



METADATA

Title: Biological membranes: From structure to functions. Theoretical and experimental approaches

Other Titles: -

Language: Greek

ISBN: 978-960-603-387-2

Subject: NATURAL SCIENCES AND AGRICULTURAL SCIENCES

Keywords: Biological membranes / Membrane lipids / Membrane proteins / Membrane transport / Signal transduction

Bibliographic Reference: Lekka, M., Leonaritis, G., Galanopoulou, K., & Kitsioulis, E. (2015). Biological membranes: From structure to functions. Theoretical and experimental approaches [Undergraduate textbook]. Kallipos, Open Academic Editions. <http://dx.doi.org/10.57713/kallipos-590>

Abstract

"Biological membranes: From structure to functions. Theoretical and experimental approaches" is a textbook exploring the main concepts of the structure and functions of biological membranes, at a theoretical and practical level. The sequence of the theoretical chapters follows a hierarchical logic, aspiring to stick to definitions, assumptions and methodology. We start with the main types of eukaryotic and prokaryotic cells' biological membranes, and we discuss techniques for cell homogenisation, fractionation and purification based on enzymic and morphological purity criteria. Chemical and physicochemical properties of the membrane components follow, solubilization and reconstitution techniques, while main concepts regarding Critical Micellar Concentration, and hydrophobic-hydrophilic balance, are described. Then, we proceed to the membrane components' assembling without disturbing the cellular integrity, dynamics and membrane biogenesis, procedures leading to the architecture of biological membranes. Models of membrane structure, the fluid mosaic model, assumptions, consistencies and inconsistencies of the models

and applications regarding synthetic membranes and liposomes are comprised. The chapter devoted to transport explains how hydrophobic and hydrophilic compounds pass through highly specific channels and describes primary and secondary active transport and the transport of particles through whole regions of biological membranes often in the form of endocytosis, via receptors. At the level of membranes' functions, we provide the fundamentals and logic of cell communication and signalling. Types of membrane receptors, classification and kinetics are outlined, followed by classical examples of signalling pathway patterns, such as G-proteins, effectors and intracellular messenger systems. Among the plethora of pathways, we focus on lipid signalling through intracellular and extracellular lipid signalling molecules. Finally, 10 classical experiments and techniques for the analysis of biological membranes are presented. In this respect, the most common techniques applying to the study of biological membranes and membrane components are presented. All the lab exercises contain relevant comprehensive technical appendixes.

