# Practical experiences with the reduction of prevalence of Salmonella infections in pig herds

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## Introduction

Salmonella reduction is an issue with still increasing importance for the swine production. PIC in Germany has already started with specific interventions to reduce Salmonella prevalence in their breeding herds in 2001 – just one year before the "QS Qualität und Sicherheit GmbH" began to set up the serological Salmonella monitoring in German finishing pigs. Including the breeding pig production in programmes implemented for Salmonella reduction is a sometimes underestimated prerequisite for Salmonella reduction in the entire pig and pig meat production chain. PIC herds with enhanced Salmonella prevalence have been identified by a continuous serological monitoring. The results from the serological monitoring were analysed with the help of PIC Health Database (Siebert, 2011) and a thorough on-farm analysis of potential risk factors leading to an individually tailored catalogue of measures for reducing the Salmonella prevalence in the specific herd.



## Method

In total 98 herds (grow out units for replacement gilts) were involved. The herds were monitored by a continuous blood sampling performed in market weight pigs (180 days of age). The sample size was 120 pigs per herd and year with a monthly sampling interval. Antibody titres were determined by ELISA according to the manufacturer's instructions. The results of the previous 3 months' serological samples were weighed 0.6:0.3:0.1 (the immediate month counting two times as much as the previous months), and the weighed average was called the "serological Salmonella index" like a modified danish System (Alban et al., 2002). Herds with a Salmonella index of more than 20 were classified as "problem herds" and selected for a thorough on-farm analysis. Epidemiological on-farm investigations were performed by regional veterinarians to evaluate the possible routes of Salmonella introduction into the herd as well as potential risk factors for the internal spread and reasons for the obviously insufficient levels of immunity.
Cross sectional blood sampling was performed in some herds to identify the time point of infection deduced from seroconversion. Samples for further investigations especially from the environment were only collected to substantiate suspicion, not to confirm well known risk factors. Antimicrobials were not used except for treatment of acute salmonellosis.

## Results

Already in the first year of action 13 out of 98 herds were classified as problem herds due to enhanced Salmonella seroprevalence. In the majority of the problem herds a number of various risk factors was identified while cases where only one risk factor caused the problem were very rare. The multi-causal genesis of enhanced Salmonella prevalences and the according control measures are demonstrated by the following examples:

1. Herd (800 pigs; 28-110 kg), continuous, slight increase in the number of seropositive pigs within 12 month
   Risk factors analysed:
   a. High pressure cleaning of the central corridor with unclosed door ventilation allowing a direct contact of the pigs to the incoming water spray. >> Closing all door vents before cleaning the central corridor with a high pressure cleaner.
   b. No strict AI-AO regime implemented; pigs failed to reach market weight in time were integrated into groups of younger pigs. >> Implementation of strict AI-AO regime combined with diligent cleaning and disinfection.
   c. Feed ration containing more than 50% wheat and triticale. >> Ration with a minimum of 30% barley.
2. Herd (1.100 pigs; 28-110 kg), distinct increase seropositive pigs 3 months after beginning of reconstruction works:

Risk factors analysed:

a. Strong rodent infestation. >> Implementation of strict pest control measures.
b. Pelleted feed with only a spot of barley. >> Amending the physical form (meal instead of pellets) and composition of the diet (≥ 30% barley), supplementation of organic acids.

3. Herd (950 pig; 28-110 kg), 20 to 40% seropositive pigs for a long time period in spite of good hygiene and ad equate feeding.
   Risk factors analysed:
   a. Overcrowding of the pens during the first 6 weeks (10 to 16 weeks of age) due to limited barn capacities. >> Enhancing the barn capacities by construction measures according to the number of pigs that needs to be housed.
   b. Regrouping of the smallest pigs from the overcrowded pens after 6 weeks when an additional unit becomes available.>> Implementation of a strict AI-AO policy without any regrouping of pigs.
4. Outdoor herd (600 pigs; 7-28 kg), more than 40 % seropositive pigs for a longer time.
   Risk factors analysed:
   a. Deficiencies in the pig flow in the nursery units. Nursery pigs with obvious growth retardation were kept in the nursery unit for a longer time and mixed with younger pigs weaned from the subsequent farrowing groups. >> Implementation of a strict AI-AO policy without any regrouping of nursery pigs.
   b. Small amounts of faeces visible on the floor of cleaned and empty pens. >> Diligent cleaning of empty units with subsequent control of the cleaning measures.
   c. Strong rodent infestation >> Implementation of strict pest control measures.

In all these herds it was possible to reduce the serological Salmonella index within 12 month to <20 by implementing the measures described.



## Discussion

In all cases described the Salmonella seroprevalence could be significantly reduced by the means of a thorough on-farm analysis followed by an intensive instruction of the farmer. Today, all PIC herds are classified in the best possible Salmonella category (I). In contrast, only 83% of the finishing pig herds in Germany have been classified to this category in the first quarter of 2011 (May et al., 2011). The success of the PIC Salmonella monitoring in breeding herds strongly depends on the intensive cooperation between the regional veterinarians and the farmers (grosse Beilage, 2002). Improving biosecurity measures (quarantine, optimised working routines, AI-AO, age segregation, pest control, stress reduction), optimising hygiene conditions (cleaning and disinfection, correct high pressure cleaning, general health management) and adapting the feed (meal, enhanced barley portion, acid additives) could again be approved as the main factors for the reduction of salmonella prevalence. These factors that have already been identified by several studies and their positive effect to reduce Salmonella seroprevalence can be assessed as well evaluated (Hotes et al., 2010). The cases described above emphasise the necessity of a thorough on-farm analysis since the combination of risk factors impairing the course of Salmonella infection in the individual herd is highly variable.
With the Salmonella monitoring in breeding pig herds that has started already in 2001, PIC makes a valuable contribution to reduce Salmonella in the early stages of pig production chain.

## Conclusions

With the results of a thorough on-farm analysis followed by an intensive instruction of the farmer, it was possible to reduce the Salmonella seroprevalence in breeding pig herds significantly. Salmonella monitoring in pig breeding herds as the earliest stage of the pig production chain is a prerequisite for the successful reduction of Salmonella in pig meat.

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