Development of challenge models to evaluate the efficacy of a vaccine to reduce carriage of *Salmonella* in peripheral lymph nodes of cattle


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Abstract

Because challenge models to infect peripheral lymph nodes (PLNs) with *Salmonella* have not been reported, we performed a series of experiments to develop and refine challenge models to evaluate an intervention applied at the animal level and to provide initial estimates of efficacy of an intervention (i.e., a vaccine) to aid in the design of future studies. In each of four experiments, steers (control or vaccinated) were inoculated with *Salmonella* strains Montevideo or Newport, and in experiment IV, *Salmonella* Senftenberg was also used. Calves were euthanized 14 to 42 days post-inoculation, and PLNs were collected. In the first experiment, calves were challenged with \( \sim 10^{10} \) *Salmonella* cells, and few treatment differences were observed 14 days post-challenge. However, by day 21, *Salmonella* Newport was recovered from fewer vaccinated calves than control calves (\( P < 0.05 \)). In experiment II, calves were challenged with \( \sim 10^7 \) *Salmonella* cells and, after two necropsies (14 and 28 days post-challenge), only one lymph node was *Salmonella* positive; therefore, the study was terminated. In experiment III, calves were again challenged with \( \sim 10^{10} \) *Salmonella* cells, and no significant effect of vaccine was observed in calves challenged with Montevideo or Newport strains. A transdermal route of challenge was explored in experiment IV, using a 10-lancet, allergy testing instrument. Sixteen steers were challenged with either *Salmonella* Newport or *Salmonella* Montevideo (Montevideo right legs; Montevideo left legs), and all steers were challenged on the lower abdomen with *Salmonella* Senftenberg. Transdermal inoculation resulted in predictably *Salmonella*-positive PLNs, and a modest vaccine effect was detected. Because it is well tolerated by the calves and results in predictable and regionally specific *Salmonella* recovery from PLNs, the transdermal route of challenge may be preferred by researchers wishing to evaluate the impact of interventions designed to reduce the carriage of *Salmonella* in PLNs.

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