The Structure of DNA+Cationic Liposome Aggregates Studied using SAXS and SANS

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DNA forms aggregates with electrostatically neutral phospholipids in the presence of metal cations or cationic surfactants. These aggregates can be used as nonviral vectors for DNA transfer and expression in cells [1, 2]. Synchrotron small-angle X-ray diffraction (SAXD) shows the formation of condensed lamellar phase L_α^c of periodicity d~7-8 nm with DNA monolayers intercalated between lipids bilayers due to interaction of DNA with unilamellar or multilamellar liposomes from saturated and monounsaturated phosphatidylcholines in the presence of divalent cations (Ca^{2+}, Mg^{2+}). Lipid bilayer thickness was determined by analyzing small-angle neutron scattering (SANS) curves of unilamellar liposomes according to three shells model, which devides the bilayer into two polar head group regions separated with nonpolar hydrocarbon region [3]. The inter-helical DNA-DNA distance d(DNA)~4-6 nm was observed in aggregates formed with multilamellar liposomes. Applying repeated heating-cooling process, reflection from DNA helices organization disapeared.

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