Pulmonary drug delivery systems

Lecture 20

(First hour)

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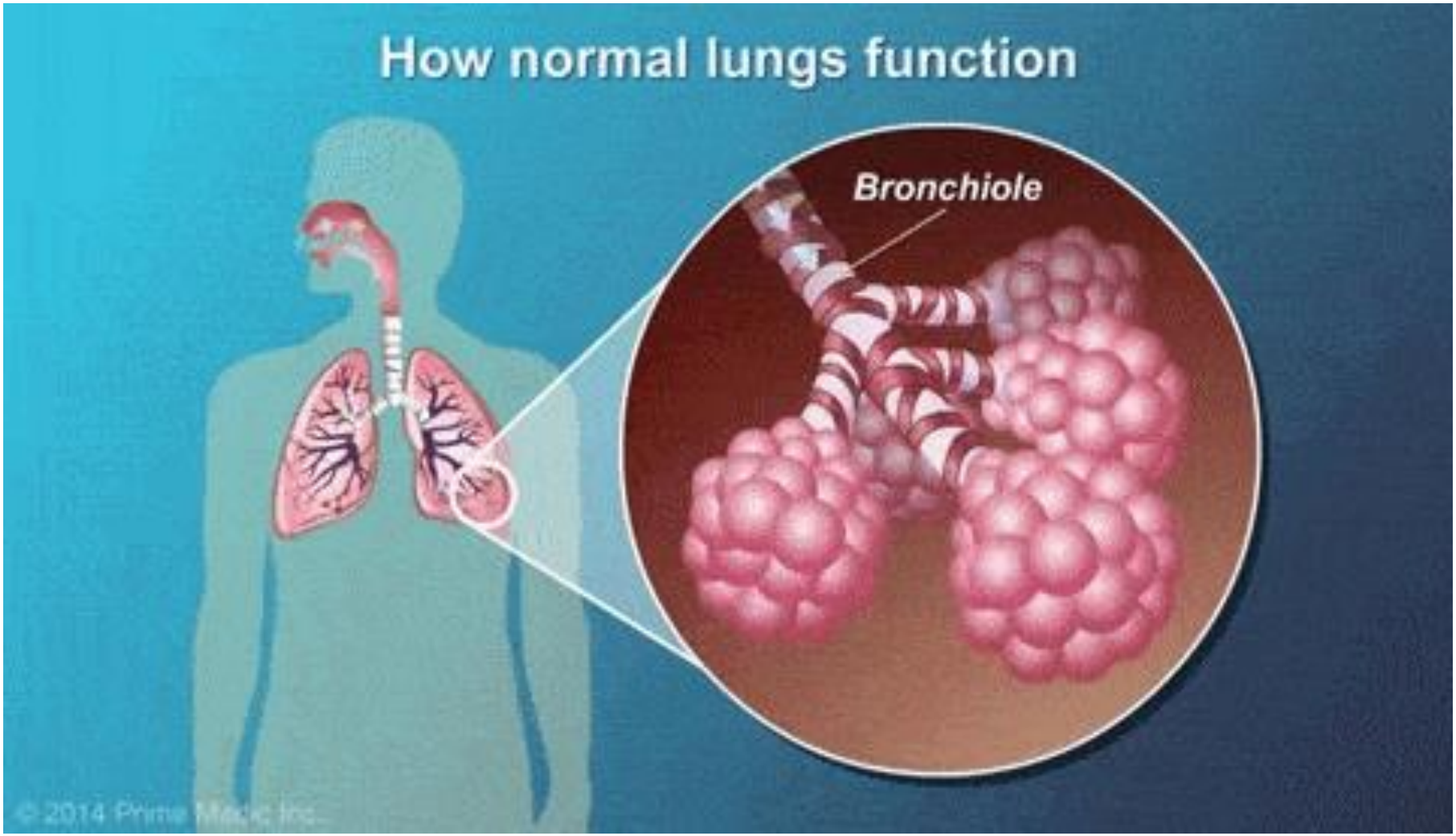
Outlines

- Introduction
- Advantages and disadvantages
- Types
- Materials
- Methods and equipment
- Evaluation

Introduction

- Aerosols are pressurized formulations or systems that depends on the power of a compressed or liquefied gas to expel the contents from the container to facilitate drug deposition inside lungs.


