LSBS 524500: Membrane Biology
R6R7 (Thurs 14:10-16:00) 2020 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 cytoplasma 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 17 Introduction to membrane structure, dynamics and function
Sept 24 Structure and diversity of lipids
Oct 1 Mid autumn Festival
Oct 8 Physical Properties of Lipid Assembly and dynamics
Oct 15 Membrane protein structures, folding and translocation
Oct 22 Clustering of membrane proteins through transmembrane helix
Oct 29 Midterm Examination (Exercise I)
Nov 5 Cell signaling through protein interaction and second messengers
Nov 12 Protein locations as defined by Phospho-Inositol lipid family
Nov 19 Role of lipid in protein stability and assembly
Nov 26 Lipidation and lipid transfer
Dec 3 Midterm Examination (Exercise II)
Dec 10 Flippase, lipase and glycosyltransferase at membrane interface
Dec 17 Conformational Space of ATPase and ABC transporters
Dec 31 GPCR
Jan 7 Ion channels
Jan 14 Final Report

Grade: Midterm Examination (Exercise) 60%, Final Report 40%
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
3. Assigned reading and presentation on current review and articles