Vaccination to control Salmonella and improve weight gain in pigs

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Introduction

Immunization appears to be one of the most promising approaches for control of Salmonella on swine farms (1). Salmonella Choleraesuis vaccines are commercially available (2-3), however S. Choleraesuis does not appear to be a common pathogen in Ontario swine herds any longer (4). On the other hand Salmonella Typhimurium var. Copenhagen has become the most frequent serovar recovered on Ontario swine farms (4). The objectives of the present study were i) to determine if an autogenous S. Typhimurium vaccine or a commercial live S. Choleraesuis vaccine can reduce the prevalence of Salmonella shedding in pigs, ii) to determine if Salmonella shedding is associated with weight gain in pigs.

Materials and methods

The trial was conducted on one farrow-to-finish pig operation with the history of salmonellosis. Nine cohorts of weaned pigs, with approximately 350 pigs in each group, were randomly assigned S. Typhimurium bacterin, S. Choleraesuis vaccine, or as the control group. A Salmonella Typhimurium var Copenhagen strain was used to prepare the autogenous vaccine. In each cohort, one pen was randomly selected in the nursery stage and 30 pigs were ear-tagged and weighed. The tagged pigs were weighed again when marketing. Pooled fecal samples were collected bi-weekly from manure found on the pen floor and cultured for Salmonella. A Generalized Linear Latent and Mixed Models was used to compare the presence of Salmonella in the pooled fecal samples collected from the pens in three groups. A mixed linear regression method was applied to compare the average daily gain in the vaccinated and the control pigs.

Results

The prevalence of Salmonella shedding in each group is shown in Figure 1. The odds of Salmonella shedding during finisher stage in S. Choleraesuis vaccinated pigs [OR=5.2 (1.8, 15.5)] and S. Typhimurium vaccinated pigs [OR=3.3 (1.1, 9.9)] was higher than in the control group. The S. Choleraesuis vaccinated pigs were more likely to shed Salmonella compared to pigs which were vaccinated with S. Typhimurium bacterin. The control pigs which had the lowest average of Salmonella shedding showed the best growth performance compared to the vaccinated groups (Table 1). In addition, the pigs from pens with a higher Salmonella recovery rate were deemed to have a lower average daily gain.

Table 1: The impact of Salmonella vaccination on average daily gain in pigs

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Coefficient</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Choleraesuis</td>
<td>-26.6</td>
<td>-53.0, 0.27</td>
<td>0.048</td>
</tr>
<tr>
<td>S. Typhimurium</td>
<td>-90.8</td>
<td>-122.5, -59.0</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Control Reference</td>
<td>Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight at weaning (Kg)</td>
<td>4.7</td>
<td>0.7, 8.7</td>
<td>0.022</td>
</tr>
</tbody>
</table>

Discussion

The prevalence of Salmonella shedding was initially lower in the control group. Younger pigs are more likely to shed Salmonella than finisher pigs (5) and therefore our estimate of vaccine effectiveness may be biased because the decrease in shedding might be due to age. It is possible that vaccination was performed after pigs had been exposed and that efficacy might have been improved had the pigs been vaccinated sooner. At least one study suggests that it might be prudent to establish a vaccination strategy for pregnant sows to control Salmonella in their piglets (6). Another significant finding of this study is that pigs that appeared clinically healthy but were found to be shedding Salmonella grew slower than pigs not shedding Salmonella. This suggests that there is an economic cost to subclinical Salmonella infection and provides an economic incentive for producers to implement Salmonella control measures.

References