

The link between biosecurity and production and treatment characteristics in pig herds

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Abstract

It is believed that biosecurity influences production figures and health status of pig herds, nevertheless, few studies succeed in demonstrating and quantifying this relation.

In the present study, 95 randomly selected Belgian closed or semi-closed pig herds were visited to quantify the biosecurity status of the herd by means of a biosecurity scoring system (Biocheck) with a range from 0 (= total absence of biosecurity) to 100 (= perfect biosecurity). At the same visit additional data concerning herd, farmer, production characteristics and the use of antimicrobials was collected. The Antimicrobial use was quantified by calculating treatment incidences (TI).

The external biosecurity (preventing pathogens from entering the herd) ranged between 45 and 89/100 with an average of 65/100, whereas the internal biosecurity (reducing within herd spread of infection) score was on average 52/100 (min 18; max 87).

The number of sows and fattening pigs on a herd were positively associated with the external biosecurity score. This indicates that on larger herds, more attention is paid to biosecurity. A negative association was seen between the internal biosecurity score and the age of the buildings as well as with the years of experience of the farmer. This indicates that biosecurity is higher on the agenda with younger farmers and in more modern herds.

A higher overall, external and internal biosecurity score had a significant positive influence on the daily weight gain of fattening pigs, indicating that a higher level of biosecurity positively influence production figures. No significant association was seen between the mortality rate of fattening pigs and biosecurity scores.

The internal biosecurity score, due to the subfactors 'Disease management' and 'Farrowing and suckling period', had a significant influence on the treatment incidence based on the used daily dose, indicating that an improved biosecurity is associated with a reduction of antimicrobial drug use.

Introduction

The term biosecurity comprises all measures to prevent pathogens from entering the herd and to reduce the spread of pathogens within the herd (Amass and Clark, 1999). Biosecurity can be divided into 2 different categories. External biosecurity deals with measures that prevent pathogens from entering the herd, while internal biosecurity is about preventing the within-herd spread of pathogens. To quantify the biosecurity situation on pig farms, a biosecurity scoring system was developed by the Veterinary Epidemiology Unit of the faculty of Veterinary Medicine, Ghent University, and incorporated in a free online application (www.biocheck.ugent.be) (Laanen et al., 2010).

It is believed that biosecurity influences production figures and the health status of pig herds. In the present study, this relationship was further explored.

Material and Methods

Ninety-five closed or semi-closed Belgian pig herds holding at least 80 sows and 400 fattening pigs were randomly selected from the national Identification and Registration (I&R) database of pig producing facilities (SANITEL-pigs, 2005). During a herd visit, the biosecurity status of the herd was quantified by means of a biosecurity scoring system (Biocheck)

with a range from 0 (= total absence of biosecurity) to 100 (= perfect biosecurity) for both external and internal biosecurity. Each biosecurity score is further subdivided into 6 subcategories, which are listed in Table 1. Additional information concerning herd (number of sows, number of fattening pigs, age of the buildings), farmer (years of experience) and production characteristics (daily weight gain and mortality of fattening pigs) and the use of antimicrobial drugs was collected. The use of antimicrobials was quantified by calculating the treatment incidence (TI_{UDDpig}), according to Timmerman et al. (2006). The TI_{UDDpig} expresses the number of pigs treated with one UDDpig (used daily dose in pigs) per 1000 pigs. Only group treatments were taken into account.

Data were analyzed using a multivariable linear regression model. Pearson's correlation coefficients were calculated for detecting highly correlated variables. All analyses were performed using SPSS software (SPSS 19.0, SPSS Inc., Chicago, IL).

Results

The average external biosecurity score was 65 (min 45; max 89), whereas the average internal biosecurity was 52 (min 18; max 87) (Table 1).

Table 1. The subcategories of the Biocheck scoring system for external and internal biosecurity and the overall results for the 95 pig herds.

Subcategory	Average	SD	Min	Max
External biosecurity	65	8	45	89
Purchase of animals and semen	89	11	58	100
Transport of animals, removal of manure and dead animals	66	12	30	96
Feed, water and equipment supply	41	17	17	100
Personnel and visitors	64	12	24	100
Vermin and bird control	57	21	0	100
Environment and region	48	22	10	100
Internal biosecurity	52	15	18	87
Disease management	60	31	20	100
Farrowing and suckling period	61	20	14	93
Nursery unit management	56	24	0	100
Fattening unit management	64	26	0	100
Measures between compartments and the use of equipment	46	18	11	100
Cleaning and disinfection	38	27	0	95
Overall biosecurity	59	10	36	88

SD=Standard Deviation

The average data for the herd details (number of sows and fattening pigs, age of the buildings), farmer information (years of experience), production characteristics (daily weight gain and mortality of fattening pigs) and the use of antimicrobial drugs (TI_{UDDpig}) are listed in Table 2.

