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RPPR Final Report
as of 06-Nov-2019

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STEM Degrees: **STEM Participants:**

Major Goals: The specific objectives of the MWD Genomics Program are best describes as two phases. In Phase-I (the current study) we will gather information and data from the S&T community, handlers and breeders. In addition we will identify additional individuals/institutions able to contribute to the broader goals of Phase-II. Phase-I also will include the initiation of a MWD DNA bank and use of these to provide a preliminary assessment of breed ancestry of select MWDs. As Phase-I is conducted, the data obtained will be used to provide the foundations for Phase-II, a large scale experimental genomics initiative, using state of the art technologies to address key needs of the MWD Program and advance the overall goals of the Future Combat Canine Research Program (FCCRP).

Accomplishments: Phase-I of this program effort was restricted to two key areas
1) information gathering
2) introductory genetic assessment of breed ancestry in current MWDs.

Information gathering
During the third year of this project, Dr. Breen continued to meet with the contracting office representative (COR), Dr. Stephen Lee, to provide regular updates on progress. During this time period we continued to identify and build relationships with individuals and institutions likely to play an active role as key stakeholders in Phase II of the program. Meetings were coordinated with each of the individuals/institutions across the USA, during which the overall goals of the MWD Genomics Program were discussed and interest of the third parties gauged. The results of these meeting was the enthusiastic support of numerous individuals, as well three large US corporations (names withheld for confidentiality). The role that each of these additional individuals/groups will play in the larger program is part of ongoing discussions.

Introductory genetic assessment of breed ancestry in current MWDs
In advance of the major experimental phase of this program we continued to recruit and bank blood and DNA samples from additional MWDs. Each of the dogs recruited had been assessed for key performance metrics in readiness for convergence with the genetic/genomic data. By the end of this study we had recruited blood samples from over 200 MWDs, representing two large cohorts with specific purpose. From each blood sample, genomic DNA was isolated and used for a first pass single nucleotide polymorphism (SNP) screen to determine breed lineage. These data indicated that while the majority of the 200 dogs recruited to date were of single breed lineage (Labrador retriever, German Shepherd and Belgian Malinois), several dogs were mixed breed with one of these three breeds as the major component. These DNA samples have been set aside for use in future case-control studies designed to identify haplotypes associated with specific traits key to their purpose.

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In Year 3 we met with a panel of key opinion leaders in the canine genetics community to contribute to the design of a new higher density SNP set. The goal of this new higher density (HD) platform was to provide an improved means to generate genome wide association data for more complex traits, such as behavior. Through several discussion among the group, we selected 1,104,936 high quality SNPs from over 19,000,000 SNPs that had been identified from over 350 whole canine genome sequences. The SNPs selected were those with the highest level of polymorphism across numerous dog breeds, including breeds that are primary contributors to the MWD population. With a SNP located every 2,200 bp across the entire canine genome, this new set offers 6x the density of the initial design, while simultaneously increasing the number of informative SNPs across breeds from ~55% to ~85%. In. short, this new canine SNP set has the potential to provide a substantially greater ability to detect genetic variants associated with complex traits.

The implementation of this new canine HD-design will require funding beyond the current award. At this time the additional funding needed will be used to demonstrate the efficacy of this new genetics platform. We anticipate that these fund will be provided by consortium members. It is expected that access to this new SNP-platform will be made broadly available to canine genetic researchers with the expectation that data will be shared as a means to validate the utility of this new design.

Training Opportunities: Nothing to Report

Results Dissemination: Nothing to Report

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI
Participant: Matthew Breen
Person Months Worked: 12.00
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Funding Support:

Funding W911NF1310006.

FINAL REPORT

- **Specific Objectives**

The specific objectives of the MWD Genomics Program are best describes as two phases. In Phase-I (the current study) we will gather information and data from the S&T community, handlers and breeders. In addition we will identify additional individuals/institutions able to contribute to the broader goals of Phase-II. Phase-I also will include the initiation of a MWD DNA bank and use of these to provide a preliminary assessment of breed ancestry of select MWDs. As Phase-I is conducted, the data obtained will be used to provide the foundations for Phase-II, a large scale experimental genomics initiative, using state of the art technologies to address key needs of the MWD Program and advance the overall goals of the Future Combat Canine Research Program (FCCRP).

Note: This award provided funding only for a proportion of Dr. Breen's time (0.2x FTE) and so all experimental data for the generation and use of the new genetics platform are being developed with funds outside the scope of this award.

- **Results**

Phase-I of this program effort was restricted to two key areas

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2) introductory genetic assessment of breed ancestry in current MWDs.

Information gathering

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