

A short note on pulmonary drug delivery systems

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Introduction

The lung is the organ of external respiration in which oxygen and carbon-dioxide are exchanged and this exchange is seen in between inhaled air and the blood. The major entrance as well as the exit for the respiratory system is through nose, known as the nasal cavity. Pharynx is having a lining by the mucosal membrane which is continuous and formed by the skeletal muscles. The adjacent part i.e., larynx is a cartilaginous part which lies inferior to the pharynx, connecting the pharynx and larynx and so it is also called as the laryngopharynx, helps in regulating the volume of air that enters and leaves the lungs. Beyond this, there is an extension of the larynx towards the position of the lungs called as trachea (also known as wind pipe). There will be a branches within the lungs called as the bronchial tree as it withholds the multiple of the bronchi branches. There are the alveolar ducts that are present in the bronchioles and there is opening of the clusters of alveoli. These alveoli are in general very small, grape fruit shaped sac.

The respiratory tract consists of the two main regions. One is conducting region and the other is respiratory region.

Conducting region: The conducting region provides a particular route for the air to move in and out i.e., incoming air and outgoing air. This helps to remove the foreign particles i.e., debris as well as the pathogens that are passing through the incoming air. Also, this system incorporates the organs but not the gas exchange process. Several major functions that the conducting region involves or functions are sensing odours, metabolism of the airborne carcinogens etc.

Respiratory region: It functions contrast to the conducting zone. This zone includes the structures that are involved directly in the exchange of gases. This respiratory zone starts from the terminal bronchioles and join the respiratory bronchiole. This bronchiole further connects to the alveolar duct thereby opening the cluster of alveoli sacs which are directly responsible for the exchange of the gases.

Drug disposition in lungs

Generally, aerosols are used for better drug disposition. There are several other medical devices that are used for

the easiest delivery of the drugs directly into the lungs.

An aerosol is a dependent form of the drugs that is used for disposing the drug directly into the lungs and also the efficacy of the aerosol is high as it penetrates into the respiratory tract. In general the aerosols acquire the size of less than 5 micro meters. Larger the particles, the droplets will deposit in the upper respiratory tract and further let the drug to directly available i.e., in the systemic disposition and based on the sensitivity and the class of the drug, the adverse effects are observed.

The drug deposition through the aerosol is dependent mainly on the four factors;

- The physiochemical properties of the drug
- The formulation forms
- The delivery device type

The advantages of the pulmonary drug delivery systems include the following;

- Quick on set of action
- The drug taken through inhalation will act only at the affected area.
- Do not require high doses
- When compared to other dosage forms, there are very less side effects.
- Drug degradation is limited.
- Doses can be removed without contamination.
- It is easy to handle

Disadvantages of pulmonary drug delivery systems;

- The drug absorption is limited due to the mucus layer which acts as a physiological barrier.
- Formulation is difficult when compared to other formulations.
- Quality testing is complicated though.

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