BCHM 421/422 – 2018/2019

Project Outline:

Supervisor: Dr. Graham Côté

Project Title: Functional and structural studies on the α-kinase family of protein kinases

Keywords (3-5):
1. Protein kinases
2. Protein phosphorylation
3. Signal transduction
4. Protein regulatory mechanisms
5. Protein structure and function

Project Goals: The human genome encodes 520 protein kinases, all of which regulate cellular processes by phosphorylating proteins on serine, threonine or tyrosine residues. Seven of the human protein kinases are termed alpha-kinases and differ significantly from other protein kinases in terms of their structure and enzymatic properties (1-4). This project will involve studies on the structure and function of alpha-kinases, including MHCK-A, which inhibits myosin II contractile activity, eEF2K, which inhibits protein synthesis and ALPK1, whose function is not known. We will investigate the regulatory properties of these α-kinases, and in particular the function of accessory domains that may interact with the α-kinase domain to promote or inhibit catalytic activity.

Experimental Approaches:
1. DNA cloning and site-directed mutagenesis
2. Expression of proteins in bacteria
3. Protein purification using affinity chromatography and ion exchange chromatography
4. ATPase assays and protein phosphorylation assays.
5. Protein-protein interaction assays using gel filtration, pull-down methods and isothermal titration calorimetry
6. There will be an opportunity to learn how to crystallize proteins and if successful, to help solve a protein structures by X-ray crystallography.

References: