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Study of the Formation Mechanism of Dipalmitoylphosphatidylcholine Liposomes and Calcium Ion Complexes

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Abstract : The study of the possible interaction between calcium ions and lipids is of great importance for the studies of complexes of calcium drug-carrying nanoparticles. We prepared calcium-containing complex liposomes from Dipalmitoylphosphatidylcholine (DPPC) lipids and studied their thermodynamic properties. In calorimetric studies, we determined that the phase transition temperature of these complexes is close to 420 C. It was shown that both hydrophobic and hydrophilic connections take part in the formation of calcium nanoparticles. We were interested in hydrophilic bonds represented by hydrogen bonds. We have shown that these hydrogen bonds are formed between the phospholipid heads, and the main contributor is the oxygen atoms in the phosphoric acid residues. In addition, based on the amount of heat absorbed during the breaking of hydrogen bonds formed between calcium-containing nanoparticle complexes, it can be concluded that the hydrogen atoms in the head of DPPC lipids form hydrogen bonds between P=O and P-O groups of phosphate. The energy of heat absorption measured by the calorimeter is of the order obtained by breaking the hydrogen bonds we have specified. Thus, we conclude that our approach to the model of liposome formation from lipids is correct. As for calcium atoms - due to the fact that it is present in the form of positive ions in the liposome, they will connect only with negatively charged phosphorus ions.

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