Cornell researchers pursue the dog's ancestor

Collaborative research explores the domestication of dogs

Dr. Marta Castelhano will spend most of December in Portugal, traveling from village to village in a car equipped with a centrifuge and clipboard. On the lookout for village dogs, Castelhano will encourage these semi-feral to completely feral dogs to cooperate long enough for her to draw four to five milliliters of blood. Halfway around the world, Dr. Patricia Arrais and Dr. Natalia Santos will work with spay and neuter programs in Brazil to capture similar data from indigenous dogs that are anesthetized for the procedure. This will be their first time collecting samples, but Castelhano has been involved with the project since early 2007.

A research associate at the College of Veterinary Medicine, Castelhano is engaged in a collaborative partnership with Adam Boyko, a research associate in Carlos Bustamante's laboratory in biological statistics and computational biology. Together, they are looking for the roots of canine domestication by studying the DNA of dogs that one would only find in those regions of the world.

"We want to understand how dogs evolved, how they became domesticated, and where dogs came from," said Castelhano, who is responsible for recruiting and training faculty to help collect the samples. "The data we're collecting will also shed new light on the genetic diversity of dogs and provides information useful to those mapping various diseases."

Since launching the initiative, 500 DNA samples have been collected from animals in countries around the globe: Egypt, Uganda, Namibia, the Azores Islands in Portugal, Indonesia, Mexico, and the Commonwealth of Puerto Rico. Plans to collect samples in Honduras, France, and the Solomon Islands are in discussion. These samples have been added to the DNA Bank. The Cornell DNA bank was established in early 2006 to discover genes that underlie inherited traits and diseases in domestic animals using animals admitted to the Cornell University Hospital for Animals. An NIH grant now helps to fund the canine part of that bank which contains over 4,000 DNA samples from dogs and other domestic animals with genetic diseases. Castelhano and Laboratory Technician Liz Corey manage the DNA bank with Dr. Rory Todhunter, a professor of surgery at Cornell.

Castelhano has coordinated the collection effort in several of these countries by recruiting individuals to collect samples, securing the necessary permits to export the samples, and shipping the supplies needed to collect the samples and record GPS coordinates and phenotypic data from the dogs. Typically, collectors work with village elders who encourage community members to bring semi-feral dogs to a central location on a certain date or with established spay and neuter/vaccination programs. In the most remote locations, where there is no refrigeration, the collectors complete the first half of the DNA extraction in the field with a portable centrifuge. Samples are then shipped back to the Cornell University College of Veterinary Medicine where Corey undertakes the rest of the extraction and the phenotype is recorded.

Working in collaboration with other canine genetic researchers, Boyko has completed sequencing and genotyping at several important genetic markers in the hopes of finding important clues to the early history and domestication of dogs, the genetic signatures of human migration and trade routes echoed in the dogs' genomes, and the background data on naturally breeding populations that will help us understand the genetic basis of dog traits and diseases.

"We believe that this work has the potential to revolutionize how we think about village dogs and the process by which dogs were domesticated from their wolf ancestors," says Boyko. "This information has the potential to illustrate why certain breeds have these diseases and may help researchers develop new treatments."

This research is possible because of strong and effective collaborations with several people: Dr Ricardo de Matos, Professor Miguel Saraiva Lima (for Portugal) and Dr Sueli Cristina Ribeiro (for Brasil).