

Results: Growth rate (gm/day), feed efficiency (kg gain/kg feed) and mortality were significantly improved ($p < 0.05$) for groups of pigs vaccinated with Enterisol Ileitis and using reduced amounts of in-feed medications, as compared to barns receiving conventional regimens of continuous medications throughout the finishing phase. An average of more than 6 grams of tylosin were removed per pig receiving vaccination. Additionally, more than 25 grams of tetracycline were removed, per pig, in two of the five trials utilizing this antimicrobial. Performance was improved while simultaneously reducing the amount of in-feed antimicrobials.

Discussion: In this study, immunization against *Lawsonia* improved performance as compared to matched non vaccinated, continuously medicated barns of pigs. Additionally, there were large periods of time where medication free feeds were used during the finishing phase, predominantly in later finishing where the majority of feed, and thus feed medications, are consumed. This may allow for more strategically placed therapeutic medications, whether directed at enteric or respiratory disease (Walter et al., 2000). This reduction of medication use with improved performance is in contrast to those efforts where medications have been removed without immunization to address enteric pathogens remaining in the environment (Nielsen, 2002).

Immunization against *Lawsonia* may allow pork producers and veterinarians to significantly reduce the use of in-feed antimicrobials in disease preventive and growth promoting roles. This would thus reduce overall reliance on antimicrobials in pork production. The potential impact on human health of such a reduction has yet to be ascertained. However, improving production and reducing the amount of in-feed antimicrobials would provide an economic incentive for producers to reduce use of medications in feeds and improve welfare for livestock.

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PI 05 Semi-quantitative Risk Evaluation for the Occurrence of *Salmonella* spec. in Swine Herds and Slaughter Plants

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Keywords: Salmonella load, critical points, bench marking, intervention strategies

Summary: The implementation of a "Salmonella Monitoring and Reduction Programme" in the framework of the emerging national quality assurance programme (it is called the "QS-System") for food products (starting with pork) in Germany has led to the necessity to provide farmers and slaughter

plants with guidelines for a) how to identify the critical points on their own farm and in their own slaughter plant that could be “responsible” for a high *Salmonella* load of the final product (= live slaughter pigs in case of the farm or carcasses and cut meat in case of the slaughter plant), and b) how to develop a “HACCP-like” plan for a measurable reduction of the salmonella load. The paper describes the development of check lists that can be used for both benchmarking and identifying “weak points” as basis for targeted intervention strategies in the framework of continuous improvement programmes.

Introduction: Since the 1st Int. Symp. on the Epidemiology and Control of Salmonella in Pork in Ames in 1996, many studies on the prevalence of *Salmonella* antibodies in sera and meat juice (e.g. Nielsen et al., 2001; Koefer et al., 2001; von Altröck, 2001), and on the prevalence of *Salmonella* spec. in slaughter pigs (e.g. Davies, 2001) and in pigs on the farm (e.g. Gibson et al., 2001; Erdman et al., 2001; Szaszak, et al., 2002) have been carried out. There are also several reports on salmonella-specific risk factors at farm level (e.g. Kranker and Dahl, 2001; Bahnson et al., 2001; Funk, 2001) during transport, lairage and slaughter (McKean et al., 2001; Hurd et al., 2001; Limpitakis et al., 2001) as well as several studies on the risk management using the HACCP concept (Bokma-Bakker and Mul, 2001). These many research projects and published studies from many countries (the cited literature are only selected examples) as well as those on the various intervention strategies have resulted in a quite good, although not yet complete, picture of the general prevalence of *Salmonella* spec. throughout the pork chain, on the risk factors and on the possibilities to reduce the occurrence of *Salmonella* spec. in pork. This growing general knowledge on *Salmonella* prevalence estimation has ploughed the field for the establishment of regional or national Salmonella monitoring and reduction programmes in several countries.

However, one experience after the start of the national programme in Germany (Anonymous, 2003; Blaha, 2003) is that pork producers with herds that have been classified as *Salmonella* high risk herds are not satisfied with the explanation of the general knowledge on risk factors. Apart from asking for quick “silver bullet” solutions, they want to know the reasons for their high Salmonella prevalence – especially in cases, where the general hygiene and biosecurity on the farm are high and well-observed. In other words, they do not want to know what ONE can do, but what THEY can do to identify their specific *Salmonella* infection sources and risk factors for their own farm. This expectation led to the need for developing a method for an at least semi-quantitative measurement of the specific risk factors of individual farms.

Material and Methods: Two approaches to identify infection sources, contamination-infection cycles and risk factors for the high Salmonella prevalence of swine herds were combined:

1) Traditional samples of various materials on high risk farms (= “Category III farms” with a high percentage of salmonella-antibody positive meat juices) with a remarkably high hygiene status and a reliable biosecurity system, such as: feces samples from individual animals and or from pens, swabs from various materials that pigs have directly contact with (walls, troughs, pen separation material, tools, boots etc.), swabs from areas that pigs can have only indirectly contact with, as well as specimens from feed and water, were investigated culturally for *Salmonella* spec.

