G Protein-coupled Receptor Biology (9-10:20 TR)
BIOL 5301 –Select Adv Topics in Biology Science CRN: 14066

G protein-coupled receptor biology is an opportunity to read and discuss scientific literature in the field of GPCR biology. As 40-50% of all drugs in the market today are targeted toward GPCRs, it is important for students to have a clear understanding of the function and relevance of these proteins to signaling, health and biology.

Midterm Assignments: 44% (2 midterms- 22% each)
Take Home Final 22%
Attendance and participation: 34%*

All writing assignments are due on time. Late submissions will not be accepted.

DATE ASSIGNMENT

August 25 Seven Trans-membrane Receptors -Intro
August 27 Structure of GPCRs - Deupi, Kobilka, Activation of G protein coupled Receptors- ADVANCES IN PROTEIN CHEMISTRY-2007

September 1 Structure of GPCRs
September 3 Structure of GPCRs
September 8 Signaling through GPCRs-second messengers Chidiac RGS proteins destroy spare receptors: Effects of GPCR-interacting proteins and signal deamplification on measurements of GPCR agonist potency- 2015

September 10 Signaling through GPCRs- second messengers

September 17 Rhodopsin
September 22 No class (Midterm #1 Due)
September 24 Rhodopsin/ GPCR antagonists
September 29 GPCR antagonists Khoury, Allosteric and biased G protein-coupled receptor signaling regulation: potentials for new therapeutics-2014

October 1 Neurotransmitters Chung, Kieffer , Delta opioid receptors in brain function and diseases, 2013
October 6 2 adrenergic receptors Pera, Penn. Crosstalk between beta-2-adrenoceptor and muscarinic acetylcholine receptors in the airway, 2014

October 8 Muscarinic Receptors Dale et. al. The pharmacological rationale for combining muscarinic receptor antagonists and -adrenoceptor agonists in the treatment of airway and bladder disease- 2014

October 13 Chemokine Receptors
October 15 GPCRs and obesity
October 20 Hormone regulation of GPCRs
October 22 Taste receptors
October 27 Olfactory receptors

November 3 Manuscript Review Ashley
November 5 Manuscript Review-Natzidielly
November 10 Manuscript Review -Olga
November 12 Second Midterm assignment Due (no class today)
November 17 Manuscript Review-Anna
Instructions for submitting assignments:

1) Create your writing assignment. Acceptable formats for submitting your assignment are .doc or docx files.

2) Save the file with your last name and date 3) Attach the file to the Safe assignment 4) Submit to complete the process. I will be notified automatically that your assignment is ready for grading.

Course Description

G protein-coupled receptors (GPCRs) are cell surface receptors, that are encoded by more than 1,000 genes, and are used by many cells, to communicate within the host and to the world outside. For instance, sight, smell, taste and pain are controlled at the cellular and molecular levels by GPCRs. In each case a GPCR is used to discriminate millions of signals to provide intelligible information to the brain and allow the host to define what is occurring outside the host. In fact, you are using the GPCR rhodopsin to read this syllabus.

Therefore, it is not surprising that because GPCRs are readily accessible on the surface of many cells, over 40% of the drugs on the market today are targeted toward GPCRs. Montelukast (Singulair®) and Zafirluast (Accolate®) are examples of GPCR antagonists that are used to block GPCR-mediated bronchoconstriction during an asthma attack. Memantine HCl (Namenda®) is being used to try to slow the dementia associated with Alzheimer’s disease, while beta-blockers (also called β-adrenergic receptor blocking agents) are being used to treat high blood pressure, glaucoma and migraines.

In this course, we will discuss the structure and function of the “classical” GPCRs, rhodopsin and the β2 adrenergic receptor. We will examine how small GTP-binding proteins are activated by ligand binding, by different types of GPCRs and examine the signaling effectors that promote downstream events, to begin to understand the specific cellular responses that are generated by ligand binding. In studying chemokine receptors, immune cell receptors that control the host immune response, we will begin to learn how individual GPCRs are important in regulating systemic responses. We will then discuss what happens when GPCRs dysfunction during neurological diseases. We will then examine current studies being carried that reveal novel insights into activation, signaling and desensitization of GPCRs.

This is an advanced discussion course. You will be graded on class participation and three written assignments. As you have been given the due dates in advance, unless you have extenuating circumstances, no late work will be accepted.