NOVEL APPROACHES TO ENHANCE THE PULMONARY DELIVERY OF PROTEINS AND PEPTIDES

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In the last two decades large efforts have been attempted to develop safe methods for the delivery of proteins and peptides via the lungs into blood circulation for the treatment of systemic diseases (e.g., diabetes mellitus). For this purpose a number of biophysical and physiological parameters have to be considered. In detail, these are physical parameters (e.g., particle diameter, particle density, hygroscopicity, electrical charge, chemical properties of the substance) as well as individual biological parameters (individual age, pulmonary diseases, breathing pattern (tidal volume, air flow, end inspiratory breath hold) affecting the mechanisms of pulmonary drug deposition. Variation of these parameters results in a relevant change of the particle deposition in the lung. For example, large particles (>10 μm) are not able to penetrate into the lung, because they are deposited by impaction in the upper airways. On the other hand, small particles (<1 μm) are inspired into the alveoli but also expired without being deposited to a relevant proportion. Particles of diameters 2-4 μm show the ideal pulmonary deposition behavior and are able to transport a relevant mass of pharmaceuticals into the lung. Modifications of the breathing pattern allow an optimal particle deposition in the bronchial or the alveolar region, e.g., for treatment of bronchial or alveolar diseases. In addition, particle deposition in the alveolar region is the basis for the treatment of systemic diseases by inhalative administration of drugs (e.g., insulin). This paper deals with the physical and physiological basics for inhalation therapy and demonstrates novel systems which were designed to optimize drug delivery into the lung periphery. In detail, the AKITA® inhalation system is an example for a system that guides the patient through the inhalation manoeuvre and ensures an optimized particle deposition and a minimized intersubject variability.