2) Based on the general knowledge on how to establish a HACCP programme, and on common risk factors for the occurrence of *Salmonella* spec., the production system and the production procedure of swine farms was divided into its components from animal supply, feed supply, feeding procedure, water supply, watering system, barn equipment, daily working procedures, tool usage, waste management, animal flow, shipping procedure, cleaning and disinfection etc. etc. to be able to establish per component salmonella-specific CCP's.

The culturing of the various animal and farm samples was to a) verify the theoretical assumptions of the reasons for the identified *Salmonella* sources and risk factors, and b) identify “new” sources that are not taken into account by the traditional hygiene and biosecurity programmes (hence the decision to deal mainly with salmonella-antibody positive herds that have a high hygiene status and an at least good biosecurity). Then the theoretical and “new” salmonella-specific CCP's per component

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were established and listed as the basis for a check list that provides per component and per CCP a semi-quantitative ranging of the CCP in question from ten points (best scenario) down to zero points (worst scenario).

After having started with this development at several farms, it became obvious that the same approach is reasonable for slaughter plants (developing a salmonella-specific HACCP-like system for establishing salmonella-specific CCP's per production component of the slaughter and processing procedure.

Results: The combination of both approaches has led to three semi-quantitative check lists that are currently used for their evaluation and improvement by applying them to herds with high and low *Salmonella* loads (as determined by the German national Salmonella programme). One check list is used just for finisher herds (in disrespect whether it is in a closed system or not), one check list is used for sow herds that supply finisher herds and or breeding herds with production or replacement animals, and one check list for slaughter plants starting with the transport and lairage procedure.

Conclusions: Although the check lists are still in the process of being tested and evaluated, two preliminary conclusions can already be drawn as far as the identification of weak points is concerned:

- 1) There are many salmonella-specific "hygiene breaches" even in the cleanest farm environments that have been overlooked so far since they are not tackled with by the traditional cleaning and disinfection procedures (dust in fan in- and outlets, dirt under pen separation walls or under feed and/or water troughs, never washed scales used for all pigs once or twice during a production cycle, etc. etc.). This means that improving the quality of the general hygiene and biosecurity is important, but additionally to these measures, a targeted (check list aided) search for "non-traditional" salmonella-specific weak points is inevitable.
- 2) Identifying commonly known risk factors (= low hygiene farms) or "new" salmonella-specific risk factors (high hygiene with "hidden" hygiene breaches) does not necessarily mean that the Salmonella load is "automatically" high, as many may expect. However, this does not mean that the developed check lists are of no value for salmonella programmes. Their value is that a) farm and slaughter plant managers that have an acute "Salmonella problem" can use them to detect "weak points" as basis for improvement measures, and b) farm and slaughter plant managers that have no acute problem, but a higher risk of having an acute problem can use the check list results for proactively reduce the identified risk.

The three check lists have been used so far on many and several slaughter plants. It has turned out that farm owners and managers as well as slaughter plant managers are highly interested in both the identification of salmonella-specific weak points and in the benchmarking that is provided by the semi-quantitative approach of the check lists, the latter is appreciated in particular by managers of production systems with various farms belonging to one pork production system and by the managers of the slaughter and processing industry when several plants belong to one company.

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***Salmonella* Typhimurium CARRIAGE at slaughter AFTER an enterocolitis outbreak in a swine herd**

PS 01

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Summary: The aim of this study was to estimate the prevalence of slaughter pigs carrying *Salmonella* Typhimurium after a enterocolitis outbreak in a commercial pig farm. A cross-sectional study was done during the slaughter of a batch of 86 animals. Mesenteric lymph nodes from 43 pigs were collected and pre-enriched in buffered peptone water (1:10) overnight at 37AC Afterwards, aliquots of 1mL and 0.1mL were transferred to selenite-cystine and Rappaport-Vassiliadis broth, respectively. A loopful of each sample was streaked onto XLT4 and brilliant green agar plates, which were incubated at 37AC for 24 hours. *Salmonella* was cultured in 23 out of 43 collected samples (53.48%). *Salmonella* Typhimurim (13 strains) and *Salmonella enterica* subs. *enterica* 1,4,5,12:i:- (10 strains) were isolated. These results indicated that the slaughter of pigs from batches previously affected by enteric salmonellosis may represent a high risk for pork contamination, since there is an positive association between infected pigs before slaughter and carcass contamination.

Keywords: Carcass, Lymph nodes, Outbreak, Pigs, Pork

Introduction: In the last decades, the pattern of *Salmonella* serotypes involved in clinical salmonellosis in pigs has changed in some countries. There has been a continuous increase in the incidence of salmonellosis caused by non-adapted serotypes, such as *Salmonella* Typhimurium, compared to those caused by *Salmonella* Choleraesuis. Some reports have already shown the long-term shedding of *Salmonella* Typhimurium after experimental inoculation (Wood and Rose, 1992; Van Winsen et al., 2001.). The aim of this study was to estimate the prevalence of pigs carrying *Salmonella* at slaughter, which were originated from a herd previously affected by an enterocolitis outbreak confirmed as salmonellosis.