How normal lungs function
Bronchiole
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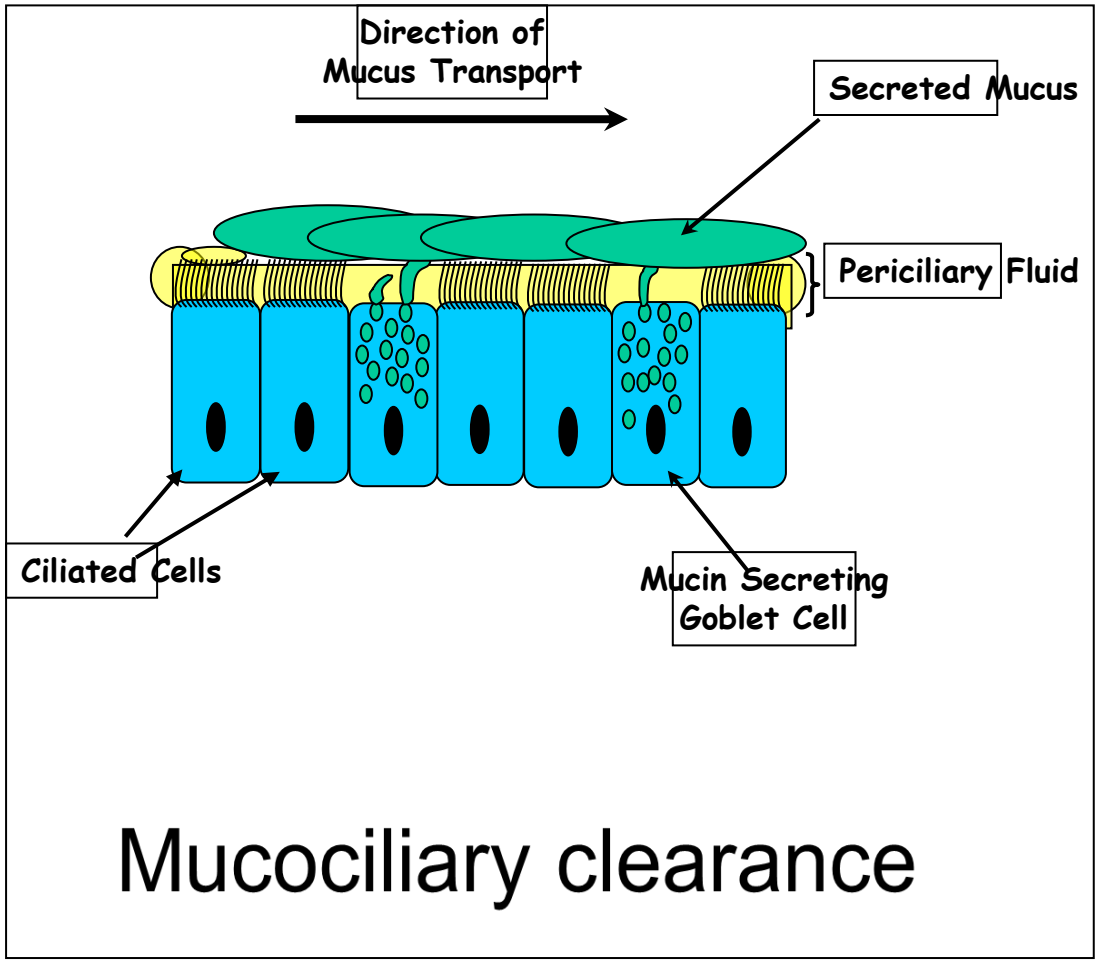
- **Factors affecting the deposition of drug inside lungs are:**

✓ Drug-related like (particle size, shape, density , charge and hygroscopicity).

✓ Formulation factors (solubility, dissolution rate, viscosity, drug concentration ….etc)

