RESEARCH OPPORTUNITY PROGRAM
299Y/399Y PROJECT DESCRIPTIONS 2019-2020
FALL/WINTER

Name and Title: Denise Belsham, Professor
Department: Physiology

TITLE OF RESEARCH PROJECT: Regulation of Brain Neuropeptides by Nutrients, Chemicals and Hormones.

Number of 299Y Spots: 2 Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
Hypothalamic neuropeptides, produced by neurons in a small region of the brain, are responsible for many physiological functions, particularly the control of energy homeostasis. My laboratory aims to understand how nutrients, endocrine-disrupting chemicals, and hormones regulate the expression and secretion of specific neuropeptides in cell models generated from the hypothalamus. We use cell and molecular biology methodologies to obtain mechanistic insights in cell lines and primary cell culture of hypothalamic neurons.

DESCRIPTION OF STUDENT PARTICIPATION:
The student will be trained in the routine techniques used in the lab and have an independent project assigned, based on their level of expertise. A more senior trainee will supervise progress on a daily basis, while the student will have the opportunity to meet with Dr. Belsham whenever needed. A student trained in my laboratory will be exposed to a wide variety of molecular biology technologies and will gain a general knowledge of research in endocrinology, neuroscience, molecular biology and cellular signaling.

MARKING SCHEME (assignments with weight and due date):
- 10% - 2-page report due October TBA, 2019 (double-spaced, including rationale of project, hypothesis, methods) - written
- 30% - final report (~10 pages double-spaced, including introduction, methods, results and discussion and references, in standard journal format; figures and legends should be included, but do not count towards the page limit; by April TBA, 2020) - written
- 10% - Participation in weekly Journal clubs/lab meetings (by April TBA, 2020)
- 10% - Oral presentation to the lab or poster presentation in Undergraduate Research Forum for ROP students (held in March) (by April TBA, 2020)
- 30% - lab mark: 15% by December TBA, 2019; 15% by April TBA, 2020
- 10% - Final data and lab books, labeled and explained for lab archives (by April TBA, 2020) - written
Name and Title: Patricia Brubaker, Professor
Department: Physiology

TITLE OF RESEARCH PROJECT: Role of the Glucagon-Like Peptides in Diabetes and Intestinal Growth

OBJECTIVES AND METHODOLOGY:
The intestinal glucagon-like peptides, GLP-1 and GLP-2, are approved drugs for the treatment of patients with type 2 diabetes and short bowel syndrome, respectively. The laboratory studies the secretion of GLP-1 from the intestine, as well as the mechanism of action of GLP-2, both in vitro using cell models and in vivo using rodent models.

DESCRIPTION OF STUDENT PARTICIPATION:
The student will participate as a full member of the research project, working in association with a senior graduate student or post-doctoral fellow on a defined sub-project. Methodologies may include: in vitro (cell culture, peptide treatment, cell biology) and/or in vivo (normal and/or genetically-modified mice, peptide administration, tissue collection) approaches combined with biochemical analyses (immunoassay, immunocytochemistry, immunohistochemistry, immuno blot, microscopy, RT-qPCR), depending upon the project and the interest(s) of the student.

MARKING SCHEME (assignments with weight and due date):
10% - 2-page report due November 1, 2019 (double-spaced, including rationale of project, hypothesis, methods)
30% - final report (~10 pages double-spaced, including introduction, methods, results and discussion and references, in standard journal format; figures and legends should be included, but do not count towards the page limit; by April 3, 2020)
10% - Participation in weekly Journal clubs/lab meetings (by April 3, 2020)
10% - Poster presentation in Undergraduate Research Fair for ROP students (held in March; preferred option) or oral presentation to the lab (by April 3, 2020)
30% - lab mark: 15% by December 4, 2019; 15% by April 3, 2020
10% - Final data and lab books, labeled and explained for lab archives (by April 3, 2020)

Note: February 16, 2020 - last day to cancel Y section code courses without academic penalty.
Name and Title:  Jinrong Min, Associate professor  
Department:  Physiology  

