Muhammad Jamal HAMZA II
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(BMHP5003_BIRM) - Introduction to Physiology
Rachael Rivers

Human Respiratory System

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Anatomy of Respiratory System

Cleveland Clinic (2020) suggests human airways, lungs, and blood vessels are all part of the network of organs and tissues known as the respiratory system, which also aid in breathing and the respiratory system also includes the muscles that propel your lungs in which all together, these components help the body circulate oxygen and eliminate waste gases like carbon dioxide.
According Cleveland Clinic (2020), respiratory system serves a variety of purposes and in addition to assisting with inhalation and exhalation, it:

- it allows human to talk and smell.
- It balances the air and human body temperature and adds moisture to it to the proper degree of humidity.
- provides the cells with oxygen and removes waste gases.

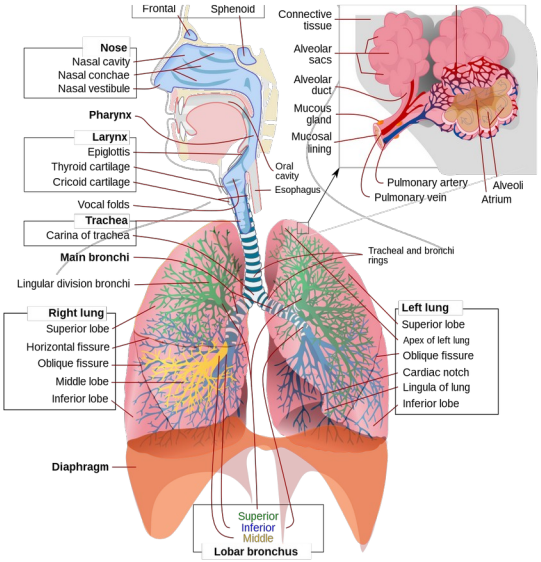

Fig. 1 (respiratory_img.png Cleveland Clinic, 2020)

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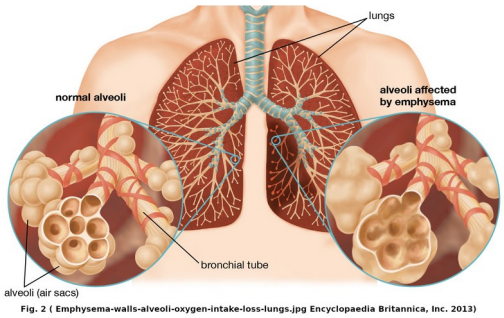


Fig. 2 (Emphysema-walls-alveoli-oxygen-intake-loss-lungs.jpg Encyclopaedia Britannica, Inc. 2013)

The **3** main mechanisms by which oxygen is transferred from ambient air to blood as it travels through the lungs are :-

- **Ventilation** is the mechanism through which air enters and exits the lungs
- **Diffusion** is the voluntary movement of gases between the alveoli and the capillaries in the lungs. This movement occurs without the organism exerting any energy or effort.
- **Perfusion** is the process through which the cardiovascular system circulates blood through the lungs

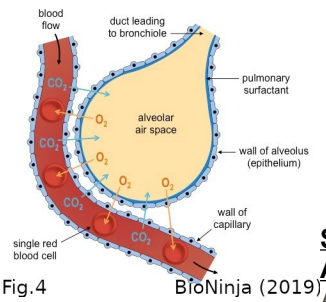
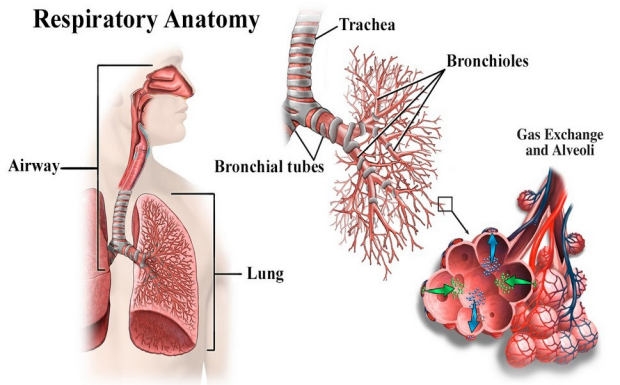


Fig.4 BioNinja (2019)

Structure of a Alveolus

Alveoli serve as the site of gas exchange, and as such, have specialised structural features to reduce the lengths that respiratory gases must travel for diffusion to occur and to increase the amount of surface area accessible for gas exchange (BioNinja, 2019).



How_Lungs_Work_Illustration_edited.jpg (National Heart, Lung, and Blood Institute, 2022)

The image displays an expanded view of the airways and lungs, in addition to trachea; bronchial tubes, or bronchi; and bronchioles. A detailed view of gas exchange at the alveoli is also depicted in the photograph. Inhaled oxygen is depicted by blue arrows moving into the bloodstream, while exhaled carbon dioxide is depicted by green arrows moving out of the bloodstream.