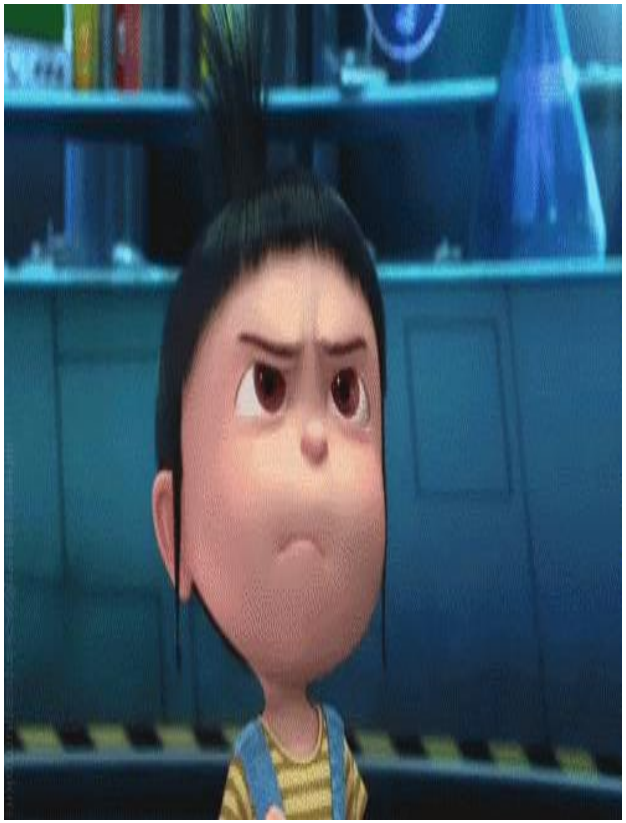
✓ Device-related (Package composition)

✓ The physiological factors like (the thickness of absorption barriers, muco-cilliary clearance, breathing pattern, presence of macrophages and blood supply).



Mucociliary clearance

Breathing Pattern



- **Advantages,** such as :

less contamination upon doses application, more stability, a proper delivery of medication with less irritation problems.

- **Disadvantages** are mainly related to manufacturing difficulty and cost.

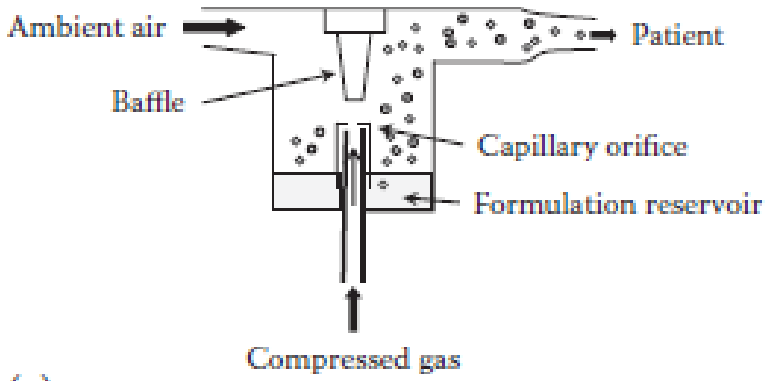
- **Pulmonary DDS are found into different types:**

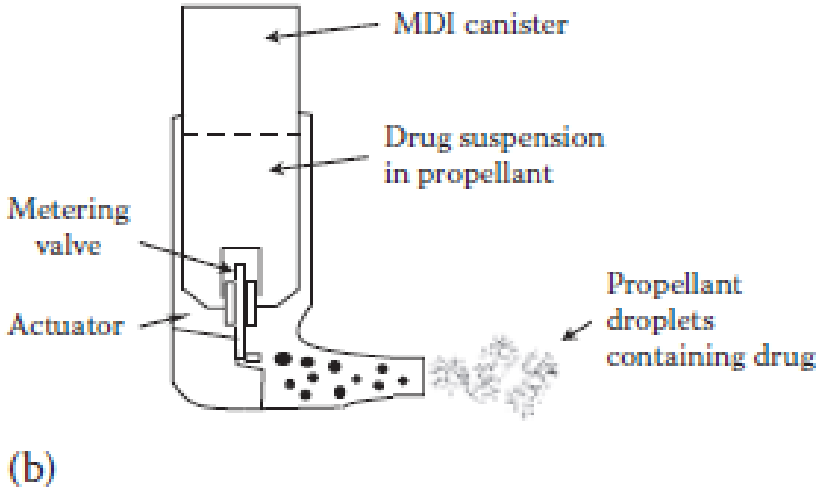
- Pharmaceutical aerosols=

  Metered dose inhalers (MDI)

- Dry powder inhalers (DPI)

