

Chapter 5: Inhalation Preparations

1. Anatomy of the Respiratory Tract:

The anatomy of the respiratory system includes the upper and lower airways, as well as the lungs. The upper airways include the nose, mouth, pharynx, and larynx, while the lower airways include the trachea, bronchi, bronchioles, and alveoli in the lungs. Respiratory muscles such as the diaphragm are essential for breathing.

Upper Airways

- Nose and Mouth: Entry points for air; the nose humidifies, warms, and filters the air.
- Pharynx: Common passageway for the respiratory and digestive systems.
- Larynx: Contains the vocal cords and is protected by the epiglottis, which prevents food from entering the airways.

Lower Airways

- Trachea: The main airway that divides into two main bronchi.
- Bronchi and bronchioles: Branches of the trachea that carry air to the lungs.
- Alveoli: Tiny air sacs within the lungs where gas exchange between the air and blood occurs.

Associated Structures

- Lungs: The primary organs of respiration, containing the bronchi, bronchioles, and alveoli. The right lung has three lobes, and the left lung has two, as the heart occupies part of the space on the left.
- Diaphragm: A dome-shaped muscle that separates the thoracic cavity from the abdomen and is the primary mover of inspiration.
- Pleura: A two-layered membrane that surrounds the lungs and allows them to glide against the chest wall.

02. Physiology of the Respiratory System:

Respiratory physiology is the study of the function of the respiratory system, which ensures the supply of oxygen and the elimination of carbon dioxide. It includes pulmonary ventilation (the movement of air) and gas exchange (the passage of oxygen and CO₂ between the air in the lungs and the blood), as well as the transport of gases throughout the body via the cardiovascular system. Finally, cellular respiration, which uses oxygen to produce energy (ATP) in cells, is the end result of this process.

Pulmonary Ventilation

- Mechanism: This is an active process of inspiration and a passive process of expiration.
- Inspiration: The inspiratory muscles, primarily the diaphragm, contract and lower the rib cage, increasing the volume of the lungs and drawing in air.
- Expiration: The diaphragm relaxes passively, the lung volume decreases, and air is expelled.

Gas Exchange

- Location:

Gas exchange occurs in the alveoli of the lungs, tiny clusters of air surrounded by blood capillaries.

- Process:

Oxygen passes from the alveolar air into the blood, and carbon dioxide from the blood into the alveolar air.

- Efficiency:

The large surface area of the alveoli (approximately $100\text{ m}^2/100\text{ m}^2$) and the thin layer of blood facilitate this exchange.

Gas Transport

- Role of Blood:

The cardiovascular system transports oxygen from the lungs to the organs and carbon dioxide from the organs back to the lungs.

