MSCBMP2880 - Cellular Biology of Normal and Disease States

Course Director:

Daniel Devor, Ph.D. – BSTWR-S330 – 412-383-8755 – dd2@pitt.edu

Course Administrator:

Sarah Biancardi – S362 BST – 412-624-3177 – sab181@pitt.edu

Participating Faculty:

Meir Aridor, Ph.D. – aridor@pitt.edu
Michael Butterworth, Ph.D. michael7+@pitt.edu
Daniel Devor, Ph.D – dd2@pitt.edu
Christopher Guerriero, Ph.D. - cjg11@pitt.edu
Gerald Hammond, Ph.D. - ghammond@pitt.edu
Yang Hong, Ph.D. – yhong@pitt.edu
Adam Kwiatkowski, Ph.D. – adamkwi@pitt.edu
Todd Lamitina, Ph.D. - todd.lamitina@chp.edu
Teresa Buck, Ph.D. - teb20@pitt.edu
Claudette St. Croix, Ph.D. - cls13@pitt.edu

Focus of the class:

The course focuses on the fundamental cell biological principles that govern protein folding, trafficking, degradation, regulation and function by examining specific topics and how they are disrupted, ultimately leading to disease. For each topic, the participating faculty will initially give a lecture providing the framework to understand the basic principles being covered. In a second class, the students will take the lead in the presentation of data demonstrating how these basic principles are disrupted leading to a specific disease. This student-led class will take one of two forms: 1) The students will lead a discussion of one or more papers in a journal-club format, or 2) The students will work with the faculty to develop a lecture on a disease relating to the principles discussed.

At the end of the course students will have an increased understanding of normal cellular function and how research in cell biology can lead to a deeper understanding of diseases that impact millions of people each year.

Meeting times and place:

Class meets on Tuesdays and Thursdays from 9:00-11:00 in BST S373 – this is the Cell Biology Conference Room

Structure of the course:

The course consists of both didactic lectures by the faculty, as well as student-led manuscript reviews and lectures. Manuscript discussions will involve a critical critique of seminal papers in the fields being discussed as a means of both supporting the information provided in the lectures as well as providing additional primary data that is discussed in detail as to the methodologies, the hypothesis generated and the way in which these data support the conclusions of the manuscript. It is important that the students have read the manuscripts before class so that they can contribute to the discussion by asking questions concerning the methods, hypothesis and conclusions.

In some instances, a team of two or more students will be asked to prepare a lecture which encompasses the disease selected by the faculty and which underscores the critical nature of the basic principles discussed. In this case, an off-day is scheduled to allow the students additional time to prepare the lecture. The faculty will provide manuscripts or other reading materials to the students necessary for the preparation of this lecture. The faculty will also be available to work with the students as they prepare the lecture as a team. The ability to deliver a clear message as to the scientific underpinnings of disease is a critical component of scientific communication which will be developed during these student-led classes.

How you will be evaluated:

You will be evaluated based on class participation during the didactic lectures as well as your involvement in the student-led presentations

COURSE SCHEDULE:

January 09: Cargo selection in the ER 1 - Aridor
January 11: Cargo selection in the ER 2 - Aridor

January 16: Protein folding, ubiquitination, ERAD/paper 1 – Guerriero/Buck

Sun Z, Guerriero CJ, Brodsky JL. Substrate ubiquitination retains misfolded membrane proteins in the endoplasmic reticulum for degradation. Cell Rep. 2021 Sep 21;36(12):109717. doi: 10.1016/j.celrep.2021.109717. PMID: 34551305; PMCID: PMC8503845

January 18: Proteasomal degradation/ paper 2 – Guerriero/Buck

Nejatfard A, Wauer N, Bhaduri S, Conn A, Gourkanti S, Singh N, Kuo T, Kandel R, Amaro RE, Neal SE. Derlin rhomboid pseudoproteases employ substrate engagement and lipid distortion to enable the retrotranslocation of ERAD membrane substrates. Cell Rep. 2021 Oct 19;37(3):109840. doi: 10.1016/j.celrep.2021.109840. Erratum in: Cell Rep. 2022 Mar 22;38(12):110578. PMID: 34686332; PMCID: PMC8641752.

January 23: Student presentations – Guerriero/Buck

January 25: Signaling via ROS 1 – St. Croix

January 30: Signaling via ROS 2 – St. Croix

February 1: Life at the leading edge: regulated cell movement – Kwiatkowski

February 6: No Class - Prepare for Student Presentations

February 8: Student Presentations – Kwiatkowski

February 13: Fundamentals of Ion Transport – Devor Epithelial polarity and cancer

February 15: No Class - Prepare for Student Presentations

February 20: : Chloride secretion: Cystic Fibrosis - Devor
Student presentations:

1. Introduction to CF
2. CFTR Potentiators – Fixing the Gating defect
3. CFTR Correctors – Fixing the Folding/Trafficking defect

February 22: Epithelial polarity and cancer – Y. Hong

February 27: Epithelial polarity and cancer – Y. Hong

February 29: No Class

March 5: Autophagy and Cell Death – Lamitina

March 7: Ageing and Senescence – Lamitina

SPRING BREAK MARCH 12 & 14

March 19: Journal Presentation – Lamitina

March 21: Phosphoinositide kinases in cell biology and physiology – Hammond

March 26: No Class – Prepare for Student Presentations

March 28: Phosphoinositide kinases as therapeutic targets – Hammond

April 2: The role of microRNAs in normal development, physiology and cell biology – Butterworth

April 4: No Class - Prepare for Student Presentations

April 9: MicroRNAs and disease –Butterworth