had the highest frequency (100%) with a mean score of 2.863 among other lesions.

Based on the results, the author concludes that PRRS is present in the locality of Bukidnon but of low prevalence and that both commercial- and backyard-

raised swine are susceptible. Moreover, at slaughter, the most common lesion is pneumonia with high severity based on the mean score. Other lesions were also present but of low incidence and severity.

Keywords: Antibodies, prevalence, sero-occurrence, lesion, biosecurity, incidence

INTRODUCTION

Porcine Reproductive and Respiratory Syndrome (PRRS) is the most economically significant disease facing the swine industry today (ARS, 2003). It was first described in the United States in 1987 as a new viral disease of swine and appeared in Europe in 1990 (Terpstra, *et al.,* 1991). Since then, the virus has spread to all the major swine-producing countries worldwide. The syndrome has also emerged in some swine farms of China last April 2006 with a morbidity rate of 50-100% and mortality rate of 20-100% (Guang-Zhi Tong, *et al.,* 2007).

The disease was first in the U.S. in 1987 and the causative agent (PRRSV) virus, was isolated in Europe in 1999 (Torremorell, *et al*., 2002). The disease syndrome which is also called swine infertility and respiratory syndrome, mystery swine disease, and blue ear disease initially manifested in sow according to Butler *et al.* (2007). Like other single-stranded RNA viruses, PRRS viruses have high mutation rates resulting in great strain diversity (Domingo, 1989; Murtaugh, *et al.,* 1997). Mutational variations in closed herds were minor when compared to the genomic strain shifts noted after introductions of infected animals from unassociated herds (Roberts, 1999; Mahlum & KS Faaberg, 2001).

Presumably, PRRSV has entered domestic swine from unidentified wildlife species (Zimmerman, unpublished data). Wills *et al*. (1997) found no evidence of PRRSV replication in cats, dogs, mice, opossums, raccoons, rats, skunks, house sparrows or starlings. Zimmerman, (2007) reported that mallard ducks (Anas platyrhrynchos) were susceptible to PRRSV, but subsequent workers have not replicated these results (Trincado, *et al*., 2006). Feral swine are susceptible to PRRSV infection, but according to serosurveys, infection in free-ranging feral swine animals is relatively rare (Albina, *et al*., 1997). Infected animals tend to shed the virus in nasal secretions (Benfield, *et al*., 1992; Christianson *et al*., 1993), saliva (Wills, *et al*., 1997), semen (Zimmerman, 2007), urine (Wills, *et al*., 1997a), and feces (Christianson, *et al*., 1994).

Swine can be infected with PRRSV by several routes of exposure, including

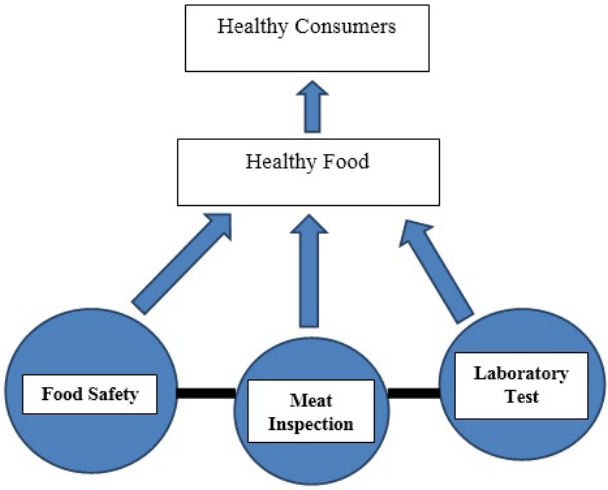
intranasal, intramuscular, oral (Magar, *et al.*, 2000), intrauterine (Christianson, 1994), and vaginal (Benfield, *et al.*, 1992). Overall, the infectivity data indicate that pigs are extremely susceptible to infection via parenteral exposure (breaks in the skin barrier) and much less susceptible by all other routes investigated to date (Zimmerman, 2007). Preliminary reports suggest a possible role for arthropods in PRRSV transmission (Zimmerman, 2007). PRRSV has been detected in, or on, wildcaught flies and mosquitoes (Otake, *et al.*, 2002). PRRSV can also be transmitted from viremic dams transplacentally to fetuses, resulting in fetal death or a birth of infected pigs that are weak or appear normal (Christianson, 1994).

