

LSBS 524500: Membrane Biology
R6R7 (Thurs 14:10-16:00) 2019 Fall semester
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Biological membranes consist of lipids, proteins and carbohydrates to define the compartmentalization of the cells. Membranes are also very dynamics not only within the lateral and in the transverse direction of lipid bilayers, but also undergo constant motions and contacts in the intracellular cytoplasm of the cells. Recent progress in the structures/dynamics and crowdedness (or clustering) of these membrane components has allowed us to address how the molecular diversity and interactions of these essential cellular components help in exert its membrane functions through channels, transporters, enzymes, receptors and other related structural components of lipid and glycoconjugates. In order to achieve this goal, we will spend 1/3 of the lecture hours to review the basics of membrane structures and functions, another 1/3 to update the progress in the field based on the review articles during the last couple years and finally, the last 1/3 to guide students reading the state of the art publications in the field of membrane biology.

Sept 12. Introduction to membrane structure, dynamics and function

Part I: Membrane lipids

Sept 19 Structure and diversity of lipids (Home Study: Vietnam Workshop)

Sept 26 Physical Properties of Lipid Assembly

Oct 3 Membrane lipid dynamics (Home Study: Germany Workshop)

Part II: Membrane Proteins

Oct 17. Membrane protein structures, folding and translocation

Oct 24 Clustering of membrane proteins through transmembrane helix

Oct 31. Cell signaling through protein interaction and second messengers

Nov 7. Midterm Examination

Part III: Protein Lipid Interactions

Nov 14 Protein locations as defined by Phospho-Inositol lipid family

Nov 21 Role of lipid in protein stability and assembly

Nov 28. Lipidation and lipid transfer

Part IV: Membrane Enzymes and Transporter

Dec 5 Protease lipase and glycosyltransferase at membrane interface

Dec 12 ATPase and ABC transporters

Dec 19. Lipid flippase

Part V: Membrane Receptor and Signalling

Dec 26. GPCR and G complex

Jan 2 Ligand gated ion channels

Jan 9. Final Examination

Grade: 30% Report and or Examination, 30% Oral Presentation, 40% Exercise

Textbook:

1. Biochemistry of lipids, lipoproteins and membranes (2008)
by Dennis E. Vance and Jean E. Vance, 5th Edition, Elsevier
2. Membrane Structural Biology, (2014)
by Mary Luckey, Cambridge Univ. Press 2nd edition

Assigned reading and presentation on current review and articles