



## RESEARCH PROGRESS REPORT SUMMARY

**Grant 03045-A:** Artificial Intelligence and Machine Learning for Diagnosis of Dog Sperm Morphology

**Principal Investigator:** Leonardo Brito, DVM, PhD  
**Research Institution:** University of Pennsylvania  
**Grant Amount:** \$12,422.16  
**Start Date:** 7/1/2022      **End Date:** 6/30/2024  
**Progress Report:** End-Year 2  
**Report Due:** 12/31/2023      **Report Received:** 12/4/2023

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### **Original Project Description:**

Sperm morphology evaluation is an important component of dog fertility analysis. However, visual evaluation of sperm morphology is difficult to teach, and results are largely dependent on the proficiency and experience of the evaluator, leading to large variability in results within and across evaluators. The objective of this pilot study is to explore recent advances in artificial intelligence for image pattern recognition, similar to that used by the likes of Google and Facebook, to create an automated method for sperm morphology evaluation. A large database with 10,000 dog sperm images will be created. The images will be evaluated by expert veterinarians, then used to train a Convolutional Neural Network (CNN) using deep learning methods. Investigators expect to generate an algorithm capable of classifying sperm morphology with greater than 90% accuracy and precision. Employing such an algorithm could allow veterinarians to establish more reliable reference values and guidelines for prospective stud dogs and for semen to be used for artificial insemination, improve veterinarian's abilities to formulate diagnoses and prognoses for infertility problems related to specific sperm defects, and to establish the reproductive safety of drugs and compounds.

### **Publications:**

None to date.

### **Presentations:**

None to date.



### **Report to Grant Sponsor from Investigator:**

Collection of all semen samples required for the study has been completed. Samples from 62 dogs presented to the veterinary hospital at The Ohio State University have been obtained and preserved. At the University of Pennsylvania, slides were prepared, and images acquired using phase-contrast under 1000X magnification. A bank with over 11K images has been created. After, the images were cropped using an algorithm developed for phase-contrast sperm images. Three specialists are currently classifying the images and building an annotated database. Ultimately, the database will be used to train a sperm morphology evaluation algorithm.