PRRSV produces a chronic, persistent infection in pigs since it replicates in susceptible cells of clinically inapparent carrier animals for several months. This clinical condition is the one most important epidemiological feature of PRRSV infection. Persistent PRRSV infection has been documented through transmission experiments and by detection of virus in animals (Zimmerman, 2007). Following in utero infection at 90 days of gestation, Benfield *et al.* (1992) isolated virus from tonsil and lymph nodes of pigs for up to 132 days after farrowing. Regardless of whether the pig is exposed in utero persistency occurs (Benfield, *et al.*, 1992; Rowland, *et al.*, 1999) as a young animal, or as an adult (Wills, *et al.*, 1997). Identification of a mechanism(s) by which the virus can persevere in an active immune response has not been done, but probably does not involve evasion of immunity through continual in vivo viral mutation (Zimmerman, 2007).

Last 2007, the disease has already gained entrance into the Philippines wherein almost similar picture of clinical signs and mortalities were reported and observed in Bulacan, Pampanga, Tarlac and Nueva Ecija (Mende, 2008).

Today, it is not known if PRRS infection is present among swine farms of Mindanao, especially in the province of Bukidnon. However, cases with clinical signs of abortions, mummified fetus, uneven growth, and reduced feed efficiency were observed in some piggery farms. Cases were not confirmed yet due to lack of diagnostic tools . Results of this study will make the swine producers be aware of the disease and be alert in preventing and controlling its spread within and among herds.

FRAMEWORK



Health is an important factor that helps build a nation. Securing food safety starts from production to slaughter following proper and specific procedures and standards. Unless observation of all aspects of production and food safety is carried out, consumption of clean and healthy food cannot be assured.

MATERIALS AND METHODS

The study used a total of 200 heads of pig with no history of PRRS vaccination selected randomly regardless of age, grouped into 100 commercial-raised sourced from Malaybalay City abattoir and 100 backyard-raised pigs sourced from Valencia City abattoir. Three ml of blood samples were collected from the animals, prepared for serum samples and examined for the presence of PRRS antibody using the CIVTEST SUIS PRRS test kit, indirect ELISA. At room temperature test was performed and reading results were taken. The test done was valid since the mean OD of the positive control is within >0.6 and the ratio whose mean OD450 of the positive control/ mean OD450 of the negative control is 6.0. Interpretation of results was carried out with the used of an IRCP (Relative Index x 10) as required in the test kit. Information regarding the animal and its source were based on interview and from the abattoir's record. At slaughter, the lungs of pigs were macroscopically evaluated using the scoring system obtained from the study by (Lenevue, 2005). The data gathered was

analyzed using the chi-square test and t-test for independence.

RESULTS AND DISCUSSION

The result of the study is presented in Table 1 which shows that 9.5% (19/200) of the animals were positive for antibodies against PRRS. This study result could mean that PRRS have already gained entrance in the province of Bukidnon but of low prevalence (9.5%). The results could be possible since the disease is already present in the Philippines causing outbreaks last 2007 in the provinces of Bulacan, Pampanga, Tarlac, and Nueva Ecija (Mende, 2008). The study further reveals that the occurrence of PRRS in Bukidnon is low enough to cause an outbreak since there were no reported cases of high mortalities and losses as compared to other provinces of the Philippines. This result suggests that the virus could be present in the province but of low level.

Table 1 further reflects the occurrence of PRRS in the commercial-raised pigs which shows 10% (10 of 100) occurrence and is higher compared to the backyard-raised pigs which is only 9% (9 of 100). However, statistical analysis showed that there is no significant difference between the two groups ($P>0.05$). This result indicates that the level of susceptibility and exposure of two groups to PRRS is the same. Possibly, the commercial farms' biosecurity and management practices were inefficient and not strictly employed; and that the backyard has obscure health programs and management practices causing the virus to be distributed easily.

Table 1. Sero-Occurrence of Antibodies against PRRSV

TYPE OF RAISING	SERO-OCCURRENCE OF PRRS ANTIBODIES				
	Positive	% Positive	Negative	% Negative	
Backyard	9	9	91	91	$X^2= 0.058$
Commercial	10	10	90	90	P=0.809
TOTAL	19	9.5	181	90.5	

The presence of lung lesions was examined and gross evaluation was done to the 200 lung samples carried out per lung lobe. The lung scoring was based on the extent of involvement of the lesions observed. At slaughter, lesions observed in almost all of the lungs examined were congestion/hyperemia, hemorrhage, edema, consolidation, atelectasis, and emphysema while abscess, adhesion, and

pleurisy were not observed. Further observation showed that lung samples tend to have a combination of two or more lesions like lung showing gray hepatization (Plate 4) with areas of consolidation (Plate 1), and edematous lung with areas of atelectasis (Plate2).

