Human physiology

Respiration System

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Respiration physiology

Respiration is the sequence of events that results in the exchange of oxygen and carbon dioxide between the atmosphere and the body cells. Every 3 to 5 seconds, nerve impulses stimulate the breathing process, or ventilation, which moves air through a series of passages into and out of the lungs.

After this, there is an exchange of gases between the lungs and the blood . This is called **external respiration.** The blood transports the gases to and from the tissue cells. The exchange of gases between the blood and tissue cells is **internal respiration**. Finally, the cells utilize the oxygen for their specific activities: this is called **cellular metabolism**, or cellular respiration. Together, these activities constitute respiration.

Respiration includes two processes:

 1) External respiration – is the uptake of O2 and excretion of CO2 in the lungs

 2) Internal respiration – means the O2 and CO2 exchange between the cells and capillary blood

The respiration processes depends on:

 a) pulmonary ventilation – it means the inflow and outflow of air between the atmosphere and the lung alveoli

 b) diffusion of oxygen and CO2 between the alveoli and the blood

c) perfusion – of lungs with blood

d) transport of O2 and CO2 in the blood

e) regulation of respiration

Parts of the Respiratory System

Your respiratory system includes your:

- Nose and nasal cavity Sinuses
- Mouth
- Throat (pharynx)
- Voice box (larynx)
- Windpipe (trachea)
- Diaphragm
- Lungs
- Bronchial tubes/bronchi
- Bronchioles
- Air sacs (alveoli)
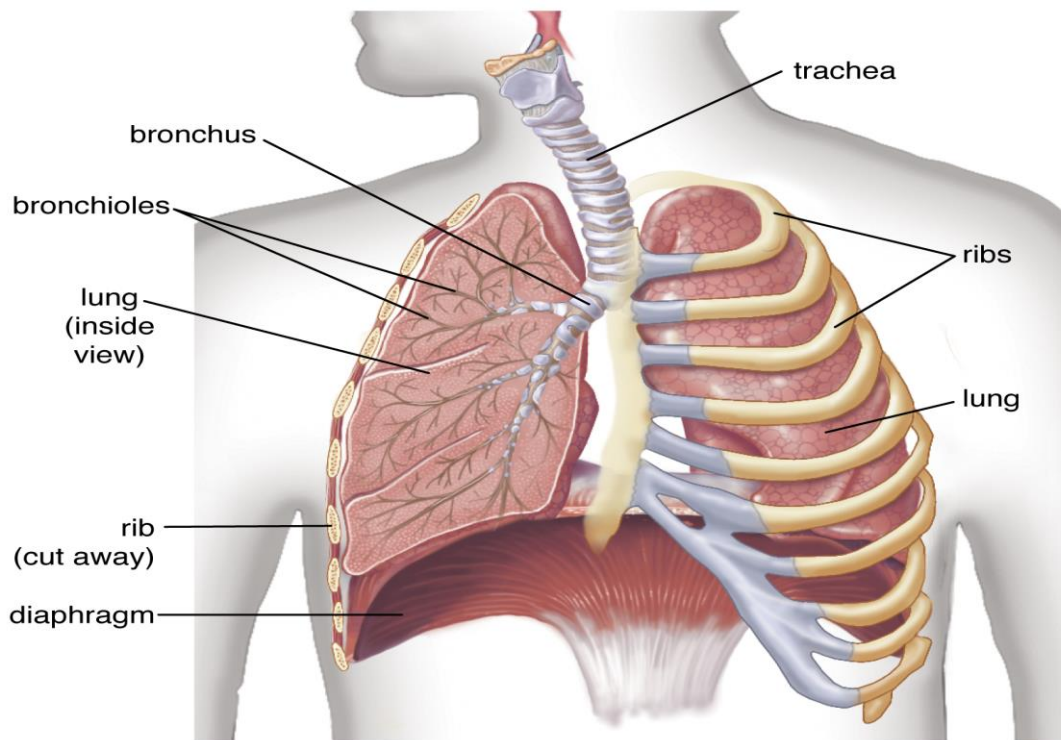- Capillaries

The Respiratory System

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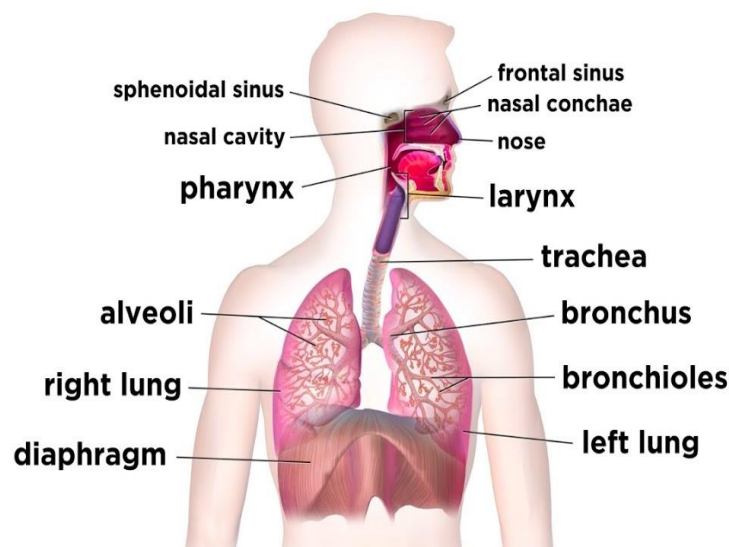
Breathing

Breathing starts when you inhale air into your nose or mouth. It travels down the back of your throat and into your windpipe, which is divided into air passages called .bronchial tubes

For your lungs to perform their best, these airways need to be open. They should be free from inflammation or swelling and extra mucus

As the bronchial tubes pass through your lungs, they divide into smaller air passages called bronchioles. The bronchioles end in tiny balloon-like air sacs called alveoli. Your body has about 600 million alveoli.

