International Journal of Biomedicine | June 2019 - Volume 9, Issue Suppl_1: Abstracts From the Second Russian International Conference "Cryo-electron microscopy 2019: achievements and prospects"

POSTER ABSTRACT PRESENTATIONS

SESSION TITLE: COMPLEX AND EMERGING TECHNIQUES IN STRUCTURAL BIOLOGY

DOI: 10.21103/IJBM.9.Suppl_1.P42

Abstract P-42: DSC-Investigations of Lipid's Membrane that Imitated of the Animal's Biomembrane under Biological Active Substances Actions

Olga M. Alekseeva[1], Anna V. Krementsova[1], Aleksey V. Krivandin[1], Yury A. Kim[2]

[1]*Emanuel Institute of Biochemical Physics, Russian Academy of Sciences,*
[2]*Institute of Cell Biophysics, Russian Academy of Sciences*

Background: To investigate the effect of biological active substances (BAS) on the structural organization of animal biomembranes, DSC (adiabatic differential scanning microcalorimetry) and SAXS (small-angle X-ray scattering) methods may be used. The DSC method of melting individual synthetic phospholipids, which are formed into multilamellar liposomes, demonstrates the organization manner of phospholipid microdomains. Multilamellar liposomes are a simple and stable model that imitates organelle membranes and their location in regards to other organelles or the outer cellular membrane. Using the SAXS method allows to measure the type of bilayer packing in multilamellar liposomes, which contain a mix of natural phospholipids, and the thickness of this bilayer.

Methods: The solutions and suspensions of BAS: melamine salt of bis (oximethyl) phosphinic acid (Melafen) and *β*-4-oxy-(3,5-ditretbutyl-4-oxiphenyl)potassium propionate (Fenozan) and its hydrophilic and hydrophobic derivatives, were prepared step by step by mixing a soluting of ethanol-aqua concentrated samples of BAS. The emulsions of phospholipid multilamellar liposomes were formed from dimyristoilphosphatidylcholine (DMPC) or from egg lecithin. The formation was conducted from thin films, when the DMPC- chlorophorm solution was dryed under argon. After that, using the layer-by-layer hydration method, with the temperature being higher than that for lipid phase transition, many bilayers formed multilamellar liposomes.

Results: Microcalorimetry research identified one pike of structural thermo-inducted transition into microdomain organization in membranes, throughout the whole thickness of multilamellar liposomes. The influence of biological active substances - melamine salt of bis (oximethyl) phosphinic acid (Melafen) and β-4-oxy-(3,5-ditretbutyl-4-oxiphenyl)potassium propionate (Fenozan) and its hydrophilic and hydrophobic derivatives, greatly changed the thermodynamic parameters of DMPC liposomes. That indicated the reorganizations of lipid microdomains in membranes. But, using the SAXS method, it has been shown that the hydrophilic substance Melafen does not change of bilayers thickness and the order of their packing in multilamellar liposomes. For these investigations of bilayer thickness and the order of bilayer packing in multilamellar liposomes, a mix of natural lipids – egg lecithin – was used.

Conclusion: These liposomes were formed by a similar method, as for DMPC liposomes were. We can confirm that Melafen and Fenozan's influence on model membranes organization differs and had several variations on different membrane organization levels. These facts may be used for further understanding of the lipid's role in response of the animal cellular biomembrane to the impact of exogenous substances.

Key Words: phospholipids • multilamellar liposomes • biology active substances • DSC

International Journal of Biomedicine. 2019;9 Suppl 1: S35-36. doi: 10.21103/IJBM.9.Suppl_1.P42