

Prevalence of *Salmonella* in the offspring of sows vaccinated with a live-attenuated *Salmonella* Typhimurium vaccine.

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Abstract

In this study, the efficacy of a live-attenuated *Salmonella* Typhimurium vaccine administered to pregnant sows in the breeding herd was evaluated as a means of reducing the prevalence of *Salmonella* infection in growing and finishing pigs. The results suggest no significant difference between the prevalence of *Salmonella* (all serovars) in the two groups of sows and their offspring. The lymph node and meat juice collected from carcasses of offspring showed no significant difference between the two groups, but the prevalence of *Salmonella* was significantly lower in the caecum content from pigs born of vaccinated sows. The farm had a very low prevalence of *S. Typhimurium*, which may explain the failure to detect any effect of the vaccine, as the majority of *Salmonella* on this farm was *S. Derby*.

Introduction

Salmonella infections are an important food safety problem; constant effort is needed to reduce the occurrence of *Salmonella* in pork, and interventions on farms can contribute to control the level of *Salmonella* in slaughter pigs. This trial aimed to evaluate the efficacy of a vaccine to reduce the level of *Salmonella* Typhimurium and other serovars in the offspring of vaccinated sows. The objective was not only to compare the prevalence of *Salmonella* and *Salmonella* infection (antibodies), but also to evaluate the efficacy of the vaccine to reduce the level of *Salmonella* shedding in pregnant sows.

Materials and methods

Three groups of sows were vaccinated antepartum using two injections given to the sows at a three-week interval (6 weeks and 3 weeks antepartum). A further three groups of sows were selected as control groups on alternate weeks to the vaccinated groups. Fifty-five vaccinated sows and 60 non-vaccinated sows were recruited, but only 51 vaccinated sows and 52 non-vaccinated sows and their offspring were followed on this 400-sow "breeding-finishing" holding. Some sows were dropped due to being culled, failure to farrow at the expected date or due to samples being missed. At weaning, piglets were tattooed with their sow's ID so that they could be traced back to their litter of origin.

To monitor *Salmonella* levels, individual or pooled faecal samples were taken from sows prior to the vaccination and up to a week after the litter had been weaned. Sows were sampled six weeks before farrowing (vaccination day), one week before farrowing, one week after farrowing, at weaning and one week after weaning. Pooled faecal samples were taken from their offspring a week after birth, at weaning, 3 days after weaning, 2 weeks after weaning and one week after moving to the finishing pens. At weaning, piglets from one litter were kept together and mixed with other litters from the same group only.

Further samples—meat juice, lymph nodes and caecum contents—were taken from carcasses in abattoirs on various days. At slaughter, 113 carcasses of pigs born of 42 vaccinated sows and 87 carcasses of 37 non-vaccinated sows were sampled. However, not all three samples were taken from each carcass. Faecal samples, lymph nodes and caecum contents were cultured for *Salmonella* using a semi solid selective medium (MSRV) and a chromogenic differential medium (Rambach agar) whereas meat juice samples were tested for antibody responses using a whole cell-based isotype-specific enzyme-linked immunosorbent assay (ELISA).

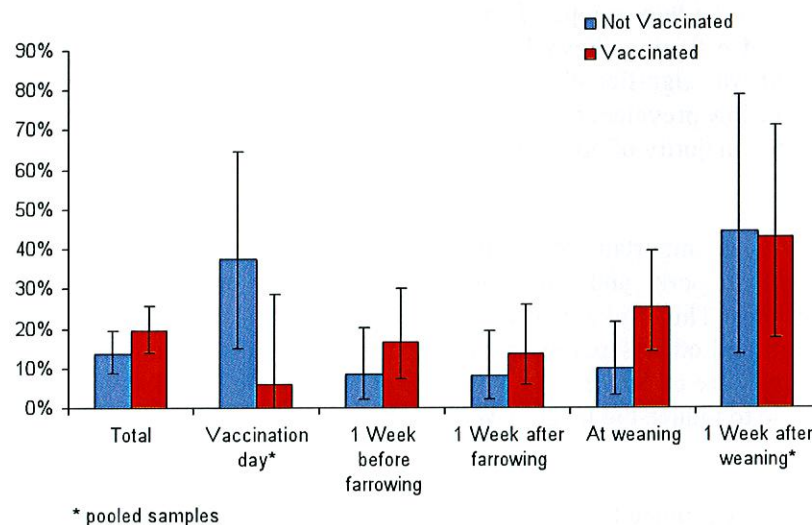
Results

A total of 103 sows were followed through the study and 1054 piglets born to these sows (506 piglets born of non-vaccinated sows and 548 piglets of vaccinated sows). Both individual and pooled faecal samples were taken at different time point.

Overall, 16.5% of samples from the sows and 19.6% from the piglets tested positive for *Salmonella*, with *S. Derby* being the most frequent serotype identified. No *S. Typhimurium* was identified in the sows.

