

Bovine antibody response to immunization against *Dermacenter andersoni* midgut and salivary gland

Background

Ticks and the pathogenic microbes they host cause loss in the cattle industry due to loss of productivity, disease treatment, and chemical acaricides. Tick vaccines have been shown to be a cost effective way to reduce herd infestation levels, which reduces chemical acaricide use and decreases tick related disease incidence in the herd (1,2). Studies also show that vaccination can reduce the rate of disease agent transmission within the tick (3). The creation of such a vaccine is a multistage process, part of which is understanding and demonstrating the immunological response between the host's immune system and the feeding tick.

Objectives

1. Optimize parameters to create an ELISA capable of detecting antibodies against *D. andersoni* midgut and salivary gland extract
2. Test weekly antibody levels of calves in vaccination trial
3. Compare vaccination cross reactivity between tick salivary gland and midgut

Immunized with midgut and salivary gland extract

Challenge infestation

Tick performance

Sero-reactivity

Feeding

- Period
- Mortality
- Weight

Fecundity

- Oviposition
- Egg clutch
- Larvae

Qualitative

- 2-D Western
- MG vs SG
- Isotype

Quantitative

- Densitometry
- ELISA

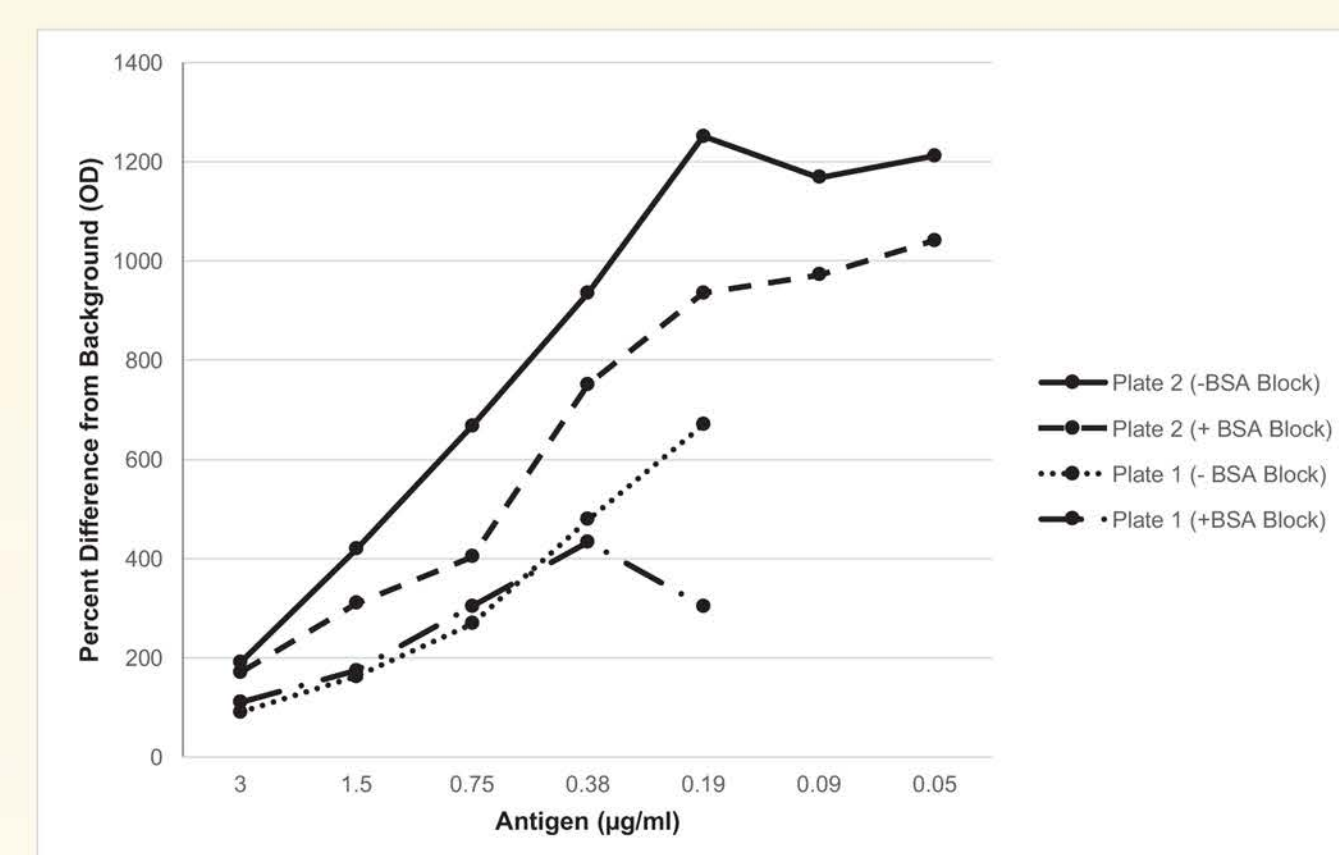
Identify *Dermacenter andersoni* proteins uniquely reactive to immune sera associated with reduction in specific tick performance parameters

