Analysis of the cause for Salmonella spread from bacteriological sampling of stall surroundings

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Abstract

The cause for Salmonella spread and reinfection was tried to be analysed and identified from bacteriological sampling of stall surroundings in 50 fattening farms and closed farms that had shown an increased prevalence of Salmonella detected by meat-juice-examination. In the bacteriological examination 388 samples of the stall surroundings were analysed. Only in 5 (3x rodent droppings, 1x stall dust and 1x animal feed) samples Salmonella Typhimurium was isolated. Generally, it was impossible to ascertain the reasons for Salmonella spread and reinfection in a farm with a positive meat-juice sample based on pathogen identification.

Introduction

Salmonellosis has become one of the most important food borne diseases in terms of both morbidity and economic cost with increasing incidence reported worldwide (BRYAN, 1988, NIELSEN, 2002, GARCIA, 2004). While Salmonella contamination of beef and poultry products exceeds the contamination of pork, a lot of research has focused on risk factors of Salmonella prevalence in pig herds, with the general aim to identify possible measures to reduce the Salmonella prevalence in slaughter pigs and to guarantee safe pork. Salmonella reduction programs in swine are becoming commonplace and will continue to be a primary focus of food safety initiatives (MOUSING et al., 1996). In many projects, efforts are now being made at farm level to reduce the incidence of Salmonella infected live animals (DAHL et al., 1996). Since Salmonella can be found widely in the environment and animals can be infected by Salmonella introduced by chronic carriers, contaminated feed or rodents, control is difficult to achieve (STRAW et al., 2006).

The aim of this study was to analyse and identify the cause for Salmonella spread and reinfection in swine farms that had shown an increased prevalence of Salmonella detected by meat-juice-examination from bacteriological sampling of stall surroundings.

Material and methods

In this study investigations of 50 fattening farms and closed farms were carried out. The proportion of seropositive reagents was lower than 20% in 4 fattening farms and 2 closed farms, whereas values between 20% and 39% were observed in 8 fattening farms and 7 closed farms. In 17 fattening as well as 12 closed farms more than 40% of the pigs examined at the slaughterhouse were seropositive. Individual sampling profiles were developed for each farm since typical bavarian agricultural practice does not facilitate systematic sampling.

A total of 388 samples comprising of rodent droppings (n=43), faeces (canine, feline and bovine) (n=16), stall dust (n=30), insects (n=8), feed (n=226), drinking water (n=59) and ground impression smears (n=6) underwent bacteriological examination (Tab. 1).
Table 1: The number of samples taken from different stall surroundings ordered to different types of business

<table>
<thead>
<tr>
<th>material</th>
<th>rodent droppings</th>
<th>feed</th>
<th>stall dust</th>
<th>drinking water</th>
<th>faeces</th>
<th>insects</th>
<th>ground impression smears</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of samples</td>
<td>43</td>
<td>226</td>
<td>30</td>
<td>59</td>
<td>16</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>closed farm</td>
<td>15</td>
<td>115</td>
<td>5</td>
<td>24</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>fattening farm</td>
<td>24</td>
<td>99</td>
<td>23</td>
<td>30</td>
<td>7</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>other farms</td>
<td>4</td>
<td>12</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Results**

Successful pathogen identification was rare despite the high percentage of farms with more than 40% positive reagents. *Salmonella Typhimurium* was isolated in only 5 (3x rodent droppings, 1x stall dust and 1x animal feed) of the 388 samples (Tab. 2).

Table 2: Results of bacterial examination from different stall surroundings

<table>
<thead>
<tr>
<th>material</th>
<th>rodent droppings</th>
<th>feed</th>
<th>stall dust</th>
<th>drinking water</th>
<th>faeces</th>
<th>insects</th>
<th>ground impression smears</th>
<th>Total number of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of samples</td>
<td>43</td>
<td>226</td>
<td>30</td>
<td>59</td>
<td>16</td>
<td>8</td>
<td>6</td>
<td>388</td>
</tr>
<tr>
<td>number of positive samples</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>positive samples (%)</td>
<td>7,0%</td>
<td>0,4%</td>
<td>3,3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2,6%</td>
</tr>
</tbody>
</table>

A positive bacterial identification was achieved in one fattening farm and 3 closed farms. In the fattening farm 25% of the meat-juice samples taken at the slaughterhouse were tested positive. The positive fraction was 32%, 88% and 100% in the closed farms. The identification of a pathogen entry-point due to *Salmonella* isolation from a feed sample was successful in only one of the 50 farms. A correlation between a high percentage of seropositive animals based on meat-juice evaluation and *Salmonella* spp. identification in swine farms was not established.

**Discussion**

The identification of the entry-point for *Salmonella* based on bacteriological examination of the stall surroundings is very difficult, because of the low rate of positive findings in the samples (BOHM, 1993, QUANTE, 2000, MEYER, 2004, RINCON et al., 2006). Furthermore it is only safe to determine the entry-point, if *Salmonella* is detected in faeces and if serovars in faeces and stall surroundings are matching. None the less results are indicating stall surroundings as a possible source of an infection with *Salmonella*. Respectively BAGGESEN et al. (1996) are describing the
distribution of Salmonella in the extra animal environment in Salmonella infected pig herds. In their opinion the environmental contamination may be enough to ensure the infection to newly introduced pigs. However only a repeated sampling and a sufficient large sample can make a statement on the presence of Salmonella in a herd.

Conclusions

Generally, it was impossible to ascertain the reasons for Salmonella spread and reinfection in a farm with a positive meat-juice sample based on pathogen identification.

References


DAHL, J., et al., 1996. Salmonella reduction at the farm level. 14th International Pig Veterinary Society Congress, Bologna, Italy, 181.

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