BIOLOGICAL SCIENCES
ARTS & SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2026

PROJECT TITLE: Study of essential protein kinases involved in the regulation of the life cycle of Trypanosoma cruzi.

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Project Description

The research activities of my laboratory are focused on the study of the protozoan parasite Trypanosoma cruzi, which is the etiological agent of Chagas disease (CD). T. cruzi is transmitted through direct interaction with insect vectors, known as the “kissing bugs,” which are only found in the Americas. However, migration of infected people is causing an increase in the number of CD cases in nontraditional affected areas, such as in the US and Europe. Recent evidence increasingly supports that Chagas disease should be considered endemic in the United States, as T. cruzi infection has been detected in multiple southern states, with confirmed autochthonous human cases evidencing local transmission. After infection, CD may remain asymptomatic for years or even decades, but in one third of cases CD can progress to dilated cardiomyopathy. There is no vaccine to prevent the disease, and the treatments available show low effectivity in the chronic phase of CD. Our approach involves the use of various reverse genetics strategies, such as CRISPR for genome editing, to genetically manipulate the parasite, and study the role of genes encoding protein kinases and/or proteins putatively involved in cytokinesis, which is the last step of cell division. Our final goal is to identify essential targets for the survival of the parasite that will help to the design of new chemotherapy against this pathogen. As a part of a large-scale screening of a gene knockout library including genes encoding protein kinases and proteins involved in cytokinesis, which we are currently conducting in our laboratory, we have identified several genes essential for the parasite to complete its life cycle. This UPRISE project involves the phenotypic analysis of several of these mutant cell lines to elucidate the function of these genes. In our molecular parasitology laboratory, the student will perform routinely basic

and state-of-the-art molecular biology, cellular biology and biochemistry techniques, such as cell transfection, cell culture DNA and protein electrophoresis, PCR, DNA extraction, cloning, CRISPR, etc., as well as cell culture and bioinformatics analyses of DNA/protein sequence data.

Prospective students to join my lab must be pursuing a Biology major, and ideally should have taken Genetics and Cellular Biology courses. Previous wet laboratory experience will be considered when selecting the successful candidate.