Summary of : Vaccination against *Lawsonia intracellularis* decreases shedding of *Salmonella enterica* serovar Typhimurium in co-infected pigs changes the host gut microbiome

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Introduction

The association between *L. intracellularis* infection and increased shedding of *Salmonella* was first demonstrated by Beloeil et al., (2004), who performed an epidemiological study and found a significant association between seroconversion to *L. intracellularis* and increased prevalence of pigs shedding S. enterica. In this study, we hypothesized that vaccination against *L. intracellularis* would decrease shedding of *S. enterica* in co-infected animals.

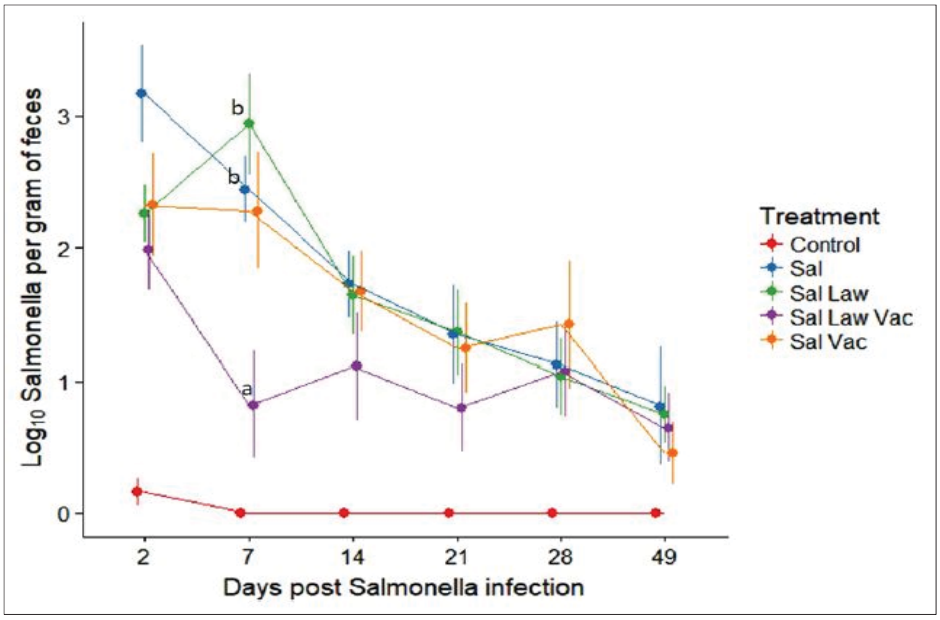
Materials and Methods

A total of five treatment groups were used: 1) challenged with *S. Typhimurium* alone, 2) challenged with both *S. Typhimurium* and *L. intracellularis*, 3) challenged with *S. Typhimurium* and vaccinated against *L. intracellularis*, 4) challenged with both *S. Typhimurium and L. intracellularis* and vaccinated against *L. intracellularis*, and 5) a non-infected control. The groups that were vaccinated against *L. intracellularis* received the single dose oral live attenuated vaccine at three weeks of age. Twenty-one days post vaccination, animals were challenged with a pure culture of *L. intracellularis*. One week post *L. intracellularis* challenge, pigs were challenged orally with *S. Typhimurium*. Fecal samples from pigs were obtained on the day of challenge and two days post *S. Typhimurium* challenge and weekly thereafter until 49 days post-infection.

Results and Discussion

The greatest difference in shedding level between groups was found at 7 days post-infection. At this time point, the co-challenged animals from the vaccinated group shed statistically less *S. Typhimurium* per gram of feces than the animals from the non-vaccinated co-challenged group (p=0.003) (Figure 1). The co-challenged vaccinated group also shed significantly less *S. Typhimurium* than the singly infected *S. Typhimurium* group (p=0.03). *L. intracellularis* vaccination did not have a significant impact on *S. Typhimurium* shedding when animals were singly infected with *S. Typhimurium*.

Investigating the 7 day post-infection timepoint, different treatment groups had significant differences in their microbiome community structure (ANOSIM p<0.05). The co-infected vaccinated group clustered apart from all other treatment groups. Again, this effect was dependent on an animal receiving both *S. Typhimurium* and *L. intracellularis* as well as prior to *L. intracellularis* vaccination.



Conclusion

These results indicate that vaccination against *L. intracellularis* impacts the microbiome and reduces shedding of S. Typhimurium in co-infected animals. This evidence suggests that *L. intracellularis* vaccination may be used as novel tool to aid in the control of *Salmonella* on swine farms as well as an alternative to reduce the need for antibiotic treatment of pigs and improve food safety.

Figure 1. Fecal shedding of *Salmonella enterica* serovar Typhimurium measured by the MPN method. Line graph of *S. Typhimurium* shedding by group in different time points. Significant differences between treatment groups are designated by different letters (P < 0.05).

References
Beloeil PA et al. Risk factors for Salmonella enterica subsp. enterica shedding by market-age pigs in French farrow-to-finish herds. Prev Vet Med. 200 4 Apr 30;63(1-2):103-20.

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