The interaction of quinone-chelators with lipid membrane: ^{1}H NMR and MD study

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The interaction of a pharmacophore with cell membranes is a topic of great interest in biology and pharmacology due to the possible relevance in the pathway of action. Substituted anthraquinones known as anthracycline antibiotics (doxorubicin, daunomycin, emodin, etc.) are widely used in cancer therapy [1]. Two mechanisms are proposed by which these quinones act in the cancer cell. First is the intercalation into DNA duplexes, and second is the generation of ROS which destroy the cellular membranes by stimulation of lipid peroxidation [2-4]. The latter is also considered as the reason of anthraquinones side effects, such as cardiotoxicity [5]. Thus, the interaction of anthraquinones with the cell membrane is of interest from the point of view of their mechanism of action.

In the present work the study of different quinones interaction with the model lipid membrane was done using ^{1}H NMR spectroscopy and molecular dynamics simulations. NOESY technique was applied to determine the localization of anthraquinones in lipid membrane and was correlated with MD simulation data. Small isotropic DMPC/DHPC bicelles were used as a model membrane in solution ^{1}H NMR experiments. It was demonstrated that all studied quinones are able to penetrate into the hydrophobic part of the lipid bilayer. This result was also confirmed by the molecular dynamics simulations of DMPC bilayer with quinone molecules.

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