RESEARCH PROGRESS REPORT SUMMARY

Grant 02383: Identifying Cellular Mechanisms of Inflammation During Canine Tick-Borne Diseases

Principal Investigator: Christine Petersen, DVM, PhD

Research Institution: University of Iowa

Grant Amount: $207,526.00

Start Date: 9/1/2017 **End Date:** 8/31/2019

Progress Report: Mid-Year 2

Report Due: 2/28/2019 **Report Received:** 3/4/2019

(The content of this report is not confidential and may be used in communications with your organization.)

Original Project Description:

Tick-borne diseases are found in all 50 states of the United States and are the most common vector-borne disease diagnosed in people in the US. The predominant disease is Lyme disease, caused by Borrelia burgdorferi and related species (sensu lato). Other important canine tick-borne diseases include those caused by Anaplasma platys, Anaplasma phagocytophilum (Anaplasmosis), Babesia canis, Babesia conradea and Babesia gibsonii (Babesiosis), and Ehrlichia canis, Ehrlichia chaffiensis and Ehrlichia ewingii (Ehrlichiosis). Many of these diseases also affect people. Dogs can serve as sentinel species for human disease and there are many areas where the immune responses and disease outcomes are very similar in people and dogs, meaning that important lessons can be learned by sharing information between human and animal health (One Health). The researchers will further investigate the dog's immune system to determine which immune cells are responsible for the cure or creation of canine tick-borne disease. Through understanding which cells are responsible for causing disease, the goal is to then specifically target the molecules they produce using immunotherapy or immune modulation to improve treatment of tick-borne diseases in all dogs.

Publications: None at this time.

Presentations:

Characterization of circulating Natural Killer cells in canines exposed to tick-borne infections. Breanna M Scorza, Kurayi Mahachi, Angela Toepp, and Christine A Petersen.

- Great Plains Emerging Infectious Disease Conference. Iowa City, IA. Poster presentation March 2018.

Natural Killer cell subsets during Lyme Disease: Pathogen control and pathogenesis. Breanna M Scorza.

- Oral presentation: Immunology Grand Rounds, University of Iowa Hospitals & Clinics, Iowa City, IA. November 2018.

Impact of Tick-Borne Co-Infections on Canine Leishmaniosis: Circulating Natural Killer Cell Populations. Breanna M Scorza, Kurayi Mahachi, Erin C Cox, Angela Toepp, Jennifer Foltz, Dean Lee, and Christine A Petersen.

- Oral presentation: Parasitology Group Meeting, University of Iowa, Iowa City, IA. January 2019.
- Oral presentation: Immunology Student Seminar, University of Iowa, Iowa City, IA. December 2018.
- Poster presentation: American Society for Tropical Medicine and Hygiene Conference. New Orleans, LA. October 2018.
- Poster presentation: Center for Immunology and Immune-based Diseases. Iowa City, IA. August 2018.
- Poster presentation: American Association of Immunology. Austin, TX. May 2018.

Report to Grant Sponsor from Investigator:

We have successfully identified sporting and hunting dogs at different clinical stages of Lyme Disease and sampled blood from them in the field. We have confirmed our field diagnoses with a specialized assays performed by IDEXX Laboratories. Currently, we have analyzed ~45% of our goal number of dogs with Lyme exposure. In the lab, we have analyzed the percentage of Natural Killer immune cells and some markers of the activation state of these NK cells in the blood. We have found one subset of these cells increases during canine Lyme disease, however we are interested in whether these cells protect from, or contribute to, inflammation that could case symptomatic Lyme disease to occur. The NK cells from healthy control dogs, dogs with asymptomatic Lyme, symptomatic Lyme, or post-treatment are beginning to show statistical differences in their markers of activation from one another. We will continue to analyze these cells to increase the statistical power of our observations. Our next experiments, which we have troubleshot and obtained working protocols for, will determine if NK cells from dogs in each Lyme subgroup have different functional properties. Our overall goal is to determine differences between dogs with asymptomatic versus symptomatic Lyme, in order to better understand which cell types, or inflammatory factors produced by them, are helpful for controlling the disease. We have made a good working relationship with the caretakers of the hunting and sporting dogs and we plan to perform another full round of this spring. Based on the number of cases of canine Lyme disease we observed last spring, we estimate that we will be able to collect enough samples to meet our statistical needs for these experiments. We plan to submit the results of these assays for publication this summer.