

Challenges and Opportunities of 'Nano' in Pulmonary Administration

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The fundamental and applied aspects of surface chemistry and nanotechnology for targeted pulmonary delivery is an exciting and growing area of research in pulmonary biomedicine. Incorporating nanotechnology with engineered particles can significantly influence lung deposition, therapeutic efficacy, and possible nanotoxic effects. Biodegradable biocompatible “stealth” nanomaterials and lung surfactant biomimetic nanocarriers can enable high aerosol dispersion performance and local targeting in the treatment of several lung diseases while enhancing spreading at the air-liquid interface in the lungs. A systematic approach is used and includes comprehensive physicochemical characterization, particle engineering design technologies, biomaterial science, and nanotoxicity. Targeted pulmonary delivery combined with nanotechnology offer unique advantages to address unmet medical needs in the treatment and prevention of several pulmonary diseases. Incorporation of nanotechnology with model drugs representing different therapeutic classes of importance in the treatment of various lung diseases can be optimized for aerosol delivery. Challenges and advantages of nanotechnology in pulmonary administration will be presented and illustrated with examples.