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Location of general anesthetics in model membranes.

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The anesthetic effect of primary aliphatic alcohols and alkanes is known generally, however, the question of its origin has not been sufficiently answered yet. Since there is a very close relation between changes in a structure of biomembrane and its specific functions, there is a hypothesis, which suggests the anesthetic effect stemming from the interaction of aliphatic molecules with cellular membrane constituents. A case study of bilayer systems doped with n-decane put forward the model, which assumes that the location and orientation of n-decane molecules within bilayer depends on their concentration. According to the model, molecules of n-decane most likely prefer one of the two possible positions. Either they concentrate among the lipid molecules with parallel orientation to their amphiphilic chains or they are located in the center of the bilayer, perpendicular to the lipid chains. The drawback of the hypothesis is in the ambiguous interpretation of experimental data. In order to shed more light on this question, we designed and performed a small-angle neutron diffraction experiment. We prepared model phospholipid (DOPC) membranes containing deuterium-labelled and unlabeled molecules of n-decane. Employing contrast variation method and mutual comparison of neutron diffraction data obtained for labeled and unlabeled samples, we were able to determine the location of n-decane molecules within the membrane.

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