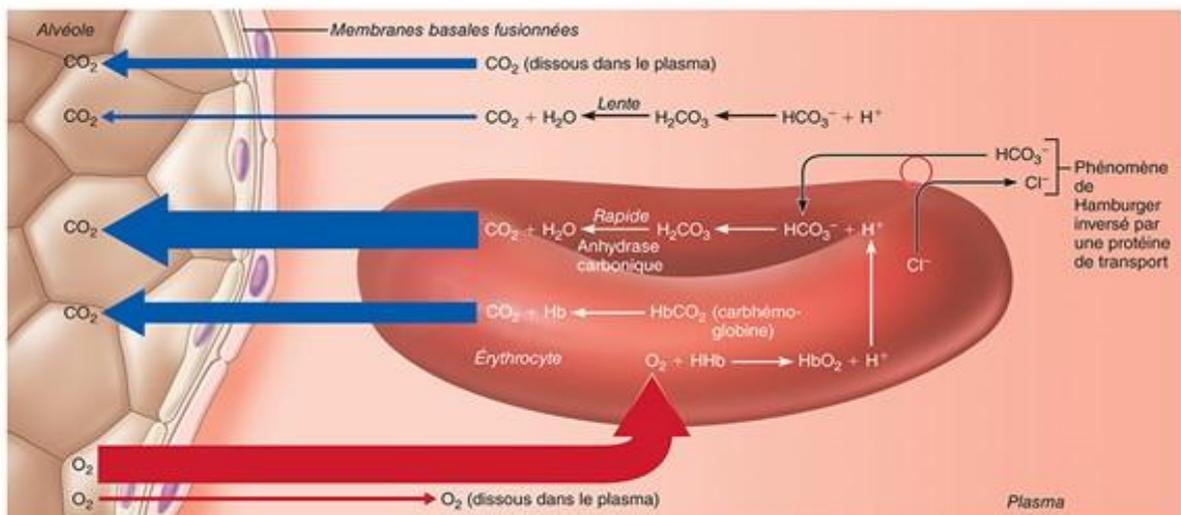
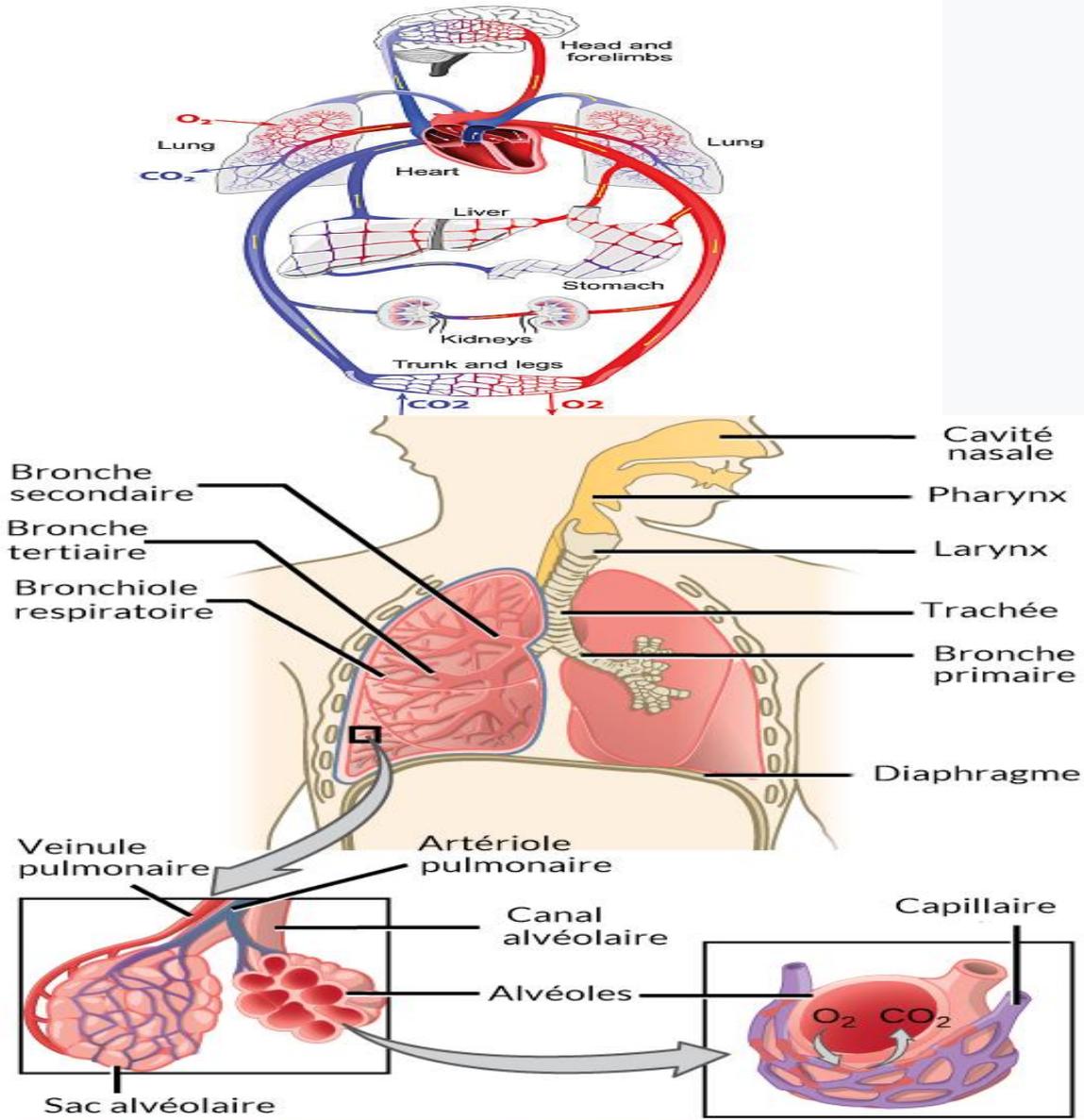
Role of Hemoglobin:

Hemoglobin in red blood cells binds and transports oxygen.