Figure 1 illustrates the mean scores of the lung lesions which showed that pneumonia lesion has the highest score of 2.863. It is followed by edema (2.303) (Plate5), emphysema (1.549), congestion (1.497)(Plate3), hemorrhage (1.247) (Plate6), consolidation (1.039), atelectasis (0.709). While the lesions such as abscess, adhesion, and pleurisy (0.000) indicated lowest. These observations are quite similar with those observed by Lenevue (2005). In France, the mean lung score of pneumonia (3.7) was quite high. Perhaps, this implies that pneumonia lesion could be severe when present in the lungs.

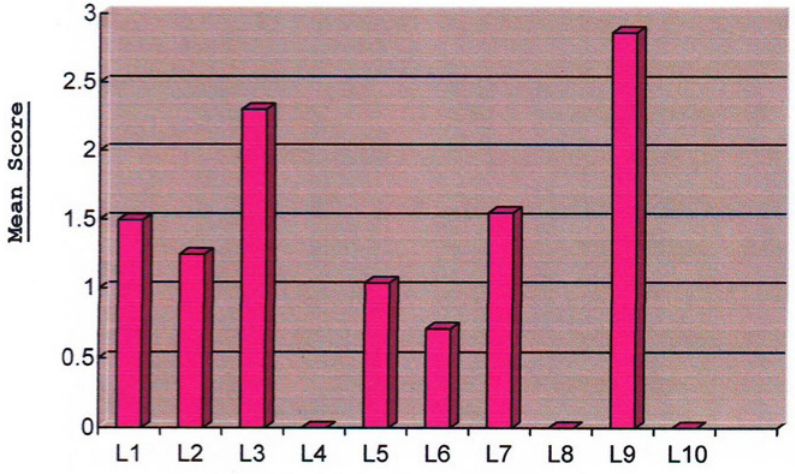


Figure 1. Mean Scores of the Lung Lesions at Slaughter.

Legend:

L1 – Congestion/Hyperemia	L6 – Atelectasis
L2 – Hemorrhage	L7 – Emphysema
L3 – Edema	L8 - Adhesion
L4 – Abscess	L9 – Pneumonia
L5 – Consolidation	L10 – Pleurisy

Figure 2 revealed that among the six lobes of lungs, the right caudal lobe has the highest mean score (1.224). It is followed by left caudal lobe (1.217), right middle lobe (1.133), right cranial lobe (1.127), left middle lobe (1.066), and left cranial lobe (0.986). However, mean scores of these lobes were almost similar with little variations. This result could mean that the lung lobes have the same level of severity of lesions. Figure 3 illustrates the distribution of lung lesions per lobe. It shows that pneumonic lesions were present in all of the lobes in 100% of the samples however, other lesions of lower frequency were also found. On the other hand, adhesion, abscess, and pleurisy were not observed even in one lobe. This results could mean that pneumonia is the most common lung lesion seen at slaughter both in commercial-raised and backyard-raised pigs. This result is quite similar to the epidemiological study in France (Lenevue *et al.,* 2005) wherein only 27.6% of the lungs were pneumonia, pleurisy rate was only 14.5%, and the abscess rate was 2.3%. These findings may be due to management factors like the production system, construction, floor space per pig, nutrition, stress, and others which can increment the prevalence and incidence of pneumonia (Fukotomi *et al.* 1996). This condition may also be caused by viruses and bacteria that favored the development of pneumonia.

Lung lesions such as adhesion, abscess, and pleurisy were not observed at all in this study whose reason is unknown. However, this may be influenced by the immunity of the animal and the length of exposure of animals to the organisms. As stated in Merck Veterinary Manual (2005), pneumonia could develop into pleurisy and formation of abscesses in severe and chronic cases. Hence, the lung sample examined in this study maybe identified as cases of acute pneumonia or the animals may have been slaughtered at an early stage that pleurisy and abscesses were not observed at all. Another reason could be that the number of samples may have been not enough that the occurrence of these lesions were not observed.

