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FTIR and Raman characterization of DMPC lipid vesicles with different biomolecules

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This work aims at gaining insight into the characteristics of the membrane-biomolecule interaction in order to understand the action mechanisms of the biomolecules, their effectivity and physicochemical properties.

Vitamin C (ascorbic acid) is an essential cofactor for certain enzymes that are widely used in medicine and in food industry, annonacin is a mono-THF acetogenin a neurotoxic chemical compound found in some fruits with potential applicability as insecticide, acaricide, fungicide, as well as antiparasitic and antitumor agents, finally, valproic acid is an antiepileptic drug and mood stabilizer with action on different channels of the central nervous system.

1,2-Dimyristoyl-sn-glycero-3-phosphocholine (DMPC) multilamellar vesicles were prepared in the presence of different concentrations of the above-mentioned biomolecules. FTIR and Raman spectroscopies were used to analyse the participation of specific functional groups in the biomolecule-membrane interaction.

Spectra recorded for the complexes Biomolecule:DMPC were analysed in comparison with those of the pure liquid, studying spectral bands related to the inner regions of the lipid bilayer (hydrophobic regions) and the interphasial region (hydrophilic region). Low and high-frequency shifts were observed depending on the group and the temperature. The effect of each biomolecule on the transition temperature (T_m) the phase gel transition (L_β) – liquid crystalline (L_α) of the phospholipids exhibits a feature transition. Raman spectra show variations according to the presence of ascorbic acid, valproic acid or annonacin.

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