Respiratory System

Function

- Supply the body/tissues with O_2, necessary for cell respiration to take place;

$$C_6H_{12}O_6 + O_2 \quad CO_2 + H_2O + ATP$$

- Rid the body of CO_2 that builds up due to cell respiration.

4 parts of Respiration

- Breathing → inspiration (inhale) & expiration (exhale)
- External Respiration → exchange of gases (O_2 & CO_2) in lungs
- Internal Respiration → exchange of gases (O_2 & CO_2) in tissues.
- Cellular Respiration → using to break glucose into ATP (energy) and O_2 & CO_2 (waste)

Respiratory Tract (pathway)

- Nose – filter (hair, cilia & mucus), warms and moistens air; divided by septum of cartilage & bone, contains secse receptors for smell.

- Pharynx – area where food and air cross.
  - Throat has 3 parts:
    - Nasopharynx (nose)
    - Oropharynx (mouth)
    - Laryngopharynx (voice box)

- Larynx – voice box – triangular shape, contains vocal cords, vibration produces sound:
  - narrow opening – high pitch
  - wide opening – low pitch
- Glottis is the opening
- Epiglottis in the flap of skin that covers during swallowing

- Trachea – wind pipe surrounded by C-shaped cartilage rings that holds it open; the open part of the C faces esophagus which allows it to expand during swallowing: lined with ciliated mucus membrane.

- Bronchiole Tree
  - Bronchi – right and left break offs of the trachea
  - Bronchiole – smaller break offs of the bronchi

- Alveoli – One cell thick: exchange of gases take place here by the process of diffusion.
  - Alveoli sac is surrounded by capillaries.
  - A chemical call “surfactant” lines alveoli & keeps them from sticking together.
  - Newborns that lack adequate amount of :surfactants die of SIDS (Sudden infant death syndrome)

Respiratory Volumes

- Tidal Volume – normal amount of air moved in & out with each breath, only about 500 ml.
- Vital Capacity – Maximum amount of air moved in & out in a single breath.
- Residual Volume – the amount of air remaining in the "dead" spaces of the respiratory system – not used in gas exchange.
- Dead Space – nasal cavity, trachea, bronchi, bronchioles.

- Inspiration – active phase = diaphragm pulls down & intercostal muscle pull ribs out – lungs expand pulling air in (negative pressure). Stimulated when CO2 and H+ levels in blood reach a certain level – The Medulla Oblongata (breathing center of the brain) sends out impulse to the diaphragm.
- Expiration – passive phase = nervous stimulation stops, diaphragm & intercostal muscles relax, lungs recoil & air rushes out.

Gas Exchanges in the Body

- Maintain homeostasis, need O2 for cellular respiration; must rid body of CO2 – can become toxic
- External respiration – exchange of gases in lungs – depends on process of diffusion. Hemoglobin (Hb) combines with oxygen (O2) to produce oxyhemoglobin (HbO2)
- Internal respiration – exchanged of gases in body tissues – depends on process of diffusion.

Upper Respiration Tract Infection

- Sinusitis – infection of the cranial sinuses.
- Otitis Media – infection of the middle ear.
- Tonsillitis – tonsils become inflamed and enlarged.
- Laryngitis – infection the larynx with accompanying hoarseness leading to the inability to talk.

Lower Respiratory Tract Infections

- Bronchitis – infection of the primary and secondary bronchi.
- Pneumonia – viral or bacterial infection of the lungs in which the bronchi and alveoli fill with a thick fluid.
- Tuberculosis – bacterial infraction, lung cells build a protective capsule around the foreigners, isolating them from the rest of the body.
- Pulmonary fibrosis – lungs loose elasticity
- Emphysema – alveoli are distended and their walls damaged so that the surface area available for gas exchange is reduced.

- Asthma – airways are unusually sensitive to specific irritants.
- Pleurisy is an inflammation of the pleural membrane (there are two).
  - One adheres to the chest cavity & diaphragm
  - The other adheres to the lungs