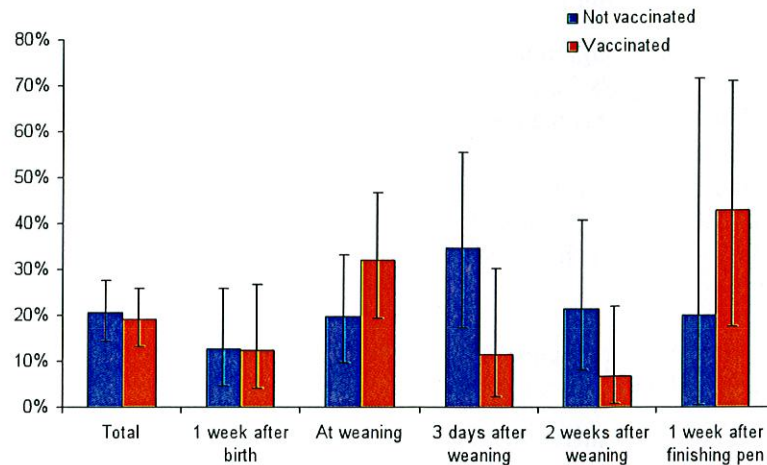
Figure 1 shows the percentage of samples from vaccinated and non-vaccinated sows that tested positive for *Salmonella* at each stage from pregnancy to weaning with binomial confidence intervals also shown. The results from the “vaccination day” and “1 week after weaning” stage were from pooled samples whereas individual samples were used at the other stages. There was no statistical difference between the prevalence of *Salmonella* in each of the two groups at any of the time points suggesting that the vaccine did not have a significant effect in reducing *Salmonella* shedding in the sows over the study period.

Figure 1. Percentage of samples taken from vaccinated and non-vaccinated sows that were positive for *Salmonella* at different points in the farrowing cycle.



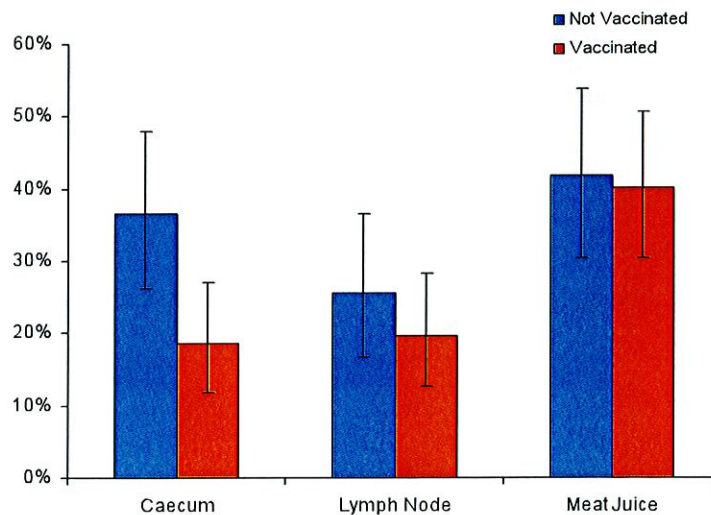
The results for the piglets of these sows are shown in Figure 2 with binomial confidence intervals. A total of 157 sample results were obtained from piglets of non-vaccinated sows, of which 20.4% were positive for *Salmonella* over the study. In comparison, 160 samples from piglets of vaccinated sows showed a prevalence of 20.0%. Again the *Salmonella* prevalence from the pooled faecal samples was variable over time but there was no significant difference between the two groups at any of the time points taking into account the correlation between piglets in the same litter.

Figure 2. Percentage of samples taken from piglets born of vaccinated and non-vaccinated sows that were positive for *Salmonella* at different time points in the study



At slaughter, three samples were collected from carcasses of the study piglets: ileo-caecal lymph nodes, caecal content and meat juice. Figure 3 shows the different sample types and the percentage of samples that tested positive for *Salmonella* for the two study groups. There was no significant difference in the prevalence of *Salmonella* in the lymph node (25.6% positive from non-vaccinated group (NV) versus 19.6% for the vaccinated group (V)) or meat juice (41.9% (NV) versus 40.2% (V)) results between the groups. The results of the caecum samples did show a significant difference between the two groups with the vaccinated group having a prevalence of 18.6%, compared to 36.6% in the piglets from non-vaccinated sows ($p=0.005$).

Figure 3. Different sample types taken from carcasses of pigs born of vaccinated and non-vaccinated sows and the percentage of samples that tested positive for *Salmonella* in the two groups.



Discussion

For this trial, the Salmoporc® STM (*S. Typhimurium*) vaccine was used in an attempt to reduce the prevalence of *Salmonella* shedding in sows and in the offspring of vaccinated sows at slaughter.

The vaccine trialled here was specific to STM. However, the first set of samples taken from the sows prior to farrowing and vaccination revealed that sows on this farm were not positive with *S. Typhimurium*; only *S. Derby* was isolated. This apparently low prevalence of STM on the farm may explain the lack of significant findings. Though the majority of isolates from the offspring of vaccinated sows were also *S.*

Derby, *S. Typhimurium* was also isolated in these groups, albeit at a low prevalence. There were too few STM positive samples (n=12) to carry out a meaningful statistical analysis.

Sows and piglets from both groups, though not mixed, were kept in the same facilities in pens or rooms next to each other. While sows or piglets from one group were not directly mixed with the other group, contacts were possible, and pens or rooms may or may not have been cleaned between each batch. This may have affected the vaccine effect.

Abattoir results also confirmed that the vaccine did not have a significant effect in reducing the prevalence of *Salmonella* in offspring. Though the prevalence of *Salmonella* was significantly lower in the caecum content, it is difficult to confirm whether this is due to the vaccine or other uncontrollable factors.

Conclusions

This study did not show a significant reduction in *Salmonella* shedding due to the vaccine in either sows or their offspring when compared with non-vaccinated groups on the same farm.

At slaughter, there was no significant difference in the prevalence of *Salmonella* in lymph node or meat juice ELISA samples in the offspring of vaccinated and non-vaccinated sows. However, there was a significant beneficial difference between the prevalence of *Salmonella* in caecal samples.

This trial studied a small number of sows and piglets from one farm. Many factors were not controlled—housing, management, pig movements, abattoir lairage pens—and these may have influenced the prevalence of *Salmonella*. The significant beneficial effect on the level of *Salmonella* in the caecum content of the offspring offered some hope but this trial needs to be repeated on farms with higher STM prevalence to confirm the effect.

Acknowledgements

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References

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