Faculty Member Contact Information

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Contact Info	
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Department	Pharmaceutical Sciences

1 Funded, 2 Unfunded URCA Assistant

	This position is **ONLY** open to students who have declared a major in this discipline.	M
	This project deals with social justice issues.	
	This project deals with sustainability (green) issues.	
	This project deals with human health and wellness issues.	
	This project deals with community outreach.	
	This mentor's project is interdisciplinary in nature.	I

Are you willing to work with students from outside of your discipline? If yes, which other disciplines?

Yes

How many hours per week will your student(s) be required to work in this position?
(Minimum is 6 hours per week; typical is 9)

9

Will it be possible for your student(s) to earn course credit?

Location of research/creative activities:

School of Pharmacy, Health Sciences Building

Brief description of the nature of the research/creative activity?

Somatotropin Release Inhibiting Factor (SRIF) is a cyclic peptide existing in two forms. The five human SRIF receptors (SST1-5) are categorized into two families (SRIF-1 family: SST2, SST3, SST5 and SRIF-2 family: SST1, SST4). All SSTs are G protein-coupled receptors, with the capacity to induce a number of signaling cascades upon activation. Our lab developed a structure-based drug design (SBDD) strategy for SST4 agonists, employing computational methods towards an Alzheimer's therapeutic. This work has been a collaborative effort with SIUE Medicinal Chemistry and Pharmacology labs in the School of Pharmacy and has resulted in a patent and multiple publications. However, SBDD employed rigid receptors, without taking into consideration the plasticity of the macromolecular SST4 structure. Toward that end, the URCA student will set up multiple molecular dynamics (MD) simulations for molecular pairs, meaning we will select pairs of small molecule agonists, discovered through our SBDD strategy, which differ in just one substituent. The idea is to understand the effects of these compounds in the context of a fully flexible environment and be able to rationalize differences in activity. The steps will be: (1) refine the SST4 macromolecular structure in reference to bond lengths and angles, and overall packing; (2) embed it into a lipid bilayer using CHARMM-GUI; (3) prepare all input files for MD, (4) submit MD calculations to the NSF cluster and (5) analyze the results.

Brief description of student responsibilities?

1. Understand small molecule and macromolecular structures. This would include foundational knowledge of biochemistry and chemistry.

2. Be able to refine the structures by running minimizations and understand notes in the protein databank files for missing residues or secondary motifs.

3. Dock the small molecules into the SST4 structure by running an algorithm to place those molecules into the binding pocket. This binding event results in the biological effect.

4. Embed the SST4 structure into a lipid bilayer since it is a transmembrane protein.

5. Learn basic unix commands to be able to remotely login into the cluster and submit calculations.

6. Organize the submitted calculations to be efficient.

7. Analyze the results with a series of tools in the lab.

URCA Assistant positions are designed to provide students with *research or creative activities* experience. As such, there should be measurable, appropriate outcome goals. What exactly should your student(s) have learned by the end of this experience?

1. Unix

2. Fundamentals of macromolecule-small molecule interactions

3. Understand scientific manuscripts

4. Organizational skills

5. Follow tutorials

6. Several complex programs to which the lab has access

7. Critical thinking

8. Analytical skills

Requirements of Students

If the position(s) require students to be available at certain times each week (as opposed to them being able to set their own hours) please indicate all required days and times:

N/A

If the location of the research/creative activities involves off campus work, must students provide their own transportation?

N/A

Must students have taken any prerequisite classes? Please list classes and preferred grades:

No

Other requirements or notes to applicants:

No other requirements