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KEY POINTS

- Pulmonary delivery may be used for drugs having local or systemic activity.
- Effective drug delivery to the lungs is dependent on the formulation, the delivery device and the patient.
- The structure of the airways is effective in preventing entry of materials, including therapeutic aerosols.
- There are three principal mechanisms of particle deposition in the airways: inertial impaction, gravitational sedimentation and Brownian diffusion.

- The aerodynamic particle size of an inhaled particle or droplet, which depends on physical size and density, is the critical parameter in determining its fate within the lung.
- There are three main categories of devices available for pulmonary drug delivery: pressurized metered dose inhalers, dry powder inhalers and nebulizers.
- Pressurized metered dose inhaler formulations may be solutions or suspensions and include a liquefied gas (usually a hydrofluoroalkane) as a propellant and may also include surfactants and co-solvents.
- Dry powder inhalers deliver drug as a fine powder. Formulations often include carrier particles, usually lactose, to aid dispersion of the powder, so that it becomes available for inhalation by patients.
- Nebulizers deliver relatively large doses of drugs, as either aqueous solutions or suspensions.
- In vitro characterization of inhalation products is most usually carried out using cascade impactors, which fractionate aerosols according to their aerodynamic size distribution.

Inhaled drug delivery

Therapeutic agents for the treatment or prophylaxis of airways diseases, such as bronchial asthma, chronic obstructive pulmonary disease (COPD) and cystic fibrosis are usually delivered directly to the respiratory tract. The administration of a drug at its site of action can result in a rapid onset of activity, which may be highly desirable, for instance when delivering bronchodilating drugs for the treatment of asthma. Additionally, smaller doses can be