12th INTERNATIONAL CONFERENCE

BIOCATALYSIS-2019:

FUNDAMENTALS & APPLICATIONS

ABSTRACTS

June, 24-28, 2019
St. Petersburg - Valaam - Kizhi
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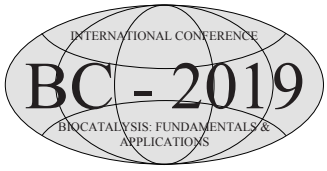

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Study of magnetic field parameters influence on exosomal membrane fluidity in complexes with magnetic nanorods by fluorescent spectroscopy

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Keywords: exosomes, magnetic nanorods, fluorescent spectroscopy, FRET

Nowadays scientists are interested in study new perspective drug delivery systems. Among all of them membrane vesicles are very popular, particularly exosomes. Exosomes are produced by almost any cells in the organism and could be found in many biological fluids. Their possible application is extremely wide as they are non-toxic, biocompatible and have highly developed surface. The last property looks perspective for creation a drug delivery system with active targeting. Despite the advantages of exosomes, the issue of trigger drug release is still remains unsolved. As a possible solution we propose utilizing complexes of exosomes with magnetic nanorods. Exposed to the low frequency alternative magnetic field nanoparticles could oscillate and loose membrane of vesicles, promoting drug release.

The aim of the work was to study the influence of magnetic field parameters on exosomal membrane fluidity. As an effective instrument for such study we chose fluorescent spectroscopy. The approach is provided by inclusion of fluorescent dye into exosomal membrane. In this work we have used BODIPY labeled DPPC lipid derivative (B9PPC – BODIPY). The analytical signal is fluorescence polarization; its decrease evidence about membrane loosening. As an alternative fluorescent method we used Forster resonance energy transfer (FRET). For this two labels were incorporated into membrane vesicles: B9PPC and TMB-PC. Together they made a pair, where one label is an energy donor, and another one – energy acceptor. If these labels locate close to each other, the fluorescence starts to quench. Thus, increase of membrane fluidity could be noticed by decrease of fluorescent intensity.

Using FRET-analysis we have shown that indeed disordering of the exosomal membrane in complexes with nanorods occurs in five minutes exposure to magnetic field. The increase of magnetic induction led to a slight increase of membrane fluidity. However, there was no significant dependence between frequency of magnetic field and membrane loosening depth. The fluorescence polarization study appeared to be more informative. We have studied dependence between time exposure in magnetic field and loosening depth under different conditions (magnetic induction, field frequency). Every pair of magnetic parameters has its own time of maximal loosening. This time decreased with magnetic induction increase and field frequency decrease.

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