

Biofísica de membranes

2014/2015

Code: 101899
ECTS Credits: 6

| Degree | Type | Year | Semester |
|------------------------------|------|------|----------|
| 2501230 Ciències Biomèdiques | OT | 4 | 0 |

Contact

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Use of languages

Principal working language: anglès (eng)
Some groups entirely in English: Yes
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Alex Peralvarez Marin

Objectives and Contextualisation

Study of the components of biological membranes and their molecular organization. Structural and dynamic features of the two main components of biological membranes: lipids and proteins, establishing the links between their molecular structure and physiological functions and possible associated pathologies. Unravel the molecular mechanisms of vital functions like the propagation of nerve impulse and signal transduction through cellular envelopes or the transport of molecules across biological membranes. Methods and techniques used for the study of biomembranes.

Content

1. Introduction
- 1.1. Structure and function of biological membranes
2. Biophysical properties of biological membranes
 - 2.1. Classification and composition
 - 2.2 Interaction of integral membrane proteins with carbohydrates and lipids: concept of "lipid annulus" and lipid-protein hydrophobic mismatch
 - 2.3 Effect of membrane fluidity on membrane protein function.
 - 2.4 Mechanical properties of biological membranes: the erythrocyte membrane.
 - 2.5. Structural features of membrane lipids: lipid curvature and tension, lateral pressure of lipid bilayers.
 - 2.6. Thermotropic behavior of lipids: lipid phases, techniques to study membrane thermotropism. Lipid Domains. Lipid bilayer model systems.
 - 2.7. Dynamics of biological membranes: Rotation and lateral diffusion of lipids and membrane proteins. Lipid "flip-flop" and lipid asymmetry in biomembranes. Biophysical methods to study dynamics in membranes.

2.8. Membrane proteins: classification, topology, and characteristics. Structural principles of integral membrane proteins: Amphiphilic character, hydrophobic scales and topology and secondary structure prediction.

3. Molecular and structural basis of physiological functions in membranes

3.1. Membrane protein biogenesis and folding: bioenergetics of membrane insertion, structural basis of biogenesis, topogenesis, and membrane protein misfolding.

3.2. Transport across membranes. Types of transport. chemosmotic theory: Nernst equation. Structural basis of water and ions transport in membrane protein channels: selectivity filer, gating and regulatory mechanisms. Active transport in biomembranes: Primary transporters: P and V-type of ATPases pump and ABC transporters. Secondary transporters: concept of coupling. Alternate access model. Ligand-induced fit. Transport and structural symmetry.

3.3. Structural basis of signal transductions in biological membranes: membrane enzymes, signal transducers, ligand-gated ion channels, mechanosensor channels.

4. Seminars

4.1. Production and isolation of membrane proteins.

4.2. Functional characterization of membrane proteins.

4.3. Structural elucidation of membrane proteins.

5. Student's seminars