- Nebulizers





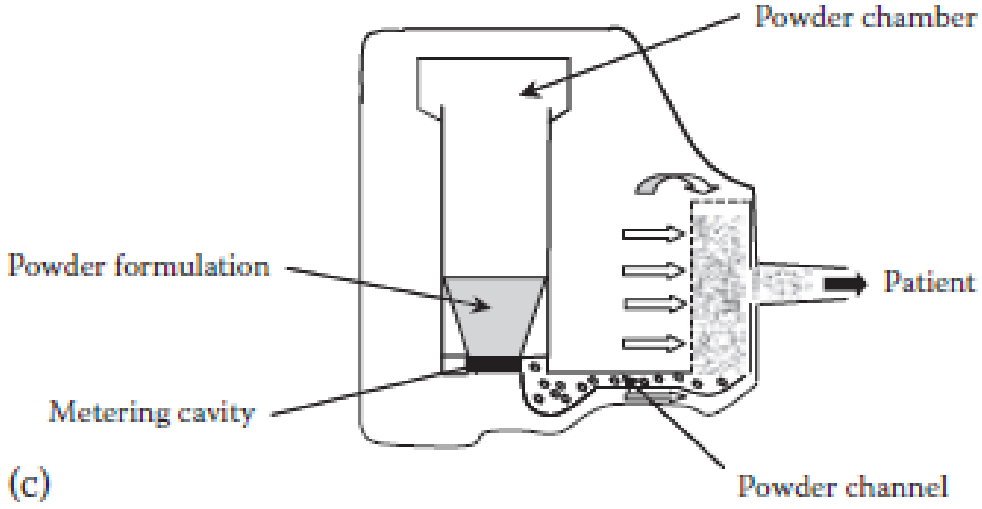
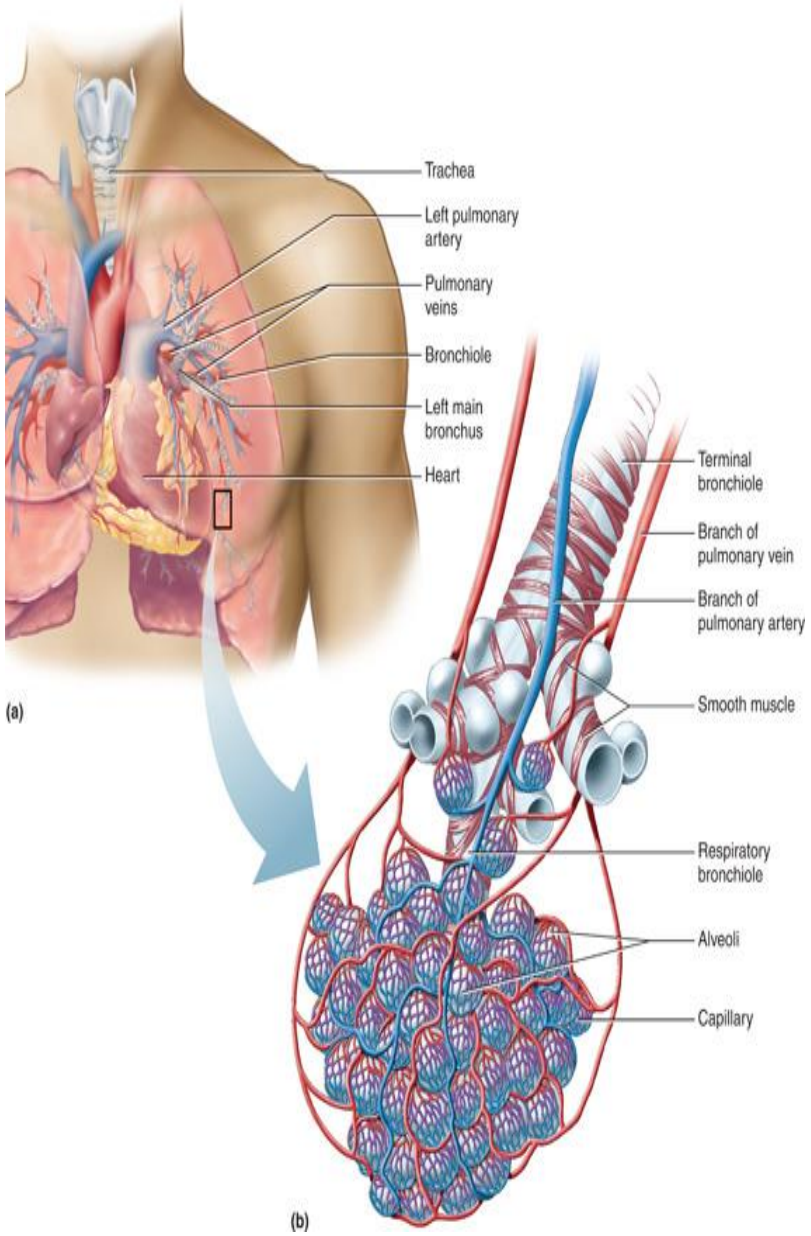


Figure 24.3 An illustration of design elements of inhalation devices: (a) nebulizer, (b) metered-dose inhaler, and (c) dry powder inhaler.

