

TOWARDS BASIC KNOWLEDGE ON INTERACTIONS BETWEEN INHALED NANO-STRUCTURED PARTICLES AND LUNG SURFACE: A PHYSICOCHEMICAL APPROACH

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Lung surfactant (LS) is the first barrier met by inhaled particles deposited on the lung surface. Fundamental research on physiological functions of LS must focus on its unique surface activity which is attained during dynamic conditions of breathing. This work reports investigations of the effects caused by selected nano-structured particles (NSPs) on the dynamic surface tension (DST) of model lung surfactants. DST was measured with oscillating bubble, growing bubble, oscillating drop and isothermal surface compression. Depending on the method used LS was represented either by a drug (Survanta, Infasurf) or by DPPC - the predominant phospholipid found in LS. DST measured during dynamic variations of the air-liquid interface were used to evaluate the essential parameters: the minimum surface tension, surface elasticity size of hysteresis. Influence of different NSPs: nanoclays, metal oxides, graphene oxide (all being potential air contaminants) on these parameters was tested. Measured physicochemical response of LS to NSPs was material and dose dependent. NSPs with high surface area reduce surface activity stronger which is in line with known data on toxicity of inhaled particles. It follows that NSPs-LS interactions are important for overall pulmonary response to inhaled aerosols.

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