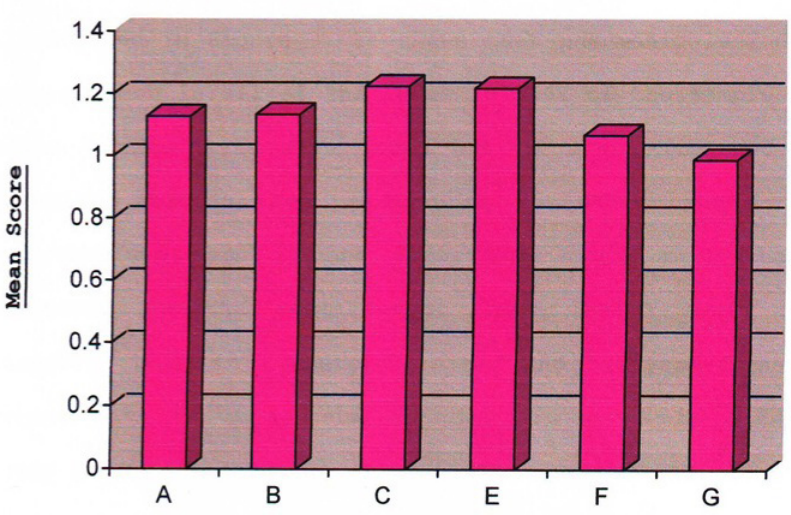


Figure 2. Means Scores of Lung Lobes.

Legend:

A. Right cranial lobe
B. Right middle lobe
C. Right caudal lobe
E. Left caudal lobe
F. Left middle lobe
G. Left cranial lobe

CONCLUSIONS AND RECOMMENDATIONS

The study revealed that PRRS is present in Bukidnon but of low prevalence (9.5%) and that both commercial- and backyard-raised swine are susceptible. Also, the study revealed that pneumonia was found in all of the lungs evaluated. Other lesions observed were of lower incidence.

Based on the above findings, the author recommends the following:

1. Similar study could be conducted with higher number of samples and with wider area of collection;
2. Similar study could be conducted using commercial farms as area of collection;
3. The conduct of similar study in the occurrence of the disease using Eliza with IFA, virus isolation, and PCR for more accurate and valid results;
4. The conduct of another study regarding the occurrence of PRRS relating

the lung lesions at slaughter to the seropositive animals where lungs will be subjected for histopathology to get a more detailed description;

5. Annual serological examination for the presence of PRRS could be done to determine the status of the herds in the province;
6. The government agencies concerned should take actions in educating the farm owners about the disease, and in containing the virus to prevent its spread within and among the swine herds.
7. A study to trace the source of seropositive animals and the farm owners should be informed of the result; and
8. The vaccination of PRRS should be implemented to pig farms to avoid outbreaks and losses.

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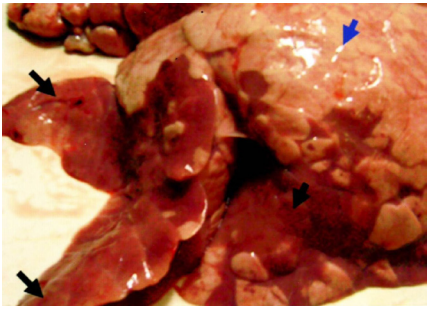

Plate 1. Lung showing gray hepatization (blue arrow) with areas of consolidation (black arrow).

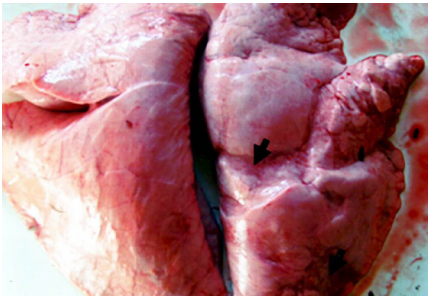

Plate 2. Edematus lung with atelectatic areas (black arrow)

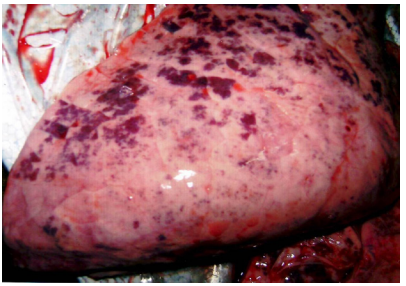

Plate 3. Multifocal areas of congestion.

Plate 4. Hepatized Lung.

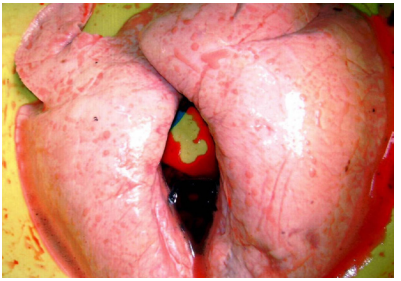

Plate 5. Edematous and pale lungs.

Plate 6. Multifocal hemorrhages approximately 1-2 mm in diameter