efficiency). By the end of the trial, the mean prevalence of pens from which Salmonella was isolated at least once was 42% (95% ci 27% - 58%) for comparison farms and 38% (95% ci 22% - 53%) for intervention farms. The prevalence of MJ ELISA positive pigs was 40% (95% ci 26% - 58%) on intervention farms and 58% (95% ci 41% - 75%) on comparison farms; this difference was not statistically significant (t-test; p=0.118). It was noted that one farm in the intervention group had no Salmonella isolated from any pen during the trial and only one of the 40 pigs tested had a positive MJ ELISA result. The data were used to investigate the impact of the prevalence of infected pens at the first sampling visit upon the outcome of the trial. There was a significant relationship between the prevalence of infected pens at the start of the trial and of the prevalence of pens that were ever infected (p<0.001). This is unsurprising, since across the whole trial 324 out of a total of 787 pen samples were positive and 242 of these occurred at the first visit. A pen from which Salmonella had been isolated on the first visit was nearly twice as likely to have Salmonella isolated on a subsequent occasion, compared to a pen that was negative on the first visit (odds ratio = 1.9; 95% ci 1.2 – 2.9). No significant association was detected between the prevalence of infected pens at the first visit and the prevalence of MJ ELISA positive pigs.

Discussion: This trial was conducted on a group of farms that already had a good awareness of biosecurity and hygiene. The intervention group achieved a commendable increase in their activities, but this was not rewarded by a significant decrease in either the prevalence of infected pens or of MJ ELISA positive pigs. However, this trial was relatively small and the results are compatible with a potentially important reduction in Salmonella. Thus, a more extensive trial is justified. A major factor that may confound the beneficial effects of the intervention was the level of infection introduced by weaners.

Acknowledgments: This study was funded by Defra (OZ0316). We are grateful to all the farmers who volunteered for this study.

References:

O 49 Selection of finishing pig herds with a low Salmonella prevalence for logistic slaughtering.
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Summary: The aim of this study was to select 50 herds with a low Salmonella-contamination rate. Per herd 40 blood samples were collected which had to be negative for antibodies against Salmonella. Infection of the pigs at the abattoir was measured by culturing tonsils for Salmonella. The results showed that not enough herds could be selected when the original criteria were applied. Less strict criteria had to be applied. We conclude from this trial that it is possible to select herds with a lower Salmonella-prevalence resulting in a lower introduction of Salmonella into the abattoir. Strict criteria must be applied to select herds with a minimal risk of being Salmonella-positive. To select Salmonella-free herds bacteriological examinations are necessary in addition to serological screening. Prolonged monitoring with a high frequency is necessary. We conclude that the effectiveness of the cleaning and disinfection protocols for transport vehicles should be improved.
Keywords: Elisa, Bacteriology, carcass contamination, abattoir, transport

Introduction: A trial study was set up with the aim to demonstrate that it is possible to produce pig carcasses with a very low Salmonella-contamination rate under practical abattoir conditions. The trial consisted of two phases, in the first phase the aim was to select 50 herds with a low Salmonella prevalence and in the second phase the hypothesis was tested that a system of logistic slaughter can produce pig carcasses with a low Salmonella contamination rate. 219 Herds were pre-selected from the regular suppliers of the abattoir to participate in phase 1. To select herds, blood samples were taken at the abattoir and tested in a Salmonella-mix-ELISA (Idexx). To demonstrate a prevalence of less than 5%, with a level of confidence of 95%, 40 blood samples have to be taken (van der Wolf et al., 2001) which all must have a negative test result. This paper describes the results of the herd selection process, Mrs. Swanenburg will present the results of the second phase.

Materials and Methods: To avoid the influence of clustering at least 4 batches of pigs of each pre-selected herd had to be tested with a maximum of 10 blood samples collected per batch. Blood samples were tested in the Dutch Salmonella mix ELISA (Idexx) using a cut-off OD% > 10%. Lorries that delivered a batch of pigs to the abattoir were sampled directly after the pigs were unloaded by taking five faeces droppings (total 25 gr) from the floor of the lorry. From herds that were selected for the logistic slaughter trial and from which one lorry sample was positive, four pooled faecal samples were collected during a visit to the herd. Each pooled faecal sample represented one compartment and consisted of at least one fresh dropping from the floor of every pen (8 – 10) in the compartment. Culturing of faeces was done to demonstrate the presence of Salmonella (qualitative), using standard microbiological culturing including non-selective pre-enrichment (BPW), selective enrichment (RV or TTB) and sero-typing. Final sero- and phagetyping was done at the Salmonella-NRL. Statistical analysis was done with the Fisher exact test in the program Statistix for Windows 7.0. P-values of less than 0.05 were considered to be significant.

