

Rickettsial Zoonoses Branch Billet

Canine-targeted anti-tick vaccine to reduce Rocky Mountain spotted fever in the southwestern United States

Rocky Mountain spotted fever (RMSF) is a potentially deadly tick-borne disease that in the U.S. southwest is transmitted by *Rhipicephalus sanguineus* (the brown dog tick). This tick feeds almost exclusively on domestic dogs, and is also responsible for the transmission of RMSF in Mexico and South America. Since 2003, cases of RMSF associated with this tick and free-roaming dogs have been identified in the southwestern United States. The overall goal of this project is to evaluate innovative strategies and new methods for the reduction of brown dog ticks. We propose to utilize an existing anti-tick vaccine that was developed in Cuba against the specific P0 ribosomal protein of the brown dog tick. On rabbits, the peptide vaccine was able to reduce tick numbers by 90%, but it has not yet been tested for dogs, the primary host for this tick. As a pilot study, we will prepare a conjugated synthetic peptide vaccine; the vaccine conjugated with a carrier protein, keyhole limpet hemacyanin (KLH), which will provide an adjuvant effect and provide an immunological marker of vaccination. We propose an initial trial to assess immunogenicity and safety in guinea pigs or rabbits in the laboratory setting. Each life stage of the tick would be utilized in the study to determine effect on the tick. Parameters such as tick weights, molting success, egg production, and survival will be monitored to determine vaccine effectiveness against the target tick species. Efficacy in reduction of tick feeding and survival would be then be considered for planned assessment in immunized dogs and non-immunized controls. In each animal, serial serum samples would be obtained to assess vaccination status, and level of anti-tick antibodies. Studies might also utilize *R. rickettsii*-infected ticks in order to assess blocking of transmission by changes in feeding success. ELISA tests will be developed to assess canine antibodies to KLH, P0 protein, and *R. rickettsii* as required for study. Successful pilot results may be broadened to use in field trials to show efficacy on natural infested dogs. Reduction in population levels of brown dog ticks will result in less risk for human contact and subsequently less risk for exposure to *Rickettsia rickettsii*.

Keywords: Anti-tick vaccine, *Rhipicephalus sanguineus*, RMSF, dogs, prevention