

# Respiratory System

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\* Respiration is an oxidation process involving the burning of food substances.

\* It may be external (ventilation) and internal i.e. cellular respiration (eg. Glycolysis, TCA cycle).

## Types of Respiration:

① Aerobic respiration: Food is oxidized in the presence of oxygen. It involves external respiration: to take  $O_2$  from environment and expel  $CO_2$  (ii) Internal respiration or cellular respiration eg. Glycolysis and Krebs's cycle.

② Anaerobic respiration:

\* Food is oxidized in the absence of  $O_2$  eg. Anaerobic bacteria, yeast, Taenia, Ascaris etc.

Aerobic respiration is of 2 types

① Direct respiration: Exchange of gases takes place through body cells directly in which blood is not used eg. aerobic bacteria, protists, plants, sponges, coelenterates, flatworms, round worms etc.

② Indirect respiration: Exchange of gases takes place through blood by special respiratory organs viz. skin, gills, buccopharyngeal cavity, trachea and ~~pulmon~~ lungs.

are four  $Fe^{2+}$  ions in one mol. of haemoglobin. can combine with 4 mols. of  $O_2$  as there  
(iv) High tension of  $O_2$  favours the formation of oxyhaemoglobin while low tension of  $O_2$  favours its dissociation.

Rabbit & Man : - only pulmonary respiration present.

It include following structure —

External nares → Nasal chamber → Internal nares → Pharynx → Larynx → Trachea → Lungs

1. Nasal chamber Nostrile (External nares) → A pair of slit, opens into the nasal chamber.

2. Nasal chambers:- Nasal cavity is divided by two nasal chambers by the nasal septum. called mesethmoid cartilage. Nasal chamber also bears scroll-like turbinal bone covered by mucus gland and serous gland. the turbinal bone is made up of —

(a) Naso-turbinal — lying on anterior dorsal side

(b) Maxillo-turbinal — lying on anterior ventral side

(c) Ethmo-turbinal — lying on anterior posterior dorsal side & is covered with sensory epithelium to detect smell.

(ii) The nasal chamber opens in pharynx by internal nostril. Pharynx:- The pharynx comprises nasopharynx, oropharynx & laryngopharynx. The pharynx provides passage to both air & food.

Larynx:- (i) The upper cartilage trachea is called larynx. The larynx is composed of cartilage attached to each others by ligaments and membranes. The main cartilage are

(a) Thyroid cartilage — C-shaped and incomplete posteriorly

(b) Cricoid cartilage — lies below thyroid cartilage.

(c) Artenoid cartilage — bears bulb-like cartilage forming posterior wall of Larynx.

(d) epiglottis — leaf like cartilage which projects into pharynx.

(ii) Inside larynx present outer pair of false vocal cord (which has little do with vibration) and a pair of inner pair of true vocal cord. The pitch of a sound is determined by the tension on vocal cords — the greater the tension the higher the pitch.

(iii) The epiglottis guards the glottis; its movement is controlled by contraction of pharyngeal muscles.

(iv) The membrane lying between posterior thyroid cartilage and anterior Artenoid cartilage work as false vocal cord.

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Trachea <sup>(iv)</sup> Larynx leads into long tube called trachea bearing 12 to 15 incomplete hyaline tracheal cartilage ring lying in connective tissue, which also contain mucus gland and circular muscle.

ii) Trachea is lined by ciliated epithelium, the cilia moves synchronously

Lungs :- i) Present in thoracic cavity on either side of heart.

ii) <sup>Each</sup> lung is covered by double wall sac, the pleural cavity containing outer parietal layer and inner visceral layer, the space between two layers bears serous fluid.

iii) In Rabbit, lung is hexalobed; Right lobe (anterior & posterior) & Left lobe (anterior and posterior part).  
Azygous associated with Right lobe (anterior & posterior) & Left lobe

iv) In human Lung is penta lobe, the right lobe <sup>has 3 lobes</sup> is divided into superior, inferior and middle lobe; the left lobe <sup>has 2 lobes</sup> has superior and inferior lobe.

v) As soon as primary bronchus enters each lung it divides to form secondary & tertiary bronchi. The tertiary bronchi <sup>sub-</sup>divided into smaller branches bronchioles which <sup>are without</sup> ~~have~~ no cartilage. After repeated branching, one of the smallest bronchioles enters a lung lobule called lobular bronchiole. The latter gives rise to about six terminal bronchioles which further subdivided into respiratory bronchioles.

vi) <sup>The</sup> Respiratory bronchiole opens into 2 or 3 alveolar ducts which terminate in expanded passages, the atria which in turn lead into alveolar sac or airsacs. The latter opens into several alveoli (acini).

vii) The wall of alveoli has an extensive network of blood capillaries

viii) A film of lecithin lines normally the alveoli of lungs that lower the surface tension & keep the ~~lungs~~ alveoli open

ix) The lung is lined by ciliated epithelium. 

## Mechanism of Breathing

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Based on suction pump principle.

Inspiration :- (1) Control by medulla oblongata of brain.  
(ii) It occurs due to (a) contraction of External Inter-coastal muscle which pushes ribs and sternum upwardward and outward increasing the volume of thoracic cavity; & (b) contraction of Radial muscle of Diaphragm reducing the Dome like part of diaphragm. Now the air comes inside.

The inflation of lung is checked by anterior region of Pons Verelli of medulla oblongata.

Expiration :- (i) Under stimulation of middle & posterior region of Pons Verelli the Internal intercoastal muscles contract & radial muscle of diaphragm relax. decrease the size of thoracic cavity.

## Lungs volumes and Capacities

- Tidal volume (TV) :- It is the volume of air inspired or expired with each normal breath. This is about 500 ml. It consists of 350 ml of alveolar volume & 150 ml of dead space volume.
- Inspiratory Reserve Volume (IRV) :- Extra amount of inspired fresh air after normal inspiration. It is 2000 to 3000 ml.
- Expiratory Reserve Volume (ERV) :- Extra amount of air that can be expired forcibly after normal expiration. It is about 1200 ml.
- Residual volume (RV) :- Volume of air which remains still in the lung after the forceful expiration. It is about 1200 ml.
- Vital Capacity (VC) :- It is the amount of air which can be maximum inspired and also maximum expired. It varies from 3.5 — 4.5 litres ( $VC = TV + IRV + ERV$ ). (ii)