BREATHING AND EXCHANGE OF GASES

DISORDERS OF RESPIRATORY SYSTEM

Respiratory Disorders

1. Tuberculosis:

- Bacterial disese caused by Mycobacterium tuberculosis. Infection of several parts but common of lungs.
- Vaccination with B.C.G (Bacillus-Calmette-Guerin).

2. Bronchial Asthma:

- Due to narrowing of bronchi and spasms in bronchial muscles.
- The disorder is generally due to hypersensivity of bronchioles to a foreign substances.
- There is intense coughing and difficulty in exhalation.
- Mucous glands become overactive producing a lot of mucus that clogs bronchioles and bronchi.
- Exposure to allergens should be avoided.
- In case the sensitivity is to one or two allergens, hyposensitisation by giving very small doses of allergens is used as a preventive measure.
- Bronchodilators, inhalers and antibiotics are given for relief and protection against infection.

3. Bronchitis:

- Inflammation of bronchi and bronchioles due to hypertrophy and hyperplasia of seromucous glands and goblet cells.
- There is a regular coughing with thick greenish yellow sputum indicating infection and excessive secretion of mucus.
- It is commonly caused by viral infection of nasal tract followed by bacterial infection.
- The disorder is common in smokers and persons exposed to CO- rich polluted air.
- Persons suffering from bronchitis should avoid smoke, irritating chemicals and pollutants.
- Bronchodilators provide symptomatic relief. Antibiotics are used to cure infection.

4. **Emphysema:**

- Cigarette-smoking leads to the disease emphysema.
- Many alveoli collapse together to form large chambers due to destruction of their walls.
- This change of smaller alveoli to large chambers reduces the area of alveolar surface across which respiratory gases are exchanged.
- All these changes seriously reduce both oxygen uptake and carbon dioxide elimination.
- Years of smoking may aggravate the condition acutely to suffocate the patient of death.

5. **Occupational Lung Disease:**

- Irritating gases, fumes and dusts present in the work place result in lung disorders.
- In **pneumoconiosis** there is permanent deposition of particulate matter in the lungs.
- Tissue reaction to the irritating substances causes proliferation of fibrous connective tissue called **fibrosis**.
- It is common in flour mill workers, iron mill workers, coal miners, stone grinders (silicosis), asbestos industry workers (asbestosis), cotton mill workers, plastic industry, etc.
- The disease takes a long time to express its symptoms, sometimes 10–15 years. By this time the lungs come to suffer permanent damage.
- Therefore, occupational lung disease is largely incurable.
- However, bronchodilators provide some relief while antibiotics cure secondary infections.
- It is always advisable to undertake preventive measures in work places involving pollution risks by

1. Reducing emission of harmful dust and chemicals.
2. Using protective gears and clothing.
3. Short duties.
4. Informing workers about the risks and preventive measures.
5. Regular health check up.

ADDITIONAL INFORMATION

Haldane effect:

- Proposed by JS Haldane, it states that binding of oxygen with haemoglobin tends to displace carbon dioxide from blood.
- It is quantitatively far more important in promoting CO_2 transport than the Bohr Effect in promoting O_2 transport.
- Haldane effect encourage CO_2 exchange in both the tissue and the lungs.

Bohr Effect:

- The **Bohr Effect** is a physiological phenomenon first described in 1904 by the Danish physiologist Christian Bohr, stating that haemoglobin's oxygen binding affinity is inversely related both to acidity and to the concentration of carbon dioxide.

Mountain sickness

- When a person living on plains ascends and stays on a mountain above 8000 ft from sea level, he develops certain symptoms in 8-24 hours.
- These symptoms include breathlessness, headache, dizziness, irritability, nasusea, vomiting, mental fatigue and a bluish tinge on the skin, nails and lips.
- This is known as mountain sickness.
- You know that the barometric pressure falls progressively with the rise in altitude. Simultaneously, pO_2, falls proportionately in the atmospheric air.
- This lowers the alveolar pO_2 and consequently reduces the diffusion of oxygen from the alveolar air to the blood.
- So, oxygenation of blood is decreases progressively with the rise in altitude.
- The fall in oxygenation of blood produces the symptoms of mountain sickness.
- All tissues are not equally affected by the shortage of oxygen.
- The more active a tissue, the more it is affected.
- So, skeletal muscles, heart and brain are much more affected than skin, intestine and bones.

Carbon monoxide poisoning

- If a person sleeps in a closed room with a lamp burning, the absence of sufficient amount of oxygen causes an incomplete combustion of carbon and produces carbon monoxide in the room.
- As the person Inhales carbon monoxides, it diffuses from the alveolar air to the blood and binds to haemoglobin forming carboxyhaemoglobin.
- The latter is a relatively stable compound and cannot bind any oxygen.
- So, the amount of haemoglobin available for oxygen transport is reduced.
- The resulting deficiency of oxygen causes headache, dizziness, nausea and even death.

Decompression sickness

- The pressure of water rises progressively with the depth in the sea.
- When a diver descends to great depths, his body is subjected to high pressure by the surrounding sea water.
- This tends to collapse his lungs unless he breathes compressed air under high pressure.
- But breathing of air at high pressure increases the partial pressures of gases in alveolil, as nitrogen forms about 79 per cent of the air, the rise in alveolar nitrogen tension affects the body most.
- While at the depth, much nitrogen diffuses and dissolves in the blood and body fats.
- This makes the diver lose his strength and work capacity, and feels drowsy.
- But more severe symptoms develop if he is lifted rapidly to sea surface (decompression sickness).
- With the rapid fall in pressure, nitrogen is evolved from his body fluids and forms gas bubbles in the blood and tissues.
- Nitrogen bubbles may block pulmonary vessels producing serous shortness of breath. Itchings and local pain result from bubbles in peripheral nerves.
- Dizziness, paralysis and mental dearrangement may be caused by bubbles in the vessels of brain and spinal cord.
- To avoid decompression sickness, the diver should be lifted very slowly to the sea surface, nitrogen will then be evolved very slowly and will be effectively removed without forming bubbles.