The ResPig program as a tool for identifying risk factors affecting technical performance and post-mortem results at the slaughterhouse on Dutch pig farms and for restrictive antibiotic use.

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Introduction

The pig industry nowadays faces more complex diseases than ever before, such as Porcine Multi Systemic Wasting Syndrome and Porcine Respiratory Disease Complex. These disease entities are often caused by multiple infections combined with suboptimal conditions in the field of environment, management, biosecurity climatic conditions and more. Successful preventive plans include the identification of infectious and non infectious factors and preventive interventions based on this. Regarding PMWS, Madec formulated a list of 20 management measures and this was already quite successful in reducing the impact of that syndrome.

A poor understanding of the risk factors for infectious diseases often results in the unnecessarily prolonged use of preventive and curative antibiotic treatments, which is not good for human food safety and also allows the development and selection of more antibiotic-resistant bacteria (1).

ResPig is a digital diagnostic and monitoring program for veterinarians including regular cross-sectional serological investigations for the presence of PRRSV, PCV2, Actinobacillus pleuropneumoniae (App), Mycoplasma hyopneumoniae (M hyo), Influenza and Haemophilus parasuis. It includes also an objective scoring system for possible risk factors (environment, management, housing, biosecurity) for respiratory diseases and an economic module to estimate the financial loses due to infectious diseases and the financial effects of advised interventions. The program helps the veterinarian to take the necessary steps towards a structured approach to respiratory problems with restrictive use of antibiotics.

Because of the high number of participating farms and the uniform sampling protocols, it is possible to analyze the disease situation on a cluster of farms. Analysis of the ResPig databank provides information on possible relationships between the serological test results and the technical- and slaughterhouse performance parameters of finishers. When antibiotic use will be registered in ResPig it must also be possible tot determine relations between infectious diseases, management, biosecurity, housing and antibiotic use.

Material and methods

1. Data were used from tree hundred farms involving 936 cross-sectional serology results (sows, gilts, 5-, 10-, 16-and 22 weeks old pigs, 5 animals per group) in 2008 and 2009. Farms provided performance and slaughterhouse data and a vaccination history. Odds ratios were calculated between the serological results of the oldest fatteners and the technical and slaughterhouse data provided in the farm anamneses.
   The definitions for the technical performance parameters were taken from the farm comparison 2008-2009 of Agrovision's management system (calculates the average technical performance of Dutch pig farms) (2). The average VION farmingnet slaughterhouse scores for 2008 were used to determine the slaughterhouse definitions for pleurisy and pneumonia. These can be found in Table.1 together with the serological definitions.
2. Two multiplying farms measured their antibiotic used in daily doses per animal (DDD) (4) and their technical performance in delivered piglets per sow per year after implementation of the structural health approach with intervention plans aiming on optimization of biosecurity and preventive vaccination programs when necessary.

Table 1: serology definitions

definitions	samples	result
App +	average titer	≥ 14 omp elisa*
PRRS +	average titer	>0.4 idexxelisa
M hyo +	% samples positive	> 20% idexxelisa
Infl +	average titer	≥ 9 log2 HI
PCV2 +	average titer	≥ 10 log2 int.elisa

performance definitions

tech.-/slaughterhouse	result
high mortality	>2.5%
sub optimal ADG	<786 gr
high pleuritis	≥16.5%
high pneumonia	≥11.7%

*antibody Elisa on the 42 kD outer membrane protein of A. pleuropneumoniae (3)

Results

1.Table 2: Relationships: odds ratio between serology and performance results

serology	techn. / slaughter results	O.R.*	P
App +	high pleurisies	4.7	(< 0.0001)
	high pleurisies + pneumonia	4.3	(< 0.0001)
PRRS +	high pleurisies	8.0	(= 0.0029)
	high pleurisies + pneumonia	6.2	(= 0.0028)
PCV2 +	sub optimal ADG	1.9	(= 0.0425)
M hyo +	high mortality	2.9	(= 0.0014)

* Significant associations (P<0.05) P-value based on Fisher's exact test

2.Table 3: structural health approach, antibiotic use and technical results

Farm		2008	2009	Δ
Farm 1: 545 sows	DDD (4)	32	8	25% ↓
	pigs/sow/year	26.8	28.5	6% ↑
Farm 2: 1200 sows	DDD (4)	62.2	56.4	9% ↓
	pigs/sow/year	26.5	28.9	9% ↑

Conclusions and discussion

Significant relationships were demonstrated between ResPig serology results for Actinobacillus pleuropneumoniae, PRRS, Mycoplasma hyopneumoniae and PCV2 and the technical performance and slaughterhouse data (table 2).

As expected, positive App serology in finishers was a risk factor for high levels of pleurisy with or without a high pneumonia score. PRRS infections were also a risk factor for both these slaughterhouse parameters. Secondary infections after PRRS-infections may be the explanation for this. Positive M hyo serology was a risk factor for high mortality in finishers. Early infections and disturbances in the clearance mechanism and integrity of the upper respiratory tract are possible reasons. A high PCV2 titer in finishers, demonstrating infection (without any indication of the actual viral load) was a risk factor for suboptimal Average Daily Gain (ADG).

The serology used in the ResPig protocols makes it possible to identify the risk factors which lead to poor results in technical performance during finishing and in the slaughterhouse so that veterinary advisers are better able to formulate more successful preventive programs.

Routine serological testing, identification of risk factors for respiratory diseases and subsequent adaptation of biosecurity and strategic vaccination interventions seem to be helpful in reducing antibiotic usage (table 3). This may contribute to better technical performance and might be beneficial for human food safety. An antibiotic use score will also be implemented in the ResPig program so that possible relations between infectious diseases, environment, housing, management and antibiotic use can be determined.

References

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