CONTROL OF SALMONELLA IN PIG HERDS:
IMPROVED HOUSING AND MANAGEMENT

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In 1993 an analysis indicated that Danish pig meat had a high content of salmonella. Therefore, the Federation of Danish Pig Producers and Slaughterhouses in collaboration with the Ministry of Agriculture agreed on a strategy to control salmonella in pork. One objective of this scheme was to control and eliminate transmission of salmonella from breeding and multiplier herds to production herds.

A salmonella index (SI) based on monthly salmonella titers had previously been developed to determine sales limitations for breeding and multiplier herds. Herds with an SI ≥ 15 were not allowed to sell any breeding stock due to high infection pressure, while herds with an SI < 15 were permitted to sell their offspring. With financial support from the Ministry of Agriculture a project involving 40 breeding and multiplier herds with an SI > 1 was started with the purpose of controlling and eliminate salmonella. The objective of the present study was to investigate whether it was possible to reduce salmonella infection pressure by improved housing and management in infected herds.

METHODS

Initially, infection profile of each herd involved in the project was established by blood and faeces sampling. In addition, housing and management procedures were analysed. Based on these measures, the owner, his pig production advisor and herd veterinarian developed a strategy with the purpose of reducing effects of stressors, infection pressure and transmission of disease within each herd.

Effects of improved housing and management on salmonella infection pressure were then measured by questionnaire in the first 20 multiplier and breeding and multiplier herds that initiated a scheme to control salmonella. Effects of measures were estimated from herd-SI:

3 months pre-control Average of 3 SIs prior to initiating measures to control salmonella.
3 months post-control Average of 3 SIs after conclusion of scheme to control salmonella.
12 months post-control Average of 12 SIs after conclusion of scheme to control salmonella.

Material: Typically, the breeding and multiplier herds had all been expanded over a period of several years. Therefore, the housing structure was compact with a somewhat random building layout (i.e., no specific measures were taken to reduce disease transmission within herd). As a consequence, transport of pigs, feed, personnel, etc. entailed a high risk of transferring disease between compartments and pig pens. Alike, open pen partitions within compartments comprised

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risk of disease transmission through nose-to-nose contact or faeces transfer. Due to the gradual expansion of herds individual pig houses varied with respect to age, quality and capacity and as consequence, control of infection pressure. Within the same farm some pig barns were operated as continuous flow while others were managed all-in all-out. Lack of capacity in some pig houses necessitated frequent moving and mixing of pigs, which entailed risk of exposing pigs to stress and infection.

RESULTS AND DISCUSSION

Salmonella indexes. Serological and faecal analyses revealed that all herds were infected with salmonella prior to incorporating any changes in housing and management. The farms were then grouped into “high” (H) herds (SI≥15, Fig. 1) and “low” (L) herds (SI<15, Fig. 2) according to their 3 months pre-control average. One farm was excluded from the analyses due to missing data.

![Salmonella Index](image)

Fig 1. Effect of control measures on Salmonella indexes (SI) in herds above the sales limitation (SI≥15) (data were only available for 2 months prior to initiating control measures for herds 5 and 6).

Average salmonella titres for a 3 and 12 month period following completion of control measures indicated that SI was below the sales limitation in 4 H-herds for the short term, while 5 out of 6 H-herds reduced infection rate below the sales limitation within the long term.

SI was low for the remaining 13 L-herds as indicated by 3 months pre-control averages. These herds maintained their SI below 15 both within the short and long term. Apparently, measures to control salmonella had only a recognisable effect in herd number 7, 8, and 10, while SI averages were similar in the remaining herds before and after implementing measures to control salmonella.
Salmonella index

Fig. 2. Effect of control measures on Salmonella indexes (SI) in herds below the sales limitation (SI<15) (data were only available for 2 months prior to initiating control measures for herds 18 and 19).

*Control measures.* Reductions in SI could not be attributed to any single component of housing and management. Control measures varied between herds.

Generally, all herds made efforts to reduce transmission of disease between compartments as well as between pens. Thus, open pen partitions were converted to closed ones to minimize nose-to-nose contact and transfer of faeces between pens. In larger herds continuous flow compartments were converted to all-in all-out management, while smaller herds started operating subsections of continuous flow compartments as all-in all-out.

All herds changed their working routines and developed a strategy for stock persons movements and transport of pigs within the herd. In some herds pigs were transported by a cart or trailer to prevent pigs from getting in contact with faeces or animals. Moreover, hygienic measures were modified from rather random cleaning procedures to more consistent ones that included high pressure cleaning as well as disinfection, drying and preheating compartments, pens and walkways prior to moving pigs. Only one set of cleaning tools were used for each compartment. Most herds developed a strategy for managing sick pigs, i.e. a set of criteria for euthanising or medical treatment.

All herds incorporated procedures for reducing stressors, such as minimizing mixing of pigs and adjustment of stocking rates. In addition, pen design, ventilation and heating were modified in some herds to improve environmental conditions.

*Conclusion.* All herds in this study used a systematic approach while developing a strategy for control of salmonella, which is probably the most efficient method while keeping costs of measures low. First, compartments with a high infection pressure was identified and second, housing and management procedures were analysed. Control of salmonella could not be attributed to any single component. Based on the analysis of housing and management procedures it is suggested that a wide range of measures should be incorporated in order to reduce infection pressure.