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The alveoli are surrounded by a mesh of tiny blood vessels called capillaries. Here, oxygen from inhaled air passes into your blood.

After absorbing oxygen, blood goes to the heart. The heart then pumps it through your body to the cells of your tissues and organs.

As the cells use the oxygen, they make carbon dioxide that goes into blood. the blood then carries the carbon dioxide back to lungs, where it's removed from body when you exhale.

This is a continuous process and goes on throughout the life of an organism. The process of taking in oxygen-rich air is called inhalation. On the contrary, the process of giving out air that is rich in carbon dioxide is known as exhalation.

Mechanism Of Breathing

The air which we breathe in and out of the lungs varies in its pressure. So basically when there is a fall in air pressure the alveolar spaces falls and the air enters the lungs (inspiration) and as the pressure of the alveoli within exceeds the atmospheric pressure, the air is blown from the lungs (expiration). The flow rate of air is in proportion to the magnitude of the pressure difference.

The breathing mechanism involves two processes:

• **Inspiration**

• **Expiration**

1-Inspiration

In the process of inspiration, there would be a contraction of muscles attached to the ribs on the outer side which pulls out the ribs and results in the expansion of the chest cavity. Later, the diaphragm, contracts, moves downwards and expands the chest cavity resulting in the contraction of the abdominal muscles. The expansion of the chest cavity produces a partial vacuum which sucks air into the lungs and fills the expanded alveoli.

Mechanism Of Inspiration

• The process of intake of atmospheric air is known as inspiration. It is an active process.

• When the volume of the thoracic cavity increases and the air pressure decreases, inspiration takes place.

• Contraction of external intercostal muscles increases the volume of the thoracic cavity.

• Contraction of the diaphragm further increases the size of the thoracic activity. Simultaneously, the lungs expand.

• With the expansion of the lungs, the air pressure inside the lungs decreases.

• The pressure equalizes and the atmospheric air rushes inside the lungs.

2-Expiration

The expiration process is considered once after the gaseous exchange occurs in the lungs and the air is expelled out. This expulsion of air is called expiration. During this process, muscles attached to the ribs contract, the muscles of the diaphragm and the abdomen relax which leads to a decrease in the volume of the chest cavity and increases the pressure of the lungs, causing the air in the lungs to be pushed out through the nose.

Mechanism Of Expiration

• The process of exhaling carbon dioxide is called expiration. It is a passive process.

• It occurs when the size of the thoracic activity decreases and the air pressure outside increases.

- Now the external intercostal muscles relax and the internal intercostal muscles contract.

- As a result, the ribs are pulled inwards and the size of the thoracic cavity is reduced.

- The diaphragm is relaxed and the lungs get compressed.

- Consequently, the pressure increases and the air is forced outside.
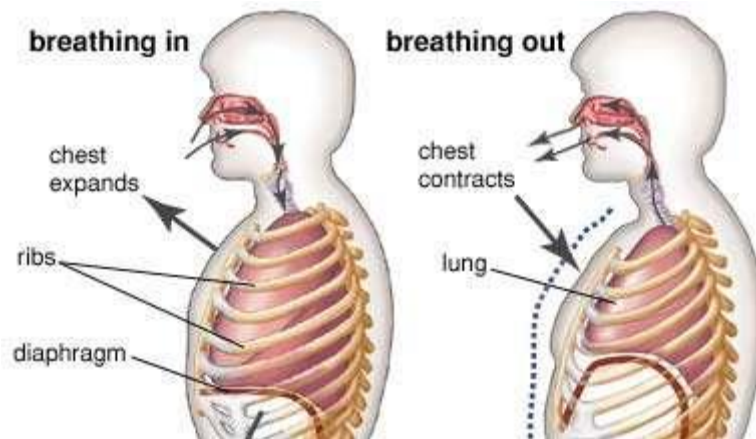
How Does the Respiratory System Clean the Air?

The respiratory system has built-in methods to keep harmful things in the air from entering your lungs.

Hairs in your nose help filter out large particles. Tiny hairs, called cilia, along your air passages move in a sweeping motion to keep the passages clean. But if you breathe in harmful things like cigarette smoke, the cilia can stop working. This can lead to health problems like bronchitis.

Cells in your trachea and bronchial tubes make mucus that keeps air passages moist and helps keep things like dust, bacteria and viruses, and allergy-causing things out of your lungs.

The Respiratory System

Cilia and mucus lining your air passages, help keep harmful substances from entering your lungs.

Mucus
Cilia

Nose

Trachea

Bronchial tubes

Bronchi

Bronchiole

Alveoli