TITLE OF RESEARCH PROJECT:  Structural and Functional Studies of Epigenetics Related Proteins  

Number of 299Y Spots:  2  
Number of 399Y Spots:  2  

OBJECTIVES AND METHODOLOGY:  
The goal of this research is to characterize epigenetics related proteins by X-ray crystallography in combination with other biochemical and biophysical techniques, such as isothermal titration calorimetry (ITC) and surface plasmon resonance (SPR). Specifically, we will purify the target proteins of interest by different chromatography columns and characterize their physiological substrates and make the protein complexes for crystallization and structural studies by X-ray crystallography.  

DESCRIPTION OF STUDENT PARTICIPATION:  
The students will participate in all aspects of the project from preparing the LB media for E Coli cell growth to purification and crystallization of the epigenetic proteins of interest.  

MARKING SCHEME (assignments with weight and due date):  
• 10% - 2-page report due November TBA, 2019 (double-spaced, including rationale of project, hypothesis, methods)  
• 30% - final report (~10 pages double-spaced, including introduction, methods, results and discussion and references, in standard journal format; figures and legends should be included, but do not count towards the page limit; by April TBA, 2020)  
• 10% - Participation in weekly Journal clubs/lab meetings (by April TBA, 2020)  
• 10% - Oral presentation to the lab or poster presentation in Undergraduate Research Forum for ROP students (held in March) (by April TBA, 2020)  
• 30% - lab mark: 15% by December TBA, 2017; 15% by April TBA, 2020  
• 10% - Final data and lab books, labeled and explained for lab archives (by April TBA, 2020)
Name and Title: Dr. Padmaja Subbarao  
Department: Physiology

TITLE OF RESEARCH PROJECT: Utility of Pulmonary Function Testing to Assess Preschool Asthma

Number of 299Y Spots: 1  
Number of 399Y Spots: 1

OBJECTIVES AND METHODOLOGY:
Asthma is a common respiratory illness that is often diagnosed based on the presence of clinical symptoms. Clinical symptoms of asthma are incredibly variable. They may present themselves due to endogenous or exogenous stimuli, with varying numbers of episodes, and with different degrees of severity. Therefore, the clinical diagnosis of asthma is difficult to objectively obtain due to the variability of symptoms. Another challenge for defining and diagnosing asthma is the absence of a single cause, as asthma often involves complex gene-environment interactions. Pulmonary function testing is often used to provide a more objective and accurate diagnosis of respiratory illnesses. Our laboratory’s focus is on determining which lung function tests and outcome measures, provide the most useful information to aid physicians in diagnosing asthma in the pediatric population.

The student’s objectives will be to:
(1) aid in the preparation for and conduct of research study visits
(2) assist with the conduct and analysis of pulmonary function tests and
(3) assist in the preparation of a manuscript that explores the factors that predict the development and severity of asthma.

The following methodologies may be used during the student’s term:
(1) Physiological Tests: Multiple Breath Washout, Spirometry, Methacholine Challenge, Airway Oscillometry, Exhaled Nitric Oxide
(2) Various statistical analyses

DESCRIPTION OF STUDENT PARTICIPATION:
The ROP student will assist with the preparation for and conduct of research study visits. The student will gain skills by assisting with and analyzing pulmonary function tests, acquiring anthropometric measurements and collecting and processing samples. The student will also work with research study staff to develop a research proposal and assist in the preparation of a research manuscript. The student will be expected to provide biweekly updates of their research progress and do an oral presentation of their research findings. The student will be supported by a local interdisciplinary research team made up of research assistants, coordinators and managers as well as respiratory therapists, biostatisticians and other students.
MARKING SCHEME (assignments with weight and due date):

2. Oral Presentation – Due Nov 2019 – 15% of grade
3. Poster Presentation in Undergraduate Research Forum – March 2020 – 10% of grade
4. Participation in biweekly meetings by March 31 2020 – 20% of grade
5. Laboratory Performance – by April 2020 – 20% of grade
6. Final Report – Due April 2020 – 20% of grade