Table 2. Results for the 95 pig herds concerning herd, farmer and production characteristics and the use of antimicrobial drugs.

Factor	Average	Median	SD	Min	Max
Number of sows	289	220	162	80	1000
Number of fattening pigs	1420	1250	877	400	7000
Years of experience of the farmer	21	20	9.9	1	42
Age of the buildings	32	30	17.01	2	129
Daily weight gain (gram/day)	680.6	676.0	71.1	486	870
Mortality (%)	3.55	3.00	2.19	1.00	11.50
TI _{UDDpig}	174.22	150.49	130.47	0.00	650.49

SD=Standard Deviation

No significant association was seen between the mortality rate of fattening pigs and any of the calculated biosecurity scores.

The overall biosecurity score was significantly associated with the TIUDDpig, which could be allocated to the internal biosecurity score. When further subdivided the two categories 'Disease management' and 'Farrowing and suckling period' were significantly associated with the TIUDDpig (Table 4).

Table 4. Influence of different parts of the biosecurity, herd and farmer characteristics on the TI_{UDDpig}.

	R ²	Coefficient (β)	p-value
Overall biosecurity	0.037	-2.45	0.06
External biosecurity	0.015	-1.97	0.236
Internal biosecurity	0.040	-1.77	0.05
Detailed model			
Disease management (INT)	0.040	-0.90	0.04
Farrowing and suckling period (INT)		-1.43	0.03
INT=Internal Biosecurity			
Discussion			

The average biosecurity scores show that there is much room for improvement. On average, the scores for external biosecurity, which are mainly measures imposed on others (suppliers, etc) are higher than the scores on internal biosecurity, which are more related to work and management strategies of the farmers themselves.

The results from this study indicate the existence of a positive relation between the number of sows and fattening pigs on a herd and the level of biosecurity, indicating that on larger herds more attention is paid to biosecurity than on smaller herds. The larger a herd becomes the more professional and well managed it must become, yet it should be acknowledged that these relationships remain low indicating that other factors also play a role in the level of biosecurity. It is also noticeable that the biosecurity level (mainly internal biosecurity) increases with a decreasing age of the buildings. This illustrates that in more modern facilities, more attention is paid to biosecurity. The same holds for the years of experience of the farmer, suggesting that younger farmers are more aware of biosecurity.

When evaluating the link between biosecurity and the daily weight gain of fattening pigs, it appears that there is a positive association between the biosecurity status of the herd and the daily weight gain of fattening pigs. Although no causal relationship was proven, this suggests that a higher biosecurity could lead to a higher daily weight gain, and therefore to better production results. Parts of both the external and internal biosecurity play a role in the influence on daily weight gain. Also from an economical point of view is this interesting since investments in biosecurity might lead to a higher income through improved production results. The association between the daily weight gain and the number of fattening pigs shows that the bigger the herd, the better the production results are.

The negative association between the biosecurity score and the TIUDDpig shows that on herds with a higher biosecurity less antimicrobial drugs are used compared to herds with a lower biosecurity. This suggests that the use of antimicrobials on a herd could be decreased by increasing the biosecurity level. Noticeable is that only the internal biosecurity had a significant influence on the TIUDDpig suggesting that the amount of antimicrobials used on a herd is influenced by the spread of pathogens within the herd and not so much on the pathogens entering the herd. The internal biosecurity deals with work and management strategies on the herd itself meaning that the farmers have the power to interfere themselves in contrast to the external biosecurity where the situation is to some extent more dependent on others (suppliers, etc.) or on the location of the herd. Yet, although significant relations were found, the low R²-values obtained indicate that a lot of unexplained variation remains present. Probably other factors, like the vaccination status of the herd, play a part in the amount of antimicrobial drugs used.

Conclusion

Improving the biosecurity level on a farm is a very useful tool in reducing the use of antimicrobial drugs and improving production figures. This is of interest to the individual farmer as well as to the whole pig-producing sector, since it will lower the costs, improve the profit and benefit the sustainability of pig production.

References

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