# RESEARCH PROGRESS REPORT SUMMARY

**Grant 03169:** Characterization of hookworm resistance in dogs with a novel diagnostic test for early intervention


**Principal Investigator:** Jeba Jesudoss Chelladurai, BVSc, PhD

**Research Institution:** Kansas State University


**Grant Amount:** $44,076.15

**Start Date:** 10/1/2023 **End Date:** 9/30/2024

**Progress Report:** Mid-Year 1

**Report Due:** 3/31/2024 **Report Received:** 3/31/2024

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**Original Project Description:**

The dog hookworm is the most common worm parasite of dogs in the United States. It can cause disease, resulting in suffering and even death in both young and old dogs of all breeds. Dog hookworms can also infect humans who come into contact with hookworm larvae present in dog stool contaminated areas. Hookworm infections in people will cause cutaneous larval migrans, a painful skin condition. Dogs must be dewormed monthly to prevent the ill effects of acquiring hookworms. While these medications were very effective 20-30 years ago, recently they have stopped being fully effective in many cases. This is because hookworms have become resistant. To know if a dog has resistant hookworms, veterinarians have to use tests performed at a diagnostic lab. The test that is currently used takes 14 days to complete. In this project, we will create a new diagnostic test that can be performed in less than a day. This new test will let the veterinarian know if the medication that they are using against the hookworms will work or not. This project will add to our knowledge about how much resistance we should expect to see in hookworms from dogs that live in the U.S. Knowing how much resistance to expect in a geographical area and knowing how many hookworms within a dog patient are specifically resistant will help veterinarians make important treatment decisions quickly.

**Publications:**

None at this time.

**Presentations:**

1. Schieferecke G^, Quintana T, Jesudoss Chelladurai J. Molecular Analysis of Benzimidazole Resistance in Hookworms in Kansas Dogs. Annual Phi-Zeta Day Symposium, Manhattan, KS. March 2024.
2. Schieferecke G^, Quintana T, Jesudoss Chelladurai J. Molecular Analysis of Benzimidazole Resistance in Hookworms in Kansas Dogs. Kansas Undergraduate Research Day at the Capitol, Topeka, KS. March 2024.
3. Schieferecke G^, Quintana T, Jesudoss Chelladurai J. Molecular Analysis of Benzimidazole Resistance in Hookworms in Kansas Dogs. K-INBRE Symposium, Manhattan, KS. January 2024.

^ = presenting author is a mentored student.

**Report to Grant Sponsor from Investigator:**

The dog hookworm, Ancylostoma caninum, is the most common worm parasite of dogs in the United States. It is specific to dogs but can infect humans by entering through intact skin (zoonotic), causing cutaneous larval migrans, a painful skin condition. Treatment options in dogs include the benzimidazole (BZ) drugs. However, hookworms have recently developed resistance to BZs. This resistance has been associated with two mutations - F167Y and Q134H in a gene of the worm. We have developed a PCR to test for these two mutations in the feces of infected dogs. The PCR test tells us if the mutations causing resistance is present in the sample or not, and also at what level the mutation is present. We have currently tested the PCR on the feces of 75 dogs from the mid-western United States.

Interestingly, we found that on average 50.9% of the hookworm infected dogs that we have tested so far had hookworms that had the resistant gene. However, the amount of resistance in the samples ranged from 1% to 100%. Approximately 41% of the samples have very high resistance levels (>75% resistant gene). Knowing this information is very useful for veterinarians to make a decision on which dewormer to prescribe. Thus, by detecting resistance early in hookworms from individual dogs using this qPCR test, we are helping both veterinarians and owners avoid treatments that may not work. We are in the process of validating these results further with next generation sequencing. The results from this study have implications for parasite control measures implemented by pet owners and veterinarians.