

Faculty Member Contact Information

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Contact Info	
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Department	Biomedical and Craniofacial Sciences

1 Funded, 1-2 Unfunded URCA Assistant(s)

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

- No

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)

- 6-9

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

- No

Location of research/creative activities:

- Science building 279 on Alton campus

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

- My research investigates the relationship of inflammation caused by oral bacteria in the nose-to-brain axis and neurodegeneration, learning, behavior, and cognition. More specifically, I will use nasal gavage of pro-inflammatory oral bacteria, compare this to localized injections of pro-inflammatory agents, and conduct a battery of molecular, immunochemical, behavioral, and learning tests on rodents.
- Porphyromonas gingivalis lipopolysaccharide (LPS) is part of the bacterial membrane that is the known pathogen in periodontitis. LPS increases pro-inflammatory cytokines, which can lead to damage to neural tissues by activating microglia. Oral bacteria can be found in the nasal cavity and can get to neural tissues through the nasal epithelium and olfactory axonal transport. P. gingivalis has been shown to translocate through the cranial

nerves to identified brain region. *P. gingivalis*, and its virulence factor gingipains, have been implicated in the neurodegeneration of Alzheimer's and Parkinson's disease.

- Experiments will include exposing rats through nasal and systemic gavage to LPS. Pro-inflammatory markers will be measured in cranial nerve ganglia, specific brain areas, as well as the heart, lungs, liver, and spleen. Behavioral tests will be conducted on exposed and non-exposed rats to identify changes in spatial memory, associative learning, and anxiety-like behavior. Opportunities for expanding this research into treatments for reducing the consequences of neuroinflammation and the impact of additional environmental toxins exist.

Brief description of student responsibilities?

- URCA assistants can fulfill different roles in the laboratory as agreed upon by the mentor and assistant. URCA assistants can help the dental students and the faculty member run the experiments described, including behavioral and learning tests, data collection of immunostained tissues, animal care, and collection of identified tissues post-mortem.

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?

- By the end of this URCA experience, the assistant will have gained the following measurable knowledge and skills:
 1. Laboratory Techniques and Histology — URCA assistants will become familiar and get practice with microscopic imaging, interpreting and quantifying staining results from tissue samples.
 2. Learning and Behavioral Testing — URCA assistants will help carry out and score behaviors used in select tests and develop an understanding the scientific rationale behind each test.
 3. Animal Care and Research Ethics — URCA assistants will demonstrate proficiency in the humane handling and routine care of research animals in compliance with IACUC protocols and gain an understanding of the ethical principles governing the use of animals in biomedical research.
 4. Tissue Collection and Post-Mortem Procedures — URCA assistants will be able to assist in or independently carry out the identification and collection of targeted tissues post-mortem.
 5. Data Collection and Scientific Rigor — URCA assistants will develop skills in consistent and accurate data recording and management.

6. Collaborative Research Practice — URCA assistants will gain experience working as part of a multidisciplinary research team alongside dental students and the faculty mentor, practicing professional communication skills and experiencing how collaborative science is conducted in a biomedical lab.

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?

- My laboratory is at the School of Dental Medicine in Alton, and so students must have transportation to and from the Alton campus. Students are welcome to carpool.

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

- N/A

Other requirements or notes to applicants:

- Students must be willing to work with rats.