



Our lungs fuel us with oxygen, the body's life-sustaining gas. They breathe in air, then extract the oxygen and pass it into the bloodstream, where it's rushed off to the tissues and organs that require it to function.

Oxygen drives the process of respiration, which provides our cells with energy. The waste gas carbon dioxide is produced as a byproduct and disposed of when we exhale. Without this vital exchange our cells would quickly die and leave the body to suffocate.

Since the lungs process air, they are the only internal organs that are constantly exposed to the external environment. Central to the human respiratory system, they breathe in between 2,100 and 2,400 gallons (8,000 and 9,000 liters) of air each day—the amount needed to oxygenate the 2,400 gallons (9,000 liters) or so of blood that is pumped through the heart daily.

### Intricate Construction

Our two lungs are made up of a complex latticework of tubes, which are suspended, on either side of the heart, inside the chest cavity on a framework of elastic fibers. Air is drawn in via the mouth and the nose, the latter acting as an air filter by trapping dust particles on its hairs. The air is warmed up before passing down the windpipe, where it's divided at the bottom between two airways called **bronchi** that lead to either lung.

Within the lungs, the mucus-lined bronchi split like the branches of a tree into tens of thousands of ever smaller tubes (**bronchioles**), which connect to tiny sacs called **alveoli**. The average adult's lungs contain about 600 million of these spongy, air-filled structures. There are enough alveoli in just one lung to cover an area roughly the size of a tennis court.

The alveoli are where the crucial gas exchange takes place. The air sacs are surrounded by a dense network of minute blood vessels, or capillaries, which connect to the heart. Those that link to the **pulmonary arteries** carry deoxygenated blood that needs to be refreshed. Oxygen passes through the incredibly thin walls of the alveoli into the capillaries and is then carried back to the heart via the **pulmonary veins**. At the same time, carbon dioxide is removed from the blood through the same process of diffusion. This waste gas is expelled as we breathe out.

The rate at which we breathe is controlled by the brain, which is quick to sense changes in gas concentrations. This is certainly in the brain's interests—it's the body's biggest user of oxygen and the first organ to suffer if there's a shortage.

### In and Out

The actual job of breathing is done mainly by the **diaphragm**, the sheet of muscles between the chest and abdomen. These muscles contract when we breathe in, expanding the lungs and drawing in air. We breathe out simply by relaxing the diaphragm; the lungs deflate like balloons.

Lungs are delicate organs and vulnerable to a range of illnesses. The most common of these in Western countries are **bronchitis** and **emphysema**, which are often caused by smoking. Tubes inside the lung become chronically inflamed, producing excess mucus. Smoking can also lead to **lung cancer**, the world's major cancer, which is diagnosed in 1.4 million people a year.