

## **Surface characterization of the interaction of anionic lipid monolayers with DNA mediated by divalent cations**

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Lipoplexes are mesoscopic complexes that are formed spontaneously as a result of the reaction of monolamellar liposomes with the DNA. The most common lipoplexes are prepared using positively charged liposomes since they efficiently react with the DNA. Additionally, it is also possible to prepare lipoplexes from negatively charged liposomes by adding cations that are capable to stabilize these systems as they create attractive electrostatic interactions with the negatively charged groups of the DNA and the lipids at the same time (1). Langmuir monolayers have been proposed as an approach to study this sort of interactions as they can be used as a model of liposome membranes (2).

In this work we would like to explore the interaction between the DNA and phospholipids due to its importance for the design of lipoplex formulations as non-viral vectors for gene therapy. Particularly, we have characterized the role of  $\text{Ca}^{2+}$  cations to mediate the interactions between the negatively charged phosphate groups of DNA and the zwitterionic and anionic headgroups of dipalmitoylphosphatidylcholine (DPPC) and dipalmitoylphosphatidylserine (DPPS).

To this end, we have performed pressure-area isotherms of Langmuir monolayers at the air-water interface and we have also prepared Langmuir-Blodgett monolayers on solid substrates that were examined by atomic force microscopy in order to reveal the changes in the different lipid domain size and topologies when they interact with DNA in the presence of different  $\text{Ca}^{2+}$  concentrations.

(1) Liang, H.; Harries, D.; Wong, G.C., Proc Natl Acad Sci U.S.A. 2005, 102(32), 11173-11178.

(2) Dittrich, M.; Böttcher, M.; Oliveira, J. S. L.; Dobner, B.; Möhwald, H.; Brezesinski, G., Soft Matter 2011, 7, 10162-10173.