Cellular Respiration

- Location: This is an intracellular process that takes place in the mitochondria.
- Function: It uses oxygen to oxidize molecules like glucose and produce energy in the form of ATP.
- Waste Products: Carbon dioxide and water are produced as byproducts of this reaction.

HUMAN CIRCULATORY SYSTEM



(b) Absorption d'oxygène et libération de dioxyde de carbone au niveau des poumons

3. Liquid Inhalation Preparations:

Inhalation preparations can be of two types:

"moist inhalations" (with warm water and essential oils or herbs) and medical preparations. Moist inhalations can be done using a bowl and towel, or a specific inhaler. Medical preparations include metered-dose inhalers, dry powder inhalers, or nebulizers, used to administer medications such as bronchodilators, corticosteroids, or antibiotics.

Moist (Natural) Inhalations

- Using a bowl:

- o Heat water, but do not let it boil (around 70°C is ideal).

- o Add a few drops of essential oils (e.g., eucalyptus, thyme, lavender) or herbal infusion.

- o Place your face about 30 centimeters above the bowl and cover your head with a towel to trap the steam.

- o Breathe slowly and deeply through your nose for 5 to 10 minutes.

- o Close your eyes to avoid irritation.

- Using a steam inhaler:

- o Fill the reservoir with hot water.

- o Add 5 drops of appropriate essential oils or herbal infusion.

- o Place the mouthpiece near your nose and mouth to inhale the steam.

- Nebulizers:

- o These devices transform medication solutions into a fine mist that is slowly inhaled by the patient.

- o They are used to administer prolonged treatments, often in a medical context.

Nebulization: Nebulization is the dispersion of a liquid into fine droplets to form an aerosol. This technique is used in medicine to administer medication directly into the respiratory tract, particularly for diseases such as asthma or cystic fibrosis. It is also used for disinfection purposes, by spraying a bactericidal or virucidal product in an enclosed space.

Medical Uses

- Drug Administration: Nebulization allows for the targeted administration of medications (such as bronchodilators) to the lungs, without requiring significant patient cooperation.

- Respiratory Physiotherapy: It humidifies bronchial secretions and facilitates their elimination.

- Disinfection: It is used to disinfect a room, premises, or vehicle, in addition to surface cleaning.

How it Works

A nebulizer, often powered by compressed air or ultrasound, transforms the liquid into an aerosol of fine particles.

- These particles are then inhaled by the patient through a mask or mouthpiece.

Commonly used medications include bronchodilators such as salbutamol (Ventolin®) or ipratropium (Atrovent®), corticosteroids like budesonide, and antibiotics for certain infections. Nebulization allows for the delivery of higher doses of medication directly into the airways.

Common Medications

- Bronchodilators:

- o Salbutamol (Ventolin®): Used to quickly relieve symptoms during severe asthma attacks.

- Corticosteroids:

- o Budesonide: Used to treat inflammation of the airways.

- Antibiotics:

- o Tobramycin: Used to treat certain lung infections.

Key points

- Method of administration: The liquid medication is transformed into a mist (aerosol) that the patient inhales calmly using a mask or mouthpiece.

- Advantages:

- o Allows for more potent drug delivery directly into the airways.

- o Does not require deep breathing, making it ideal for children, the elderly, and debilitated patients.

Precautions:

- o Nebulization with certain medications often requires dilution in a sodium chloride solution (physiological saline).

- o After using corticosteroids, it is advisable to rinse your mouth, drink water or brush your teeth, and rinse your face to prevent irritation.

- o It is crucial to consult a healthcare professional for specific recommendations and to ensure the correct use of the device and medications.