Fig.3 lungs.jpg (National Heart Lung and Blood Institute, 2022)

Human Respiratory System Analysis

The 11 basic organ systems that make up the human body, which operates as a biological machine, control all of the vital bodily activities (Hill and Ponton, 2018). The respiratory system is one of the 11 fundamental organ systems. When someone breathes, respiratory system is engaged in the exchange of oxygen and carbon dioxide. Information about the human body's respiratory system is provided in this poster.

When the respiratory system is mentioned, breathing is frequently the first thing that comes to mind, yet this is only one of many roles. The body has to produce enough energy to maintain life, and this energy is obtained by burning food molecules through the process of oxidation (whereby food molecules are combined with oxygen) (Villa-Forte, A., 2022). Villa-Forte, A., (2022) suggested in the process of oxidation, oxygen and carbon and hydrogen combine to produce carbon dioxide and water, thus, life depends on the use of oxygen and the generation of carbon dioxide and therefore, even during intense exercise, the human body must have an organ system that can quickly absorb sufficient oxygen from the air and remove carbon dioxide from the blood circulating in it.

Additionally, it aids in controlling blood pH. The respiratory system makes it possible for the body to take in oxygen and expel carbon dioxide.

Exchanging Oxygen and Carbon Dioxide

The pharynx, a region at the rear of the throat, is where the nasal cavity and mouth converge. Two pipes—one for food and the other for air—split off at the base of the throat. Only air passes via one pipe, the larynx. The food travels through the oesophagus, the other pipe, which leads to the stomach. The epiglottis, a little tissue flap, guards the larynx. The trachea (windpipe) is the part of the airway that continues below the larynx. The walls of the trachea have stiff rings of cartilage to keep it open. The trachea is also lined with cilia, which sweep fluids and foreign particles out of th airway to keep them out of the lungs.

The trachea splits into two bronchi tubes (left and right) further down. The trachea and lungs are linked by the bronchi.

The bronchi divide into bits of bronchi and bronchioles, which are even smaller tubes. Each bronchiole has a little air sac at the end known as an alveoli. Here is where the actual exchange of carbon dioxide and oxygen takes place. The bronchial tree is the collective name for this arrangement of bronchi, bronchioles, and alveoli.

Alveoli in the lungs receive oxygen that was inhaled. This air-blood barrier allows oxygen to readily enter the capillaries' blood. The name of this process is diffusion. In a similar way, blood-borne carbon dioxide enters alveoli before being expelled. The pulmonary veins carry oxygenated blood from the lungs to the left side of the heart, which then pumps it to the rest of the body. The series of actions known as respiration is what causes the atmosphere and the body's cells to exchange oxygen and carbon dioxide (National Cancer Institute, 2019). The superior vena cava and the inferior vena cava are two significant veins that carry oxygen-poor, carbon dioxide-rich blood back to the right side of the heart. The blood is then transported to the lungs via the pulmonary artery, where it absorbs oxygen and exhales carbon dioxide.

Associated Diseases with Respiratory System

Lung emphysema is characterised by swollen alveoli, thinning or ruptured alveolar walls, and loss of alveolar wall elasticity (Kountz and Alexander,1934). The American Thoracic Society, World Health Organization and Ciba Guest Symposium provide the following definition of emphysema: "Emphysema is a lung disorder characterised by abnormal, permanent expansion of the air gaps distal to the terminal bronchiole, together with deterioration of their walls (Thurlbeck, W., M., and Müller, N., L, 1994). Taraseviciene-Stewart, L., and Voelkel, N., F., (2008) also suggested emphysema is mostly brought on by cigarette smoking and air pollution in humans, and it is also brought on by cigarette smoking in rats.

Arbex et al. (2012) posits one of the causes of respiratory diseases is air pollution, which is a combination of particulate matter (PM) and gases released into the atmosphere primarily by industries, cars, and thermoelectric power plants, as well as from the burning of biomass and fossil fuels. According to Arbex et al. (2012), children are particularly vulnerable to exposure to air pollutants, and minute ventilation is higher in children than in adults as a result of children having higher basal metabolic rates, participating in more physical activity than adults, and spending more time outdoors.

Another breathing disorder is asthma (Bio Teacher, 2019) in which coughing, wheezing, chest tightness, and shortness of breath are some of its signs. Pollen, cigarette smoke, house dust, and pet dander are among the environmental factors that contribute to its development. Scientists have more recently discovered a connection between stress and anxiety and the development of asthma (Bio Teacher, 2019). Humans with chronic, poorly managed asthma are prone to lung remodelling and the development of fixed airway blockage (Taraseviciene-Stewart, L., and Voelkel, N., F., 2008).

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