Experimental layout and timeline of lab's overall objectives

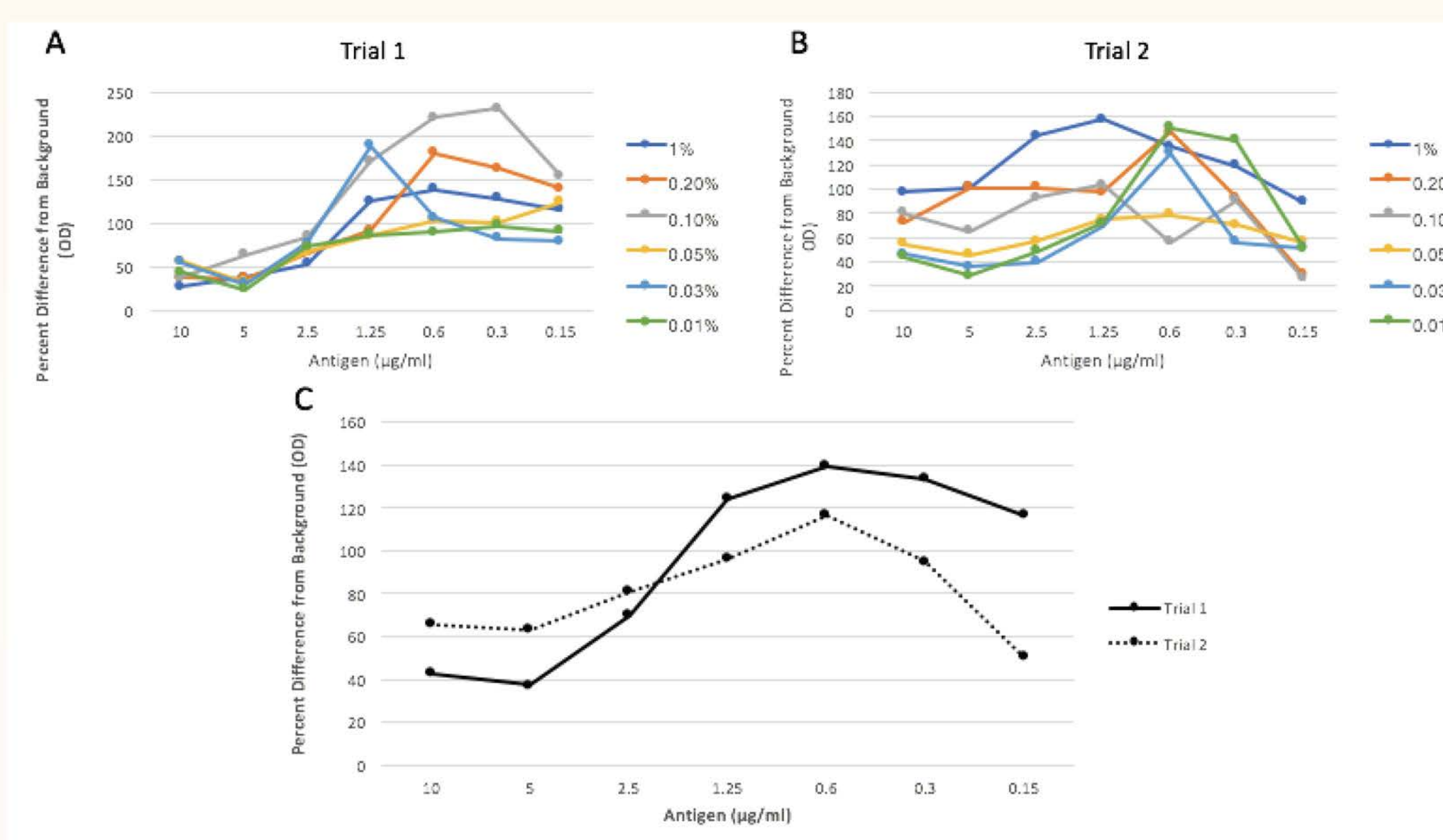
Methods

50µl of antigen, tick midgut or salivary gland extract, was coated on wells of ELISA plates for 2 hours at 37°C or overnight at 4°C, then overlaid with bovine sera for 3 hours. Secondary antibody, peroxidase-coupled rabbit anti-bovine IgG was used for 15 minutes. Wells developed for 15 minutes with 50 µl of TMB (Thermo Scientific, USA) and 0.2% H₂SO₄ was added to each well. Optical densities were measured at 450 nm. Concentrations of all components used as described below.

