



How your lungs work

Your lungs are incredible. Every day you take about 25,000 breaths, mostly without thinking.

About your lungs

All day, every day, your lungs work, often without you thinking about it.

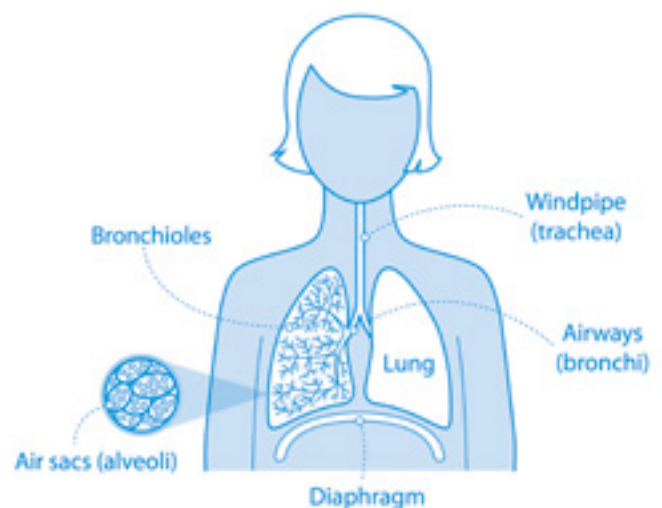
How often you breathe in and out every minute depends on your age and what you're doing. If you're resting, an adult will breathe around 12-20 times a minute – that adds up to around 17,000 – 30,000 times a day! The amount of air that moves in and out of your lungs can vary from just a few litres a minute when you're resting, to over 100 litres a minute if you're exercising vigorously.

The lungs absorb oxygen from the air you breathe in and transfer it into your bloodstream so that it can get to every part of your body. As the cells in your body work, they produce a waste gas called carbon dioxide that is released into the bloodstream. Your lungs get rid of this waste gas when you breathe out.

What are your lungs made up of and how do they work?

Your two lungs fill your chest and sit on either side of your heart. The left lung is smaller than the right because it shares that side of the chest with your heart.

Your **windpipe** – also called your **trachea** - carries air into the lungs and out again when you breathe out. The windpipe divides into **airways** called **bronchi**. These branch into smaller and smaller airways. The smallest are too narrow to be seen with the naked eye. This is often called the **bronchial tree**. At the end of these tubes are tiny air sacs called **alveoli**. This is where gas exchange happens. Under a microscope, the inside of your lungs look like a giant sponge.



There are around 300 million air sacs and if they were spread out they would cover an area roughly the size of a tennis court.

What is the pleura?

The **pleura** is a thin, transparent membrane that surrounds your lungs, and lines the inside of your ribcage. It has two layers so the outside of the lungs can slide smoothly against the inside of the chest wall as you breathe.

What muscles do you use to breathe?

Your main breathing muscle is the diaphragm. This divides your chest from your abdomen. Your **diaphragm** contracts when you breathe in, so pulling the lungs down, stretching and expanding them. It relaxes back – into a dome position – when you breathe out, reducing the amount of air in your lungs.

The abdominal muscles are used to push air out of the lungs when you breathe out.

There are also muscles in between the ribs, which keep the ribcage stiff and help with breathing. These are called **intercostal muscles**.

Why do you breathe?

Every part of your body needs oxygen to survive.

Everyday functions of the body like digesting your food, moving your muscles or even just thinking, need oxygen. When these processes happen, **carbon dioxide** is produced as a waste product. The job of your lungs in this system is to provide these processes with oxygen and to get rid of the waste gas, carbon dioxide.

Your brain constantly gets signals from your body which detect the amount of oxygen and carbon dioxide in your blood.

Your brain will send signals to the muscles involved in breathing and adjust your breathing rate depending on how active you are.

When you're active, your breathing can increase up to about 40-60 times a minute to cope with the extra demand. The delivery of oxygen to your muscles also speeds up, so they can do their job efficiently. The increase in your breathing also makes sure there's no build-up of carbon dioxide in your bloodstream.

