P6

Salmonella risk categorization of finnish fattening pig farms

Felin E.[1], Fredriksson-Ahomaa M.[1]

[1]University of Helsinki, Faculty of Veterinary Medicine, Department of Food Hygiene and Environmental Health, Helsinki, Finland

Introduction

Salmonella spp. prevalence in pigs is very low in Finland, Sweden and Norway compared to other European countries (EFSA and ECDC, 2018). The Finnish *Salmonella* Control Program for pigs includes bacteriological monitoring at slaughterhouses, and the prevalence of *Salmonella* culture-positive lymph node samples at slaughter has been < 0.1% and no *Salmonella* spp. have been found in carcass swabs or pork during the 2010s (Anon., 2017; https://www.ruokavirasto.fi/globalassets/teemat/zoonoosikeskus/zoonoosit/bakteerien-aiheuttamat-taudit/salmovalvontaohj_siat2016paivheinakuu2017.pdf, visited January 13, 2019). EFSA (2011) stated that incoming pig batches should be risk-ranked based on the herds' status of *Salmonella* spp. and suggested that this ranking could be based on historical serological testing of meat juice. This is in use in some European countries. We piloted serological *Salmonella* monitoring in Finnish context.

Material and Methods

Meat samples of ca. 10 g of muscle from the diaphragm were collected at slaughter from 1353 fattening pigs originating from 259 farms (mean 5 samples/farm). Blood samples at the end of the fattening period were collected from 1116 fattening pigs at 57 farms (mean 20 samples/farm). The *Salmonella* antibodies were analyzed using commercial ELISA tests: the SALMOTYPE Pig Screen test for meat juice (Labor Diagnostik GmbH, Leipzig, Germany) and the Pigtype® Salmonella Ab (Qiagen, Leipzig, Germany) for serum samples. A cut-off value OD20% was used. Farms were allocated into risk categories according to the within-farm seroprevalence using the Danish and German schemes (Alban et al., 2012; QS Qualität und Sicherheit GmbH, 2018) and our modified scheme (Table 3).

Results

Salmonella antibodies were detected in 3.1% of the meat juice samples and in 17.6% of the blood samples, using a cut-off value of OD20%. The OD values were low. Only 0.1% of meat juice samples and 1.9% of blood samples had OD values >40%.

All farms were in German category 1 (Table 1). Most (98%) farms were in Danish category 1 and only 2% of farms were in Danish category 2 (Table 2).

In our modified categorization, majority of the farms were allocated to the risk category 1 (within-farm seroprevalence < 20%), and only few (< 2%) farms had within-farm seroprevalences >40% (Table 3).

Table 1: Serological results from Finnish fattening pig farms allocated according to the German Salmonella control programme using a cut-off value OD40

Risk category	Meat juice samples (259 farms)	Serum samples (57 farms)	Corrective actions in German QS
Category 1, Low, within-farm seroprevalence ≤20%	100% of farms	100% of farms	None
Category 2, Medium, within-farm seroprevalence >20-40%	0% of farms	0% of farms	Check and document the hygiene status
Category 3, High, within-farm seroprevalence >40%	0% of farms	0% of farms	Bacteriological sampling, epidemiological investigation, corrective actions at farm

Table 2: Serological results from Finnish fattening pig farms allocated according to the Danish Salmonella control programme using cut-off value OD20%

Risk category	Meat juice samples (259 farms)	Serum samples (57 farms)	Corrective actions in Danish programme
Category 1, Low, within-farm seroprevalence <40%	98.1% of farms	98.2% of farms	None
Category 2, Medium, within-farm seroprevalence 40-65%	1.9% of farms	1.8% of farms	Penalty fee
Category 3, High, within-farm seroprevalence >65%b	0% of farms	0% of farms	Penalty fee, slaughtered separately

Table 3: Serological results from Finnish fattening pig farms allocated according to modified categories using a cut-off value of OD20%

Risk category	Meat juice samples (259 farms)	Serum samples (57 farms)
Category 1, Negligible, within-farm seroprevalence <20%	88.4% of farms	75.4% of farms
Category 2, Low, within-farm sero-prevalence 20-40%	9.7% of farms	22.8% of farms
Category 3, Medium/High, with-in-farm seroprevalence >40%	1.9% of farms	1.8% of farms

Discussion and Conclusion

Within-farm *Salmonella* seroprevalences were generally low in Finnish fattening pig farms. This reflects the favorable *Salmonella* situation of pig farms in Finland and is consistent with results from the Finnish National *Salmonella* Control Program. However, differences between farms were found, so serological monitoring could be used to direct preventive measures at the farms at risk, and to target microbiological sampling.

When allocating farms to risk categories, the targets of the programme and corrective actions must be considered. The German and Danish serological sampling programmes are part of their reduction strategies, while Finland is applying an eradication policy. Consequently, the German and Danish categorizations are not directly applicable in the Finnish context. We piloted a modified allocation of farms (Table 3). In category 2, the farmer could be recommended to self-check the biosecurity measures using a specific checklist. If meat juice samples were used, approximately 10% of the farms would fall within this category in the current Finnish situation. Category 3 would indicate an elevated food safety risk, which could result in bacteriological sampling and a biosecurity check at the farm in question. Approximately 2% of farms would fall into this Category 3 in the current Finnish situation. The eradication decision cannot be based only on highly sensitive serological monitoring, because the cost of *Salmonella* eradication is very high on pig farms (Finnish Food Safety Authority Evira, 2018). In the Finnish context, subsequent procedures for eradicating the pathogen from a farm would follow whenever *Salmonella* spp. is isolated from animals at the farm. This modified categorization system is only an example, and it would need to be adjusted and optimized after additional data collection.

Serological *Salmonella* monitoring would provide us with large-scale farm-level data which would enable us to follow farm-level trends and detect changes readily and sensitively. However, in Finland this would have only a limited positive impact on food safety, because the current situation is already excellent. Therefore, a cost-benefit analysis should be conducted before applying the method in practice.

References

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