	Name of branches	Number of tubes in branch
Conducting zone	Trachea	1
	Bronchi	2
		4
		8
	Bronchioles	16
		32
	Terminal bronchioles	6×10^4
Respiratory zone	Respiratory bronchioles	5×10^5
	Alveolar ducts	
	Alveolar sacs	8×10^6



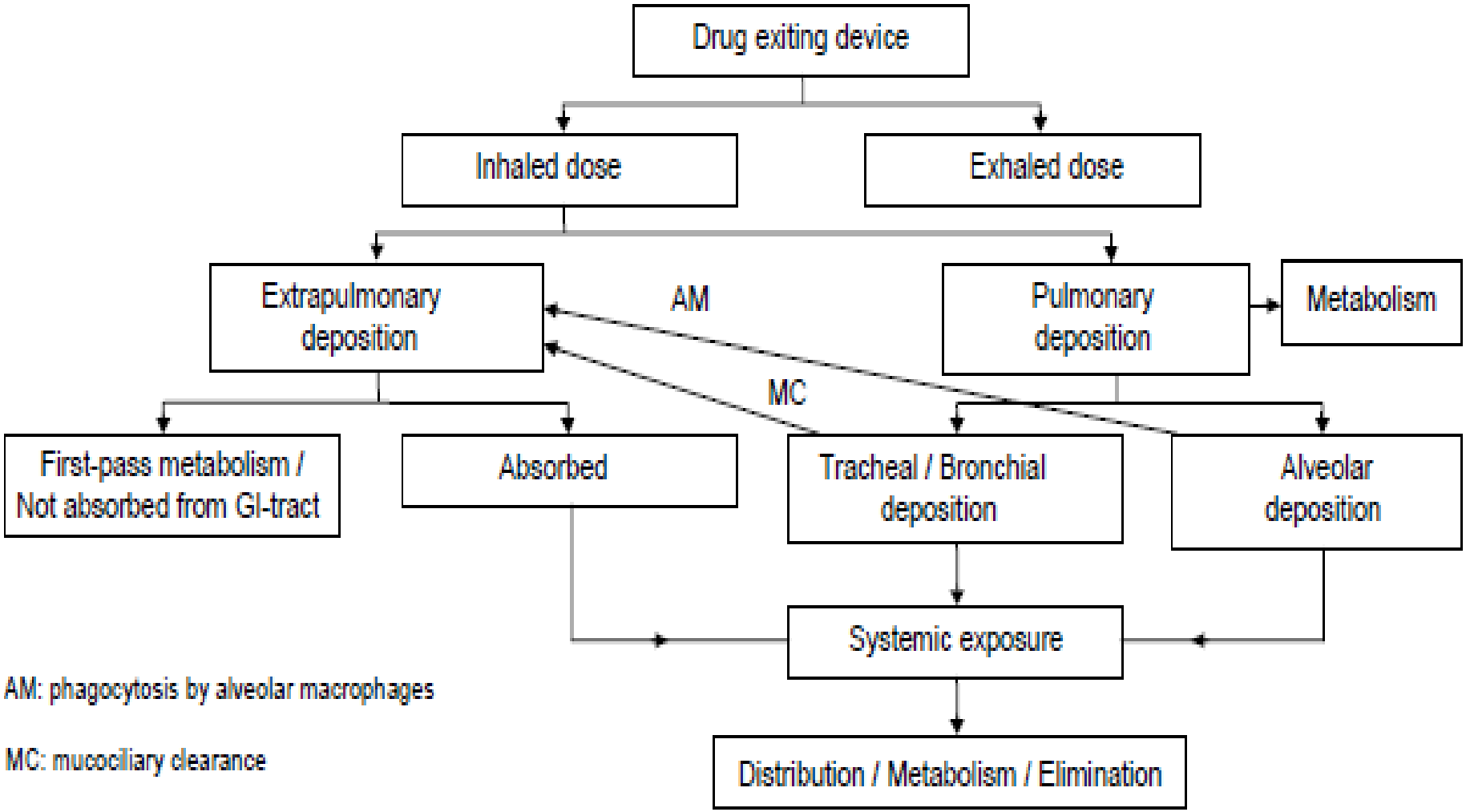


Figure 6. Schematic illustration of the fate of an inhaled drug.