

BIOLOGICAL SCIENCES
ARTS & SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2024

PROJECT TITLE: Signal transduction pathways and environmental sensing in the protozoan parasite Trypanosoma cruzi.

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Project Description

Many unicellular eukaryotes, pathogenic and free-living alike, transition between developmental forms during their life cycle. How these organisms sense the environment to determine when and where to differentiate is largely unknown. Cyclic adenosine monophosphate (cAMP) is a universal second messenger that mediates a variety of cellular processes in eukaryotic cells, including differentiation. Our recent work with the human pathogen *Trypanosoma cruzi*—the etiological agent of Chagas disease—revealed the presence of two putative cAMP microdomains in this parasite: the flagellar tip and the contractile vacuole complex (CVC). Cyclic AMP response protein 3 (CARP3) was found in these compartments interacting with adenylate cyclase 1 (AC1), an enzyme that synthesizes cAMP and is involved in differentiation and osmoregulation in a location-dependent manner. The main goal of this project is to elucidate the function of CARP3. The UPRISE student involved in this study will learn basic molecular and cellular biology techniques, such as cell culture in a BSL2 facility, cell transfection, DNA isolation, PCR, restriction analysis, gene cloning, gel electrophoresis, western blot, and immunofluorescence analysis. The student will also perform assays to analyze the phenotype of *T. cruzi* mutant cell lines where the cAMP signaling pathway has been altered. The ideal student to work in this project should have been taken Cellular Biology and Microbiology courses, as well as having laboratory experience in cell culture, biosafety, and basic cellular biology techniques. This will be a great opportunity to learn molecular biology, while generating relevant data on the mechanisms driving environmental sensing and cell differentiation in American trypanosomes.