PROJECT ABSTRACT

Every day, soldiers serve in desert environments, forced to endure intense head and aridity. Indeed, these environmental stressors may pose a greater threat than that of enemy combatants. While billions of dollars have been spent on protecting soldiers from bullets, far less attention has been paid to the more insidious threat of heat and dehydration, which may result in cognitive or physical impairment or even death. What if there was a way to significantly enhance the performance and safety of our soldiers by reducing the physiological need for water, particularly in desert environments? While humans and most other mammals are exquisitely sensitive to dehydration, many animals that evolved in deserts are capable of living without ever drinking water. This basic science research proposal aims to understand the genetic and genomic underpinnings of survival without water in a desert-adapted rodent native to the southwest United States.

I will accomplish this goal by conducting a series of experiments on captive desert rodents housed in a chamber designed to replicate the intense heat and aridity of desert environments, while allowing me to manipulate other environmental variables such as water availability and diet. I will measure multiple physiological parameters including serum electrolyte and urine concentration, as well as animal behavior. This will allow me to better understand the unique physiology of these animals and relate it to human physiology. To assay the underlying genomic processes that underlie the physiology, I use the techniques of computational genomics. Here, I will understand the genome wide patterns of gene expression and methylation. This will allow me to identify specific genes and pathways that will become future targets for therapeutic intervention.

This project will result in the elucidation of genetic mechanisms that enable survival and lay the foundation for future work aimed at developing interventions, specifically reducing the untoward effects of dehydration on soldier performance.