

BCHM 421/422 Project – 2023-24

Project Outline: Ion channel function, in particular the flow of calcium across a cell membrane, is a useful marker for neuronal activation and is often used as a proxy for pain. Our research group is interested in understanding how 1) circadian rhythms and 2) *Borrelia burgdorferi* (which contributes to Lyme disease) can alter the activation state of sensory neurons. We seek two potential BCHM421/422 students to use various experimental approaches, including transgenic animals lacking circadian rhythms in specific cells, to study how non-specific cation channels (e.g. TRPV1, TRPA1) and sodium, potassium and calcium channels are altered in response to either 1) time of day or 2) stimulation with *B. burgdorferi*. Understanding which ion/cation channels are altered, and the mechanisms underlying these changes, will help us identify potential targets to develop new therapeutics.

Supervisor: Nader Ghasemlou

Project Title: Biophysics of sensory neurons

Project Goals: 1. Identify which ion channels are altered at the transcriptomic and proteomic levels in sensory neurons, either using a circadian (24-hour) approach or in response to *B. burgdorferi* treatment

2. Use biophysical approaches to determine how altered channel expression affects ion channel fluctuations across the cell membrane.

Experimental Approaches:

Goal 1: animal handling, tissue collection (using sterile surgical techniques), qPCR, Western blotting

Goal 2: animal handling, tissue collection (using sterile surgical techniques), cell culture, electrophysiology and/or calcium imaging

References:

<https://pubmed.ncbi.nlm.nih.gov/36352529/>

<https://pubmed.ncbi.nlm.nih.gov/36323780/>

<https://pubmed.ncbi.nlm.nih.gov/35046040/>

<https://pubmed.ncbi.nlm.nih.gov/23965627/>