

## **Human Respiratory System**

The Respiratory System is crucial to every human being. Without it, we would cease to live outside of the womb. Let us begin by taking a look at the structure of the respiratory system and how vital it is to life. During inhalation or exhalation air is pulled towards or away from the lungs, by several cavities, tubes, and openings. The human respiratory system consists of a complex set of organs and tissues that capture oxygen from the environment and transport the oxygen into the lungs. The primary function of the respiratory system is to supply the blood with oxygen in order for the blood to deliver oxygen to all parts of the body. The respiratory system does this through breathing. When we breathe, we inhale oxygen and exhale carbon dioxide. This exchange of gases is the respiratory system's means of getting oxygen to the blood. Respiration is achieved through the mouth, nose, trachea, lungs, and diaphragm.

### **Nose and pharynx**

The respiratory system of humans begins with the nose, where air is conditioned by warming and moistening. Bone partitions separate the nasal cavity into chambers, where air swirls about in currents. Hairs and hair like cilia trap dust particles and purify the air.

The nasal chambers open into a cavity at the rear of the mouth called the **pharynx** (throat). From the pharynx, two tubes called Eustachian tubes open to the middle ear to equalize air pressure there. The pharynx also contains tonsils and adenoids, which are pockets of lymphatic tissue used to trap and filter microorganisms.

## Trachea

After passing through the pharynx, air passes into the windpipe, or **trachea**. The trachea has a framework of smooth muscle with about 16 to 20 open rings of cartilage shaped like a C. These rings give rigidity to the trachea and ensure that it remains open.

The opening to the trachea is a slit like structure called the **glottis**. A thin flap of tissue called the **epiglottis** folds over the opening during swallowing and prevents food from entering the trachea. At the upper end of the trachea, several folds of cartilage form the **larynx**, or voice box. In the larynx, flap like pairs of tissues called vocal cords vibrate when a person exhales and produce sounds.

At its lower end, the trachea branches into two large **bronchi** (singular, bronchus). These tubes also have smooth muscle and cartilage rings. The bronchi branch into smaller **bronchioles**, forming a bronchial "tree." The bronchioles terminate in the air sacs known as **alveoli**.

## Lungs

Human lungs are composed of approximately 300 million alveoli, which are cup-shaped sacs surrounded by a capillary network. Red blood cells pass through the capillaries in single file, and oxygen from each alveolus enters the red blood cells and binds to the hemoglobin. In addition, carbon dioxide contained in the plasma and red blood cells leaves the capillaries and enters the alveoli when a breath is taken. Most carbon dioxide reaches the alveoli as bicarbonate ions, and about 25 percent of it is bound loosely to hemoglobin.

When a person inhales, the rib muscles and diaphragm contract, thereby increasing the volume of the chest cavity. This increase leads to reduced air pressure in the chest cavity, and air rushes into the alveoli, forcing them to expand and fill. The lungs passively obtain air from the environment by this

process. During exhalation, the rib muscles and diaphragm relax, the chest cavity area diminishes, and the internal air pressure increases. The compressed air forces the alveoli to close, and air flows out.

The nerve activity that controls breathing arises from impulses transported by nerve fibers passing into the chest cavity and terminating at the rib muscles and diaphragm. These impulses are regulated by the amount of carbon dioxide in the blood: A high carbon-dioxide concentration leads to an increased number of nerve impulses and a higher breathing rate.