A combination of ESR and SANS techniques to explore the Cyclodextrin action on membranes

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Cyclodextrins (CDs) have the shape of hollow truncated cones with an external hydrophilic surface and an internal hydrophobic cavity where various large organic molecules can be included. The β-CDs, consisting of 7 glucopyranose units, are known for their cholesterol affinity. Recently, they have been described as a drug release modulator within liposomes and also as a new tool to understand the function of lipid rafts which are cholesterol-rich domains.

To improve the potentialities and the efficiency of β-CDs in emerging pharmaceutical applications, the uncommon combination of Electron Spin Resonance spectroscopy (ESR) and Small Angle Neutron Scattering (SANS) has been applied.

For the first time, the percentage of cholesterol extracted by the CDs has been quantified in a non invasive way in liposomes and cell membranes[1, 2, 3]. SANS spectroscopy allowed us to improve the understanding of the mechanism of action of CDs on liposomes. From the modelling of the experimental neutron scattering cross section, the liposome geometry, the average radius, the polydispersity and the bilayer thickness (hydrophobic and hydrophilic part) of liposomes (doped or not with cholesterol) have been inferred as a function of Rameb concentration.

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