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Respiratory System: Organs and its Functions

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Description

In humans and most animals, including a few fish and snails, the lungs are the major organs of the respiratory system. Two lungs are positioned near the backbone on either side of the heart in mammals and most other animals. In the respiratory system, they perform gas exchange by extracting oxygen from the air and transferring it to the bloodstream, as well as releasing carbon dioxide from the bloodstream into the atmosphere. Various muscle mechanisms in different species promote respiration. Different muscles are used by mammals, reptiles, and birds to support and nurture respiration. The pharyngeal muscles drove air into the lungs in earlier tetrapods by buccal pumping, which is still found in amphibians. The diaphragm is the main respiratory muscle in humans, and it is responsible for breathing. The lungs also provide airflow that allows for vocal sounds, such as human speaking.

Humans have two lungs, one right and one left. They are found within the chest's thoracic cavity. The right lung, which shares space in the chest with the heart, is larger than the left. The right lung is heavier than the left, weighing around 1.3 kilogrammes (2.9 lb). The lungs are a portion of the lower respiratory tract, which starts with the trachea and branches into the bronchi and bronchioles before receiving air through the conducting zone. The terminal bronchioles mark the conclusion of the conducting zone. The respiratory bronchioles of the respiratory zone separate into alveolar ducts, which give rise to alveolar sacs, which contain the alveoli, where gas exchange occurs. The walls of the respiratory bronchioles and alveolar ducts are likewise sparsely covered with alveoli. The lungs have about 2,400 kilometres (1,500 miles) of airways and 300 to 500 million alveoli between them. Each lung is contained in a pleural sac, which is made up of two membranes called pleurae that are separated by a film of pleural fluid that allows the inner and outer membranes to slide over each other without much friction while breathing. Each lung is also divided into lobes by the inner pleura. There are three lobes in the right lung and two in the left. Bronchopulmonary segments and pulmonary lobules are separated from the lobes. The lungs have a distinct blood supply, getting deoxygenated blood from the heart in the pulmonary circulation for the purpose of obtaining oxygen and expelling carbon dioxide, as well as a separate supply of oxygenated blood to the lungs' tissue in the bronchial circulation.

A variety of respiratory disorders, such as pneumonia and lung cancer, can affect the tissue of the lungs. Chronic bronchitis and emphysema are examples of chronic obstructive lung disease, which can be caused by smoking or exposure to toxic substances. Coal dust, asbestos fibres, and crystalline silica dust are all known to induce a variety of occupational lung illnesses. Bronchitis, for example, can impact the respiratory tract. As in pulmonology, medical phrases connected to the lungs frequently begin with pulmo, from the Latin pulmonarius (of the lungs), or with pneumo, as in pneumonia.

The lungs begin to form as an outpouching of the foregut, a tube that eventually forms the upper section of the digestive system, during embryonic development. Because the foetus is kept in the fluid-filled amniotic sac when the lungs form, they do not function to breathe. The ductus arteriosus also allows blood to be diverted from the lungs. Air begins to move through the lungs upon birth and the diversionary duct shuts, allowing the lungs to begin to breathe. Early childhood is when the lungs fully mature.

Functions

The main function of the lungs is the process of gas exchange called respiration (or breathing). In respiration, oxygen from incoming air enters the blood, and carbon dioxide, a waste gas from the metabolism, leaves the

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blood. A reduced lung function means that the ability of lungs to exchange gases is reduced. Across the narrow blood–air barrier, the alveolar and pulmonary capillary gases equilibrate. This thin membrane (0.5–2 m thick) is folded into around 300 million alveoli, providing an exceptionally large surface area for gas exchange (estimates range from 70 to 145 m^2). The influence of respiratory muscles on rib cage expansion. The lungs are unable to expand on their own to breathe, and will only do so when the capacity of the thoracic cavity increases. The breathing muscles, which contract the diaphragm, and the intercostal muscles, which pull the rib cage higher, achieve this, as illustrated in the diagram. The muscles relax during exhalation, allowing the lungs to return to their resting position. At this time, the lungs contain the Functional Residual Capacity (FRC) of air, which are roughly 2.5–3.0 litres in an adult human.

A significant number of accessory muscles in the neck and abdomen are activated during heavy breathing, as in exertion, to pull the ribcage down during exhalation, reducing the volume of the thoracic cavity. Although the FRC has dropped, around a litre of residual air remains since the lungs cannot be entirely evacuated. Lung function testing is used to determine the volume and capacity of the lungs.