CROSS-SECTIONAL STUDY OF ANTIBODIES AGAINST SALMONELLA IN DANISH SOWS

Hanne Bak* and Dan Bysted

1Danish Food and Veterinary Research, Bülowsvej 27, 1790 København V, Denmark. hba@dfvf.dk; 2Danish Bacon and Meat council, Copenhagen, Denmark

Abstract The study examined the level of Salmonella antibodies in Danish sows comparing breeding and multiplying (B&M) herds with production herds. From B&M herds, blood samples were taken from sows in the herds, and from production herds, blood samples were taken at a slaughterhouse. All samples were analysed for Salmonella antibodies in the ELISA from the national surveillance program with results expressed as OD%. Results from the two types of herds were compared with Students t-test using a cut-off value of p=0.05. Totally, 757 samples were included in the analysis, among these 209 were from B&M herds, and 548 were from production herds. The mean OD% was 12.31 in the B&M herds and 19.15 in the production herds. The comparison of the OD% in the two herd types gave a p-value of 0.0001. Therefore, the sows from B&M herds had a significantly lower level of antibodies than sows from production herds.

Introduction The level of infection with Salmonella in Danish pigs is monitored in a national surveillance and control program, where the slaughter pigs are monitored serologically (Mousing et al., 1997). When problem herds are identified serologically, these herds and their suppliers undergo bacteriological examinations (Bysted et al., 2002).

The level of Salmonella infection in the Danish sow herds is monitored indirectly, because a sow herd with a high level of Salmonella infection will have a high likelihood of being pointed out for bacteriological examination, when the herd has delivered Salmonella infected pigs to grower or fattening units. The Danish breeding and multiplying herds are monitored more closely by monthly serological analyses of blood samples from the growers, and a Salmonella index is calculated.

Only few studies have been carried out with focus on the serological profiles for Salmonella among sows, and the serological test is not validated for use on sow blood samples. The purpose of the present study was to obtain an impression of the serological status of the Danish sows with respect to Salmonella antibodies. Furthermore, samples were taken both from breeding and multiplying herds and from ordinary production herds in order to compare the level of Salmonella antibodies in herds monitored with different intensity.

Materials and Methods Blood samples were taken from 181 sows in 16 breeding and multiplying herds. In each herd the practicioning veterinarian took 10 (11 in one herd) samples during a routine visit. The veterinarians randomly selected the herds and the sows within the herds. For each sow, herd number in central husbandry register (CHR) and parity was recorded.

From sows in production herds, blood samples were taken at a slaughterhouse. Totally 69 samples were taken from live sows in the pens at the slaughterhouse, and 550 samples were collected immediately after slaughter of the sows. The CHR-numbers were recorded for the sampled sows. Since no information from the herds of origin was available, the slaughter weight was recorded as a rough measure of age (parity), but this could only be done for 414 sows.

All blood samples were analysed for Salmonella antibodies in the ELISA used in the surveillance program (Nielsen et al., 1995), and the results were expressed as OD% (Nielsen et al., 1998). A descriptive analysis including data control was carried out on the test results, and the test results from the two types of herds were compared with Students t-test using a cut-off value of p=0.05. The serological responses were compared to the parity/slaughter weight.

Results At the data control, 23 observations were deleted from the data set, because the animals were boars. Totally 14 of the herds, that delivered animals for the slaughterhouse, turned out to be breeding and multiplying herds, and therefore the 48 observations from these herds were moved to the other herd category. This resulted in a final data set with 757 observations, among these 209 were from breeding and multiplying herds, and 548 were from production herds. There were between 1 and 35 observations per herd (CHR-number), the mean value was 4.6 sows per herd. From 49 herds, only one sample was taken. The parities of the sampled sows were from 0 to 8.
with mean parity 2.5, and the slaughter weight was between 97 and 278 kg with mean value 177 kg. Table 1 and Figure 1 show a survey of the OD% found in the two types of sow herds. A comparison of the OD% of sows in the breeding and multiplying herds with the OD% of sows in the production herds showed a highly significant difference (p-value=0.00012), the OD% of the breeding and multiplying herds were the lowest. A simple plot of the OD% against either the parity or the weight for the individual sows showed no clear correlation between the OD% and the age.

Discussion There was a highly significant difference between the OD% of samples taken from sows in breeding and multiplying herds and samples from the sows from the ordinary production herds. The lower OD% found in the breeding and multiplying herds could in part be caused by the more intense surveillance of these herds, but the trading patterns for the breeding and multiplying herds and the production herds are also important. The breeding and multiplying herds often sell their pigs to several purchasers, whereas the production herds have a long-time agreement with a few purchasers. Therefore the consequences of a high level of Salmonella antibodies are more severe for the breeding and multiplying herds, because their purchasers change suppliers more often. The purchasers of the production herds are not likely to change supplier based on a serological index, but would merely base such a decision on problems in their own herd.

The monitoring of the Danish slaughter pigs have shown that around 10% of the pigs had a Salmonella OD% above the cut-off of 20 OD% (Anonymous, 2004). Among the sows, the number of positive samples was 27%, and in the production herds even higher, namely 31%. This difference could be caused by a higher cut-off value in the sows than in pigs given a higher background level of antibodies reacting in the Salmonella ELISA in older animals. The simple comparison of OD% and the age parameters for the individual sows revealed no clear correlation, but it was still possible, that a higher background level of antibodies was present with increasing age. In another study (Nielsen et al., 1995) the OD% of non-infected pigs increased slightly during 92 days, and this increase was explained by an increasing number of cross-reacting antibodies induced by other Enterobacteria. However, the data from the present study still indicates, that the level of Salmonella antibodies in the sows from the production herds was higher than in the slaughter pigs, because the percentage of samples with an OD% above 30 OD% was also higher than the level seen with cut-off 20 OD% in slaughter pigs. Therefore it could be concluded, that the higher number of samples with high Salmonella OD% in sows compared to slaughter pigs was at least in part caused by a higher level of Salmonella infection in the sows. The infection with Salmonella could be circulating in the sow population and be much more stable here than among the slaughter pigs.

Conclusion The sows from breeding and multiplying herds had a significantly lower level of antibodies than sows from production herds. The level of Salmonella antibodies among sows from production herds was higher than the level seen in slaughter pigs.

References
Table 1. Survey of data from analysis of blood samples from sows for antibodies to *Salmonella*

<table>
<thead>
<tr>
<th>Sow herd type</th>
<th># of samples</th>
<th>Salmonella OD%</th>
<th>% of samples with Salmonella OD%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. deviation</td>
</tr>
<tr>
<td>Breeding</td>
<td>209</td>
<td>12.31</td>
<td>17.81</td>
</tr>
<tr>
<td>Production</td>
<td>548</td>
<td>19.15</td>
<td>23.12</td>
</tr>
<tr>
<td>Total</td>
<td>757</td>
<td>17.26</td>
<td>21.99</td>
</tr>
</tbody>
</table>

Figure 1. Distribution of *Salmonella* antibodies in two types of sow herds