

Insane in the Membrane: Biology and biophysics of the membrane

Tuesday and Thursday 11:00-12:15, PORTER B121

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Office hours: Tuesday 10:00-11:00 Thursday 13:00-14:00

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Course Website: <http://dosequis.colorado.edu/Courses/InsaneMembrane/>

Lab Website: <http://dosequis.colorado.edu/>

Purpose

This course is an in depth look at the biology and physics of the biomembrane. A large number of important biological processes occur within the biomembrane. These include the primary production of ATP, our sensory understanding of the outside world via the detection and interpretation of light, sound, heat, pressure and chemicals and the communication between cells such as neurons. This course will investigate the biology and biophysics of the molecules involved in these processes and provides students with knowledge about these important processes and the methods utilized to study them in detail. Students will have weekly reading assignments from the primary literature; they will submit short critical writings on the reading material and will critique and discuss the papers in class. In addition each student will give an oral presentation on several journal articles and an in depth written critique. A final written paper will be required that addresses a critical question in membrane biology and outlines a proposed experimental approach to answer the question.

Syllabus

Week 1	Introduction to the membrane and the processes contained within it. Reading: Guinness, Biomembranes Chapt 1(Website)
Week 2	Lipids, membrane, membrane protein structure and stability. Reading: Guinness, Biomembranes Chapt 2 (Website), Review (Website)
Week 3	Bacteriorhodopsin, halorhodopsin, photosynthetic reaction center. Reading: Papers from the literature available on course web site as PDF.
Week 4	Photosystem I and II, Light harvesting complexes Reading: Papers from the literature available on course web site as PDF.
Week 5	Cytochrome oxidase Ubiquinol cytochrome-c oxidoreductase Reading: Papers from the literature available on course web site as PDF.
Week 6	Complex II and Formate dehydrogenase Reading: Papers from the literature available on course web site as PDF.
Week 7	Bo3 oxidase Reading: Papers from the literature available on course web site as PDF.
Week 8	ATP-synthase, Ca ATPase Reading: Papers from the literature available on course web site as PDF.
Week 9	FuA transport, TOLC complex

	Reading: Papers from the literature available on course web site as PDF.
Week 10	GPCR's.G-proteins, porins Reading: Papers from the literature available on course web site as PDF.
Week 11	ABC-cassette transporters, Calcium ATPase transporter Reading: Papers from the literature available on course web site as PDF.
Week 12	Anion specific channels, chloride channel, aquaporin, GlpF Reading: Papers from the literature available on course web site as PDF.
Week 13	Potassium channels, cation specific Reading: Papers from the literature available on course web site as PDF.
Week 14	Ligand gated ion channels, AChR, ACH-BP, Reading: Papers from the literature available on course web site as PDF.
Week 15	Gap junctions Mechanosensitive channels Reading: Papers from the literature available on course web site as PDF.
Week 16	Toxin channels, hemolysin, colicin Reading: Papers from the literature available on course web site as PDF.

Critical writings

There will be weekly short critical writings on the reading material. Each student will write a 1 page critique on the papers that they present orally to the class. Students will prepare a final written paper that addresses a critical question in membrane biology and outlines a proposed experimental approach to answer the question.

Discussions

Each student will give two oral presentations on the reading assignments. These presentations will be followed by a discussions lead by the student. The goal is to critically analyze the reading material and to review what students have learned from the presentation and the reading material.

Grade determination

- 40 % Final Written Proposal
- 20% Oral presentations
- 15% Presentation Write-up
- 15% Weekly Queries
- 10% Participation in class discussion

Queries Day 1

- What is a membrane?
- Do any biological processes occur in the membrane?
- What physically composes a membrane?
- What do you expect to learn from this course?