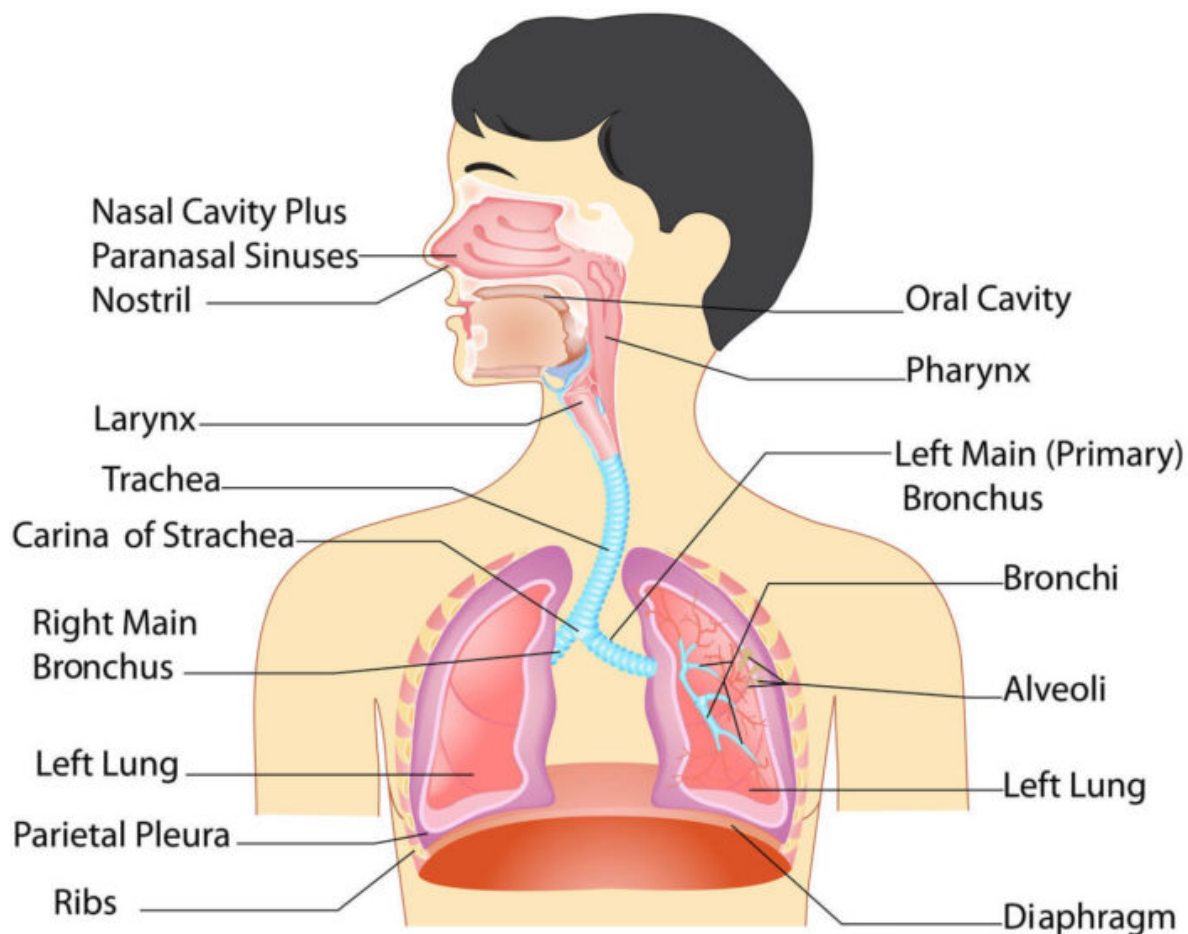


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**ADRENAL FATIGUE** *solution*

# Anatomy Of The Respiratory System



The respiratory system (also referred to as the ventilator system) is a complex biological system comprised of several organs that facilitate the inhalation and exhalation of oxygen and carbon dioxide in living organisms (or, in other words, breathing).

For all air-breathing vertebrates, respiration is handled by the lungs, but these are far from the only components of the respiratory system. In fact, the system is composed of the following biological structures: nose and nasal cavity, mouth, pharynx, larynx, trachea, bronchi and bronchioles, lungs and the muscles of respiration. (1)

A properly functioning respiratory system is a vital part of our good health. Respiratory infections can be acute and sometimes life threatening. They can also be chronic, in which case they place tremendous long term stress on the immune system, endocrine system, [HPA axis](#), and much more.

## Anatomical Components

An image of the respiratory system, showing all the major components, is shown above.