Results: A total of 7646 blood samples were collected and tested (Table 1). Salmonella was isolated from 49 (45%) of the total of 109 lorry faecal samples. Three herds were excluded from the trial because both lorry faecal samples were positive. Combining the results of the serological and faecal investigations resulted in the selection of 24 herds to participate in the trial. However, since the aim was to select 50 herds less strict criteria were used to select additional herds (Table 2). During the start of phase 2 twenty herds were visited during which visit pen faecal samples were collected. Salmonella was isolated in 9 out of 20 herds (45%). In one herd the serology was also positive. Of these 20 herds 10 were selected based on the original selection criteria. Of these 10 herds 3 tested positive. Of the 9 remaining herds (one was serologically and bacteriologically positive) which were selected based on the less strict criteria 6 herds tested positive. This difference is large but not statistically significant (Statistix 7.0, Fisher Exact test, upper tail, P=0.08).

Discussion: All stages of the production process - herd, transport and lairage - have to contribute to a low level of contamination of slaughter pigs with Salmonella because a laps in hygiene in any stage can result in contaminated pigs entering the abattoir. Due to the fact that not enough herds could be selected using the original criteria and less strict criteria had to be applied, the risk of herds not being Salmonella-free increased. This was confirmed by the observation that of the herds which were selected with the less strict criteria a larger number had Salmonella-positive pen faecal samples than the herds that were selected with the strict criteria. We conclude from this observation that the strict criteria are necessary to select herds with a minimum of risk of being Salmonella-infected. However, also the herds that were selected based on the less strict criteria were not completely Salmonella-free. There are three explanations for this. First, the assumption in the samples size (prevalence <5%), secondly, the level of confidence of 95%, and thirdly, the sensitivity of the Salmonella mix-ELISA test is not 100% but only 85 to 90%. We conclude from this that bacteriological investigations could be useful in addition to serological investigations to select Salmonella-free herds. An additional problem encountered is that the Salmonella-status of herd can change with time. We conclude that repeated sampling is crucial for a good assessment of the Salmonella-
status. Bacteriology of the faecal samples from the lorries shows that they are frequently contaminated with Salmonella. Our data suggest that the contamination could not always be attributed to the just unloaded pigs. In six herds, blood and pen faecal samples were all negative while one or more corresponding samples of the lorries were positive. The Salmonella serotypes found on the lorries would, if they had been present in the herd, have given a clear serological response in the Salmonella mix-ELISA test. Therefore we conclude that the effectiveness of the cleaning and disinfection protocols should be improved.

Acknowledgement: The authors thank the participating abattoir and their employees, the laboratory of the Animal Health Service, CCL Nutricontrol and Jan Lommerse for their help in this study. The Authors thank the Product Boards for Livestock, Meat and Eggs for financing this study.

References:

Table 1. Results of the serological testing for antibodies against Salmonella (cut-off%=10\(^2\)) in blood samples from 219 finishing pig herds.

<table>
<thead>
<tr>
<th>Percentage positive samples</th>
<th>Number of herds per category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>39 (17.8%)</td>
</tr>
<tr>
<td>&gt;0-25%(^{a})</td>
<td>118 (53.9%)</td>
</tr>
<tr>
<td>&gt;25-50%</td>
<td>41 (18.7%)</td>
</tr>
<tr>
<td>&gt;50-75%</td>
<td>13 (5.9%)</td>
</tr>
<tr>
<td>&gt;75%</td>
<td>8 (3.6%)</td>
</tr>
</tbody>
</table>

\(^{a}\) results with an OD\(^2\)-value > 10 are considered positive.

\(^{b}\) percentage positive samples of the total number of samples per herd.

Table 2. Selection criteria for participation in the trial and number of selected herds.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Number of herds</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 or more blood samples, all negative, maximum 1 positive lorry faecal sample(^{a})</td>
<td>24</td>
</tr>
<tr>
<td>60 or more blood samples, maximum 1 positive, maximum 1 positive lorry faecal sample(^{b})</td>
<td>17</td>
</tr>
<tr>
<td>20 or more blood samples, all negative, no positive lorry faecal samples(^{b})</td>
<td>9</td>
</tr>
<tr>
<td>45 blood samples, 1 positive, no positive lorry faecal samples(^{b})</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
</tr>
</tbody>
</table>

\(^{a}\) A: initial criterion, B: Criterion added later on.

Cost-effectiveness of Salmonella control in the pork chain using maximum acceptable prevalence levels

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Summary: To motivate stages in the pork chain to control Salmonella, Maximum Acceptable Prevalence (MAP) levels can be defined whereas exceeding these levels results in a penalty. A simulation model was used to determine the effect of different control strategies on the prevalence of contaminated carcasses. Not implementing any control strategy in the chain is not the cheapest option in case the revenues per batch of carcasses depend on the prevalence. Hence segmentation of batches of carcasses based on their prevalence can be useful to increase food safety.

Keywords: food safety, economic evaluation

Introduction: To control the food safety of pork with respect to Salmonella contamination, multiple stages of the supply chain have to be involved (Berends et al. 1998). The basic end-product of the pork chain is