No effect of PRRSV infection on herd prevalence of *Salmonella enterica*

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**Introduction**

Researchers have demonstrated interactions between Porcine Reproductive and Respiratory Syndrome virus (PRRSV) and respiratory infectious agents such as swine influenza virus (1), porcine respiratory corona virus (1), *Mycoplasma hyopneumoniae* (2), *Streptococcus suis* (3,4), and *Salmonella cholerasuis* (5). In Denmark, field observations of increased within-herd seroprevalence of *Salmonella enterica* have been made concurrently with recent infection of PRRSV. We were interested in investigating whether these observations were random findings or whether recent infection with PRRSV alter the within-herd seroprevalence of *Salmonella enterica*.

Herds with a production of more than 100 slaughter pigs are continuously monitored for presence of antibodies against *Salmonella enterica* in the meat juice from meat samples (6). Meat samples from a herd are collected at the slaughterhouse by a semi-automated system that selects every nth animal from that herd. In recent years the national seroprevalence of *Salmonella enterica* has decreased (7). Furthermore, a serological testing system has been adjusted to analyze meat juice for antibodies against PRRSV (8). Approximately 1,000 PRRSV seronegative herds have been monitored for infection with PRRSV by this system since January 1998. The PRRSV infection status of a herd is monitored continuously at a rate of 3.33 samples per month (40 samples per year). The sensitivity of the test is estimated at 0.44 - 0.60. The test specificity is estimated at 0.98. The herd PRRS status changes from “PRRS negative” to “PRRS suspect” when 2 samples among the latest 10 samples are tested positive. “PRRS suspect” herds are verified “PRRS negative” or “PRRS positive” by the testing of 10 additional samples.

Due to sub-optimal test specificity, some herds classified as “PRRS suspect” are later verified “PRRS negative” by the testing of 10 additional samples. This allowed us to set up a control group in this study.

**Materials and Methods**

We conducted a cohort study of meat samples from farrow-to-finish and grower-to-finish herds monitored for *Salmonella enterica* and PRRSV in meat samples that 1) were declared free of infection with PRRSV by blood sampling in the period from June 1997 to January 1998, and 2) had a change in herd PRRS status from “PRRS negative” to “PRRS suspect” in the period from 1st January 1998 to 31st May 1998. In each herd the proportion of *Salmonella enterica* positive samples was calculated respectively before and after “PRRS suspect” herd status assignment. The period “after” was defined as 4 months following the date of “PRRS suspect” status assignment, and the value 1998 was inserted in a year-variable. The period “before” was defined as the same 4 months in 1997 to avoid influence of seasonality on *Salmonella enterica* seroprevalence.

The PRRS status in “PRRS suspect” herds was verified “PRRS negative” (Group 1) or “PRRS positive” (Group 2). The change over time in the proportion of *Salmonella enterica* positive samples of the two groups was compared. The number of positive animals were analyzed by a binomial model with herd as random effect, and year and group as explanatory, fixed variables.

**Results**

“PRRS suspect” status was assigned to 89 herds from January 1998 to May 1998. Forty-seven herds got PRRSV infected (group 2), and 42 herds remained PRRS negative (group 1). Crude data of *Salmonella enterica* test results are presented in table 1. In group 1, 6 herds experienced a decrease in Salmonella prevalence, and 2 herds experienced an increase during the study period (figure 1). In group 2, 10 herds experienced a decrease in salmonella prevalence, and 4 herds experienced an increase during the study period.

The odd’s ratio for Salmonella-test-positivity in 1998 compared with 1997 was 0.42 [95%CI: 0.23 - 0.75], and the odd’s ratio for Salmonella-test-positivity in group 2 compared with group 1 was 3.14 [95%CI: 1.68 - 5.87]. However, the rate of decline in Salmonella-test-positivity over time did not differ between the groups (odd’s ratio= 0.89 [95%CI: 0.40 – 2.02]).

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Discussion

We have no explanation for the fact that herds which got the PRRSV infection during the study period (group 2) already had a higher level of Salmonella sero-prevalence before PRRSV infection than group 1. It may be speculated that herds with a high Salmonella sero-prevalence are more susceptible to PRRSV infection but it seems more likely that an unidentified confounding factor increases the risks of getting the PRRSV infection and contributes to a high Salmonella prevalence. However, the design of this study was chosen to eliminate potential biases of this type. The study confirmed a decline in Salmonella sero-prevalence in Denmark from 1997 to 1998. The rate of decline in Salmonella sero-prevalence in herds which got the PRRSV infection during the study period was not different from the rate of decline measured in the control group.

Conclusion

Recent PRRSV infection has no effect on the prevalence of Salmonella in herds.

Table 1. *Salmonella enterica* test results in study herds

<table>
<thead>
<tr>
<th></th>
<th>1997</th>
<th></th>
<th>1998</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive samples</td>
<td>Negative samples</td>
<td>Percentage positive</td>
<td>Positive samples</td>
</tr>
<tr>
<td>Group 1 (PRRS- in 1997 and 1998)</td>
<td>37</td>
<td>1158</td>
<td>3.1%</td>
<td>20</td>
</tr>
<tr>
<td>Group 2 (PRRS- in 1997 and PRRS+ in 1998)</td>
<td>129</td>
<td>1146</td>
<td>10.1%</td>
<td>54</td>
</tr>
</tbody>
</table>

Figure 1. Herd frequency distribution of change in the proportion of *Salmonella enterica* positive samples. In each herd the change was calculated by subtracting the proportion in 1997 from the proportion in 1998.
References


