Expanding undergraduate research with scorpion toxin genes

Professional Development Grant Report

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B. Abstract

Scorpions are an ancient and medically important arthropod group with a multitude of venom components. Various venom components have been characterized for several species, yet genetic variation in toxin protein genes is largely unknown for most scorpion species. This project will allow current undergraduate research students to create large amounts of genetic diversity data to catalog sodium toxin genes. Moreover, it will allow research students to expand their research goals through obtaining additional DNA sequence data from isolated DNA.

C. Review of Research

The primary purpose of this project is to allow undergraduate research students to expand additional procedures to improve research that investigates toxin variability among scorpion populations and begin to catalog the toxin diversity in these venoms. The major objectives are for the students to systematically investigate the different toxin variants, produce DNA sequence data from those variants, investigate the DNA sequence variability to catalog the number and forms of toxin variants.

To complete the objectives outlined above, the students will conduct several assays: 1) create glycerol stocks of isolated toxin gene variants, 2) sample these stocks through further analyses such as plasmid isolation and PCR (Polymerase Chain Reaction) to create gene variant copies for DNA sequencing, 3) send the created toxin gene variants to UAMS for DNA sequencing, and 4) obtain and analyze DNA sequence results to determine the extent of toxin gene variation within a population.

D. Summary of outcomes

The funds from the PDG purchased reagents to conduct the variability analysis and pay for DNA sequencing at UAMS. The 2014 spring students were able to create glycerol bacterial stocks for long-term toxin gene storage, sample these glycerol stocks and extract DNA that subsequently allowed DNA sequencing of the toxin gene variants. We were able to create over 50 DNA samples for further investigation. Two undergraduate students in the Fall 2014 semester are expanding this project and will also investigate toxin protein creation via recombinant DNA methods. In addition, I plan to incorporate these results in a larger InBre proposal to be submitted to the NIH InBre program managed through UAMS. This funding has been essential to support and increase the student number conducting undergraduate research in the molecular biology research laboratory.