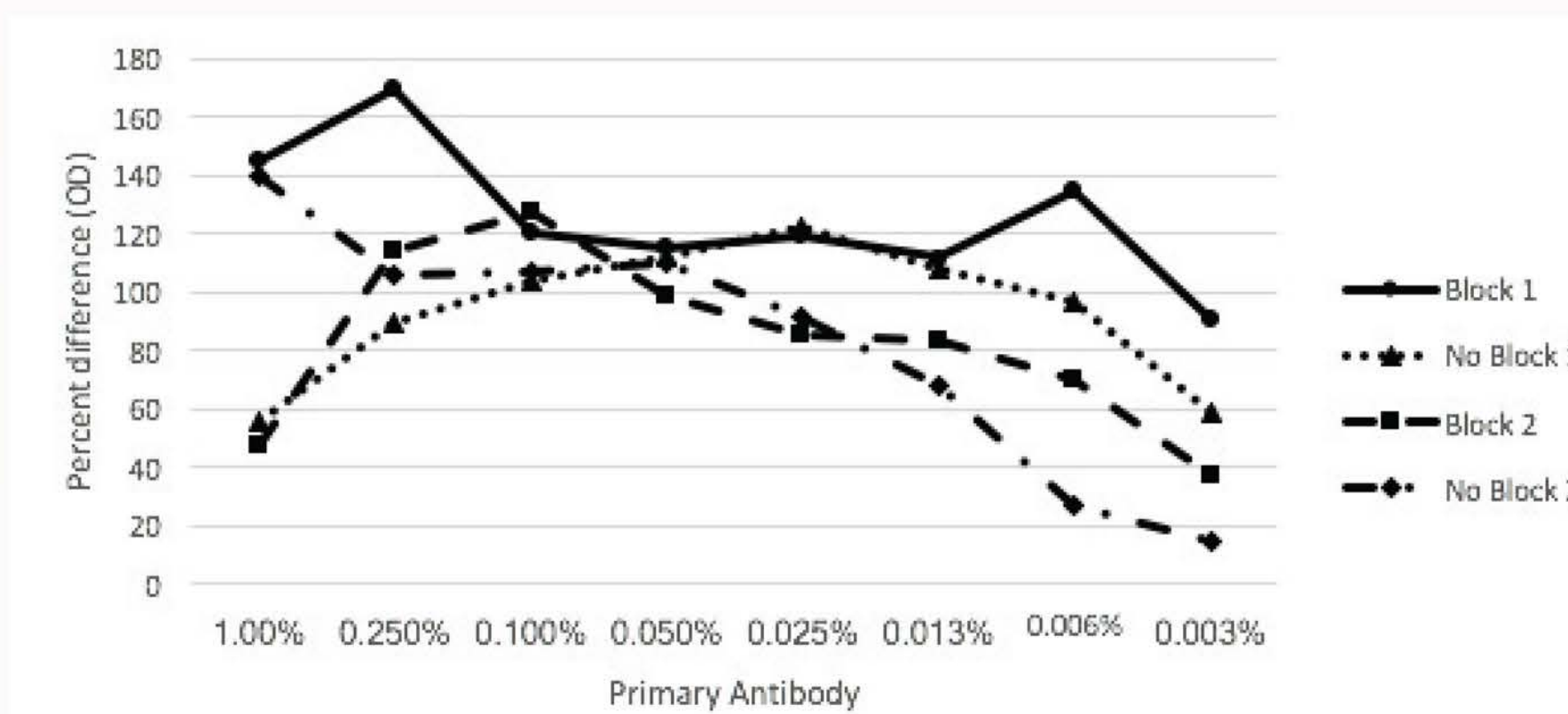
Measures



Difference from background caused by antigen and 2° antibody alone for an ELISA testing anti-tick midgut antibodies in cattle. BSA Block= 1% bovine serum albumin in PBS, coated wells for 2 hours