### 1. *Nose and Nasal Cavity*

The nose and nasal cavity constitute the main external opening of the respiratory system. They represent the entryway to the respiratory tract – a passage through the body which air uses for travel in order to reach the lungs. The nose is made out of bone, muscle, cartilage and skin, while the nasal cavity is, more or less, hollow space. Although the nose is typically credited as being the main external breathing apparatus, its role is actually to provide support and protection to the nasal cavity. The cavity is lined with mucus membranes and little hairs that can filter the air before it goes into the respiratory tract. They can trap all harmful particles such as dust, mold and pollen and prevent them from reaching any of the internal components. At the same time, the cold outside air is warmed up and moisturized before going through the respiratory tract. During exhalation, the warm air that is eliminated returns the heat and moisture back to the nasal cavity, so this forms a continuous process.

## 2. Oral cavity

The oral cavity, more commonly referred to as the mouth, is the only other external component that is part of the respiratory system. In truth, it does not perform any additional functions compared to the nasal cavity, but it can supplement the air inhaled through the nose or act as an alternative when breathing through the nasal cavity is not possible or exceedingly difficult. Normally, breathing through nose is preferable to breathing through the mouth. Not only does the mouth not possess the ability to warm and moisturize the air coming in, but it also lacks the hairs and mucus membranes to filter out unwanted contaminants. On the plus side, the pathway leading from the mouth is shorter and the diameter is wider, which means that more air can enter the body at the same speed.

## 3. Pharynx

The pharynx is the next component of the respiratory tract, even though most people refer to it simply as the throat. It resembles a funnel made out of muscles that acts as an intermediary between the nasal cavity and the larynx and esophagus. It is divided into three separate sections: nasopharynx, oropharynx and laryngopharynx. The nasopharynx is the upper region of the structure, which begins at the posterior of the nasal cavity and simply allows air to travel through it and reach the lower sections. The oropharynx does something similar, except it is located at the posterior of the oral cavity. Once the air reaches the laryngopharynx, something called the epiglottis will divert it to the larynx. The epiglottis is a flap that performs a vital task, by switching access between the esophagus and trachea. This ensures that air will travel through the trachea, but that food which is swallowed and travels through the pharynx is diverted to the esophagus.

#### 4. *Larynx*

The larynx is the next component, but represents only a small section of the respiratory tract that connects the laryngopharynx to the trachea. It is commonly referred to as the voice box, and it is located near the anterior section of the neck, just below the hyoid bone. The aforementioned epiglottis is part of the larynx, as are the thyroid cartilage, the cricoid cartilage and the vocal folds. Both cartilages offer support and protection to other components, such as the vocal folds and the larynx itself. The thyroid cartilage also goes by a more common name – the Adam’s apple – although, contrary to popular belief, it is present in both men and women. It is typically more pronounced in adult males. The vocal folds are mucous membranes that tense up and vibrate in order to create sound, hence the term voice box. The pitch and volume of these sounds can be controlled by modifying the tension and speed of the vocal folds.

#### 5. *Trachea*

The trachea is a longer section of the respiratory tract, shaped like a tube and approximately 5 inches in length. It has several C-shaped hyaline cartilage rings which are lined with pseudostratified ciliated columnar epithelium. (2) Those rings keep the trachea open for air all the time. They are C-shaped in order to allow the open end to face the esophagus. This allows the esophagus to expand into the area normally occupied by the trachea in order to permit larger chunks of food to pass through. The trachea, more commonly referred to as the windpipe, connects the larynx to the bronchi and also has the role of filtering the air prior to it entering the lungs. The epithelium which lines the cartilage rings produces mucus which traps harmful particles. The cilia then move the mucus upward towards the pharynx, where it is redirected towards the gastrointestinal tract in order for it to be digested.

## 6. Bronchi

The lower end of the trachea splits the respiratory tract into two branches that are named the primary bronchi. These first run into each of the lungs before further branching off into smaller bronchi. These secondary bronchi continue carrying the air to the lobes of the lungs, then further split into tertiary bronchi. The tertiary bronchi then split into even smaller sections that are spread out throughout the lungs called bronchioles. Each one of these bronchioles continues to split into even smaller parts called terminal bronchioles. At this stage, these tiny bronchioles number in the millions, are less than a millimeter in length, and work to conduct the air to the lungs' alveoli. The larger bronchi contain C-shaped cartilage rings similar to the ones used in the trachea to keep the airway open. As the bronchi get smaller, so do the rings that become progressively more widely spaced. The tiny bronchioles do not have any kind of cartilage and instead rely on muscles and elastin.

This system creates a tree-like pattern, with smaller branches growing from the bigger ones. At the same time, it also ensures that air from the trachea reaches all the regions of the lungs. Besides simply carrying the air, the bronchi and bronchioles also possess mucus and cilia that further refine the air and get rid of any leftover environmental contaminants. The walls of the bronchi and bronchioles are also lined with muscle tissue, which can control the flow of air going into the lungs. In certain instances, such as during physical activity, the muscles relax and allow more air to go into the lungs.

## 7. Lungs

The lungs are two organs located inside the thorax on the left and right sides. They are surrounded by a membrane that provides them with enough space to expand when they fill up with air. Because the left lung is located lateral to the heart, the organs are not identical: the left lung is

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