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EFFECT OF SILICA NANOPARTICLES ON RHEOLOGICAL AND STRUCTURAL PROPERTIES OF DPPC LANGMUIR MONOLAYERS

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The study of the interaction between nanoparticles and model of lung surfactant is of great relevance to understand possible adverse effects of inhalable nanoparticles on the respiratory function [1,2]. We report therefore a study on the interfacial properties, structure and dilational rheology of monolayers of the major lipidic component of the lung surfactant, 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC), in the presence of silica nanoparticles. Investigations are performed by a Langmuir trough equipped with Brewster Angle Microscopy.

The results show that silica nanoparticles penetrate into the DPPC monolayers, leading to a slight expansion in the well-know phase transition of DPPC from the liquid expanded to the liquid condensed, whereas for high surface pressures the system reaches a more compressed state as compared to the pure lipid monolayer, which is possibly due to squeeze of the material into the subphase.

The changes in the phase behaviour reflect into differences in the dynamical response obtained from oscillatory barrier experiments in the range 10^{-3} – 10^{-1} Hz. In the region around the phase transition the DPPC layers in the presence of silica nanoparticles show lower values of the elasticity modulus than the films of pure lipid. This difference may be related with the replacement of the interfacial lipid molecules by nanoparticles, which reduces the reorganization of DPPC molecules on the monolayer [3]. This is in accordance with the changes in the structural order of the interface observed by Brewster Angle Microscopy.

These preliminary results evidence that the incorporation of nanoparticles in the lung surfactant film could affect to the normal behaviour of the breathing cycle for the interaction of these type of materials with the lung surfactant, changing the interfacial behaviour of this complex system.

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