

Understanding the impact of nanoparticle decoration on their interactions with airway mucus

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Polymeric nanoparticles offer many advantages for the pharmacological or genetic treatment of cystic fibrosis by inhalation. However, in order to be effective, they must be able to cross the thick mucus layer present in the airways of cystic fibrosis patients. At present, contradictory data are found in the literature on the impact of coating nanoparticles with the hydrophilic polymer polyvinyl alcohol (PVA) on their interactions with mucus. Some studies concluded that PVA-coated nanoparticles are muco-adhesive while others suggested they are muco-inert.

This MRes project for a self-funded student will be in collaboration with the University of Naples in Italy and will try to understand why previous studies are contradictory. It will investigate in a systematic way how parameters such as PVA concentration, molecular weight and degree of substitution affect the diffusion of coated nanoparticles in airway mucus. The nanoparticles will be produced by our collaborators in Italy. In Nottingham, the student will measure their permeation across thin layers of tracheal mucus as well as their uptake and transport in bronchial epithelial cell layers grown at the air-liquid interface. They will also use fluorescence microscopy to visualise their localisation within the mucus or cell layers.

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