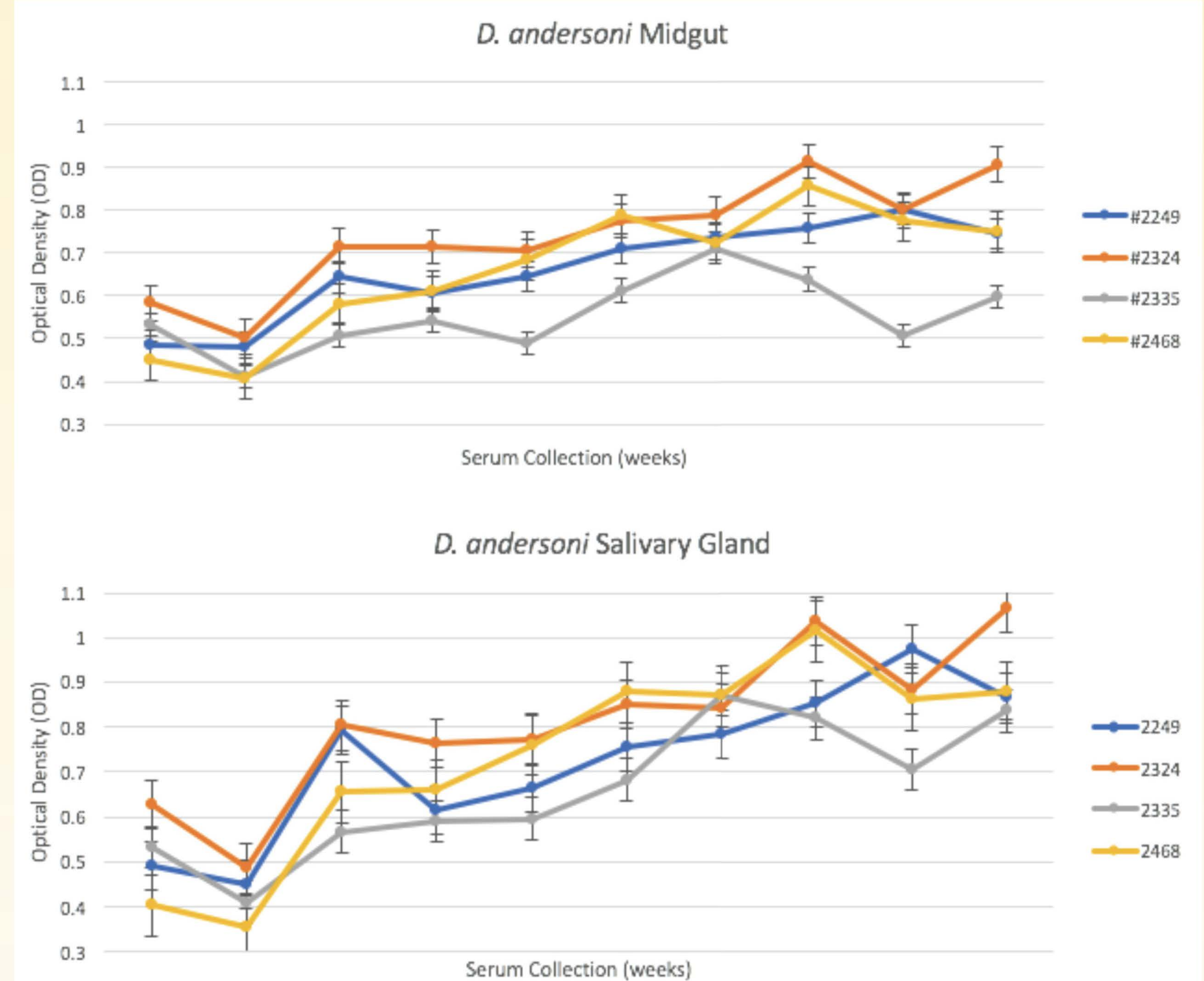


Difference between pre-immune and hyper-immune serum for various antigen and 1° antibody levels. (A-B) Lines indicate 1° antibody concentrations in PBST. (C) Lines indicate averages for all antibody concentrations within that trial.



Difference between pre-immune and hyper-immune serum for various 1° antibody levels. Antigen: 0.6µg/ml, 2° Antibody: 1:10,000

Results



Weekly antibody levels from vaccinated cattle. Time point one is before vaccination and subsequent time points are one week apart after vaccination. 2249: midgut immunized, 2324: midgut immunized, 2335: salivary gland immunized, 2468: salivary gland immunized.

Conclusion

Vaccination and boosters with midgut and salivary gland extract from *D. andersoni* ticks increases antibody responses to these extracts. Cross reactivity is substantial but highly variable.

References

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2. De La Fuente, J., Rodríguez, M., Redondo, M., Montero, C., García-García, J., Méndez, L., ... & Ramos, E. (1998). Field studies and cost-effectiveness analysis of vaccination with Gavac™ against the cattle tick *Boophilus microplus*. *Vaccine*, 16(4), 366-373.
3. Jittapalapong, S., Jansawan, W., Barriga, O. O., & Stich, R. W. (2004). Reduced incidence of *Babesia bigemina* infection in cattle immunized against the cattle tick, *Boophilus microplus*. *Annals of the New York Academy of Sciences*, 1026(1), 312-318.

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