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Overcoming biological barriers in severe lung diseases through tailored inhalable nanoparticles

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Lung delivery represents a fascinating option to limit ubiquitous distribution of systemically, and often chronically, administered drugs used to treat severe pulmonary diseases. Nonetheless, clinical outcomes of inhaled therapies strongly depend on drug ability to deposit along the airways and to overcome barriers imposed by the lungs. In this context, the general aim of our studies is the development of inhalable nanomedicines able to deliver the intact drug in the lungs and to shield its interactions with lung lining fluids while enhancing drug availability at the cell target. This objective has been pursued through the design and production of differently engineered nanoparticulate systems with increasing levels of complexity, driven by technological and biological design rules. Some examples, such as drug nanocrystals, micelles and biodegradable poly(lactide-co-glycolide) (PLGA) nanoparticles, will be discussed highlighting how the most appropriate formulation approach can be selected only taking into account the distinct physico-chemical profile of the drug under investigation (e.g., molecular weight, solubility, stability) and the peculiarities of the lung pathology (e.g., cystic fibrosis, lung cancer). Surface engineering of nanocarriers with either polymers or phospholipids turns out as crucial to face the current challenge of overcoming lung barriers, especially mucus. Last but not least, *in vitro*/*in vivo* studies represent a critical step to select the best formulation to candidate for further development.

Biography

Francesca Ungaro is Associate Professor of Pharmaceutical Technology at the Dept. of Pharmacy of University of Napoli Federico II. Since her PhD, she has been studying innovative delivery systems for small and biotech drugs, with particular regard to micro- and nano-particles. In the last 10 years, special attention has been focused on engineered carriers for inhalation. In particular, she has been coordinating several national and international projects (1 ongoing) aimed to the development of inhalable formulations for cystic fibrosis treatment. She is author of 63 scientific articles in highly-ranked journals, 1 patent, 4 book chapters, 1 editorial and more than 100 presentations at symposia (h-index =22, total citations >1500).

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