Genetic Markers for Fever Tick Resistance in Cattle

The U.S. cattle industry is threatened by reestablishment of the Fever Tick (Boophilus spp.), which transmits the disease agents of Texas Tick Fever (bovine babesiosis). The disease was eliminated from the U.S. 55 years ago by a 36-year campaign that purged the tick from the southern states. Without the eradication, APHIS estimates that cattle production losses and mortality due to ticks today would cost $1 billion annually. Despite a quarantine buffer zone maintained along the Rio Grande since 1938, today Fever Tick and Texas Fever outbreaks are occurring with increasing frequency in Texas, both within the buffer zone and in the “tick-free” area outside the zone. The buffer zone was recently expanded in five counties due either to the threat of or the known existence of Fever Ticks beyond the zone. Climatic change has led to expanded habitat favorable to the tick, fueling fears that Fever Ticks will spread widely if reestablished in the U.S. No Tick Fever vaccine exists and treatment options for bovine babesiosis are limited. Tick control is imperative to prevent the disease but is complicated by pesticide resistance in tick populations. Reliance on pesticides can be circumvented by development of vaccines capable of inducing resistance to ticks. Effective anti-tick vaccine design requires incorporation of both suitable antigens and adjuvant tailored to the appropriate immune response for optimal efficacy. Knowledge of the bovine immune mechanisms involved in tick resistance is therefore critical to development of effective vaccines.

**Process**

- Phenotyping of calves as resistant or susceptible to *Amblyomma americanum* tick infestation
- Collection of tick bite site biopsies and blood samples during *A. americanum* infestation
- Challenge of *A. americanum* tick resistant and susceptible phenotyped cattle by infestation with *Boophilus microplus* ticks
- Collection of blood samples during *B. microplus* infestation
- Transcriptome analysis of the bovine immune response to Texas Fever Tick

**Outcomes**

- Identification of genetic immune determinants for bovine resistance to the Fever Tick
- Development of an effective adjuvant for formulation of an efficacious tick vaccine