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Interaction of nanoparticles with internal lung surface -
what we can learn from experimental work with fine particles

There is increased concern about the associations between particulate air pollution and human health. Inhaled and deposited particles play a crucial role in the aetiology of a range of pulmonary diseases. With each breath millions of particles may enter the lung where they are deposited on the internal surface. A variety of pulmonary diseases develop from the inhalation and deposition of pathogenic organisms or noxious particles.

Nanoparticles, mostly formed by emissions from combustion processes, are small in mass but large in number and, hence have a greater total surface area. The toxic material carried by these particles may be likely to interact with cells in the lung. Therefore, it has been proposed that nanoparticles are especially toxic.

The internal tissue surface of the lung is coated with an aqueous liquid layer and at the air-liquid interface there is a film of phospholipids, called surfactant. This lipid film is surface active, and any fine particles deposited on it will be wetted and displaced into the liquid layer. Subsequently these particles may be cleared or they may be phagocytized by cells. From preliminary studies we conclude that the interaction of nanoparticles with the surfactant film as well as with the cell membrane is different and governed by a mechanism called adhesive interaction.

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Keywords: internal lung surface, surfactant, cells, fine particles, nanoparticles, particle displacement, adhesive interaction

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