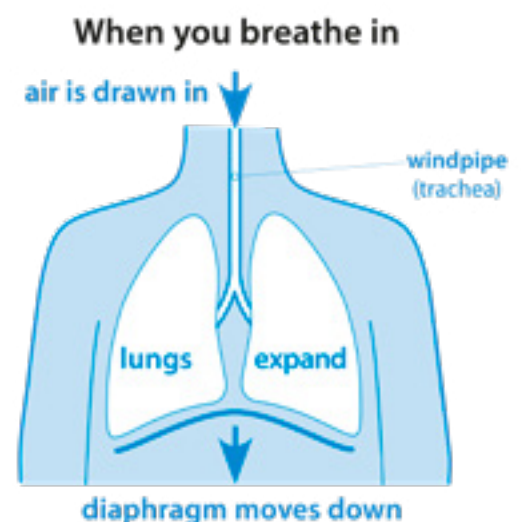
How do you breathe?

Breathing in:

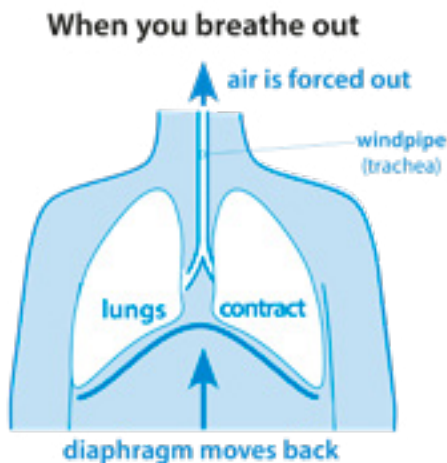
Healthy lung tissue is springy and elastic so your muscles need to work to expand your chest and draw air into your lungs.

Signals from the respiratory centre in your brain travel down nerves to your diaphragm and other muscles. The diaphragm is pulled flat, pushing out the lower ribcage and abdomen. At the same time, the muscles between your ribs pull your rib cage up and out. This expands the chest and draws air into the lungs.

Air is pulled into your nose or mouth, and into your windpipe. This divides into airways supplying the left and right lungs.



The air passes down the airways, which divide another 15 to 25 times, and finally into thousands of smaller airways until the air reaches the air sacs.



Breathing out:

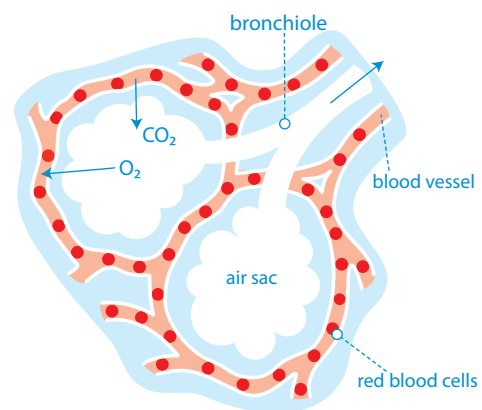
At rest, breathing out is mostly a passive process. The muscles you use to breathe in now relax and your elastic lungs push air out. When you exercise and your body needs to move air more quickly, your abdominal muscles provide the main drive for exhaling. Intercostal muscles also help.

The system works so that you breathe in and out comfortably at rest where the least effort is required to move air – and you're probably not conscious of your breathing. When you exercise, you need to move more air. To do this you can take bigger breaths or breathe more quickly – usually both.

Although breathing is usually automatic, you can control it if you want to - for example, when you talk or sing.

How does oxygen get into the bloodstream?

Inside the air sacs, oxygen moves across paper-thin walls to tiny blood vessels called **capillaries** and into your blood. A protein called haemoglobin in the **red blood cells** then carries the oxygen around your body. At the same time, carbon dioxide that is dissolved in the blood comes out of the capillaries back into the air sacs, ready to be breathed out.



Blood with fresh oxygen is carried from your lungs to the left side of your heart, which pumps blood around your body through the arteries.

Blood without oxygen returns through the veins, to the right side of your heart. From there it is pumped to your lungs so that you can breathe out the carbon dioxide and breathe in more oxygen.

What else do the lungs do?

The lungs are exposed to the air so they also play an important protective role in your body, linked to your immune system. Each breath of air doesn't only carry oxygen, it also carries germs and other foreign bodies such as **pollutants**. As a result, your lungs are also designed to prevent unwanted materials from getting into your body. Read more about pollution: www.blf.org.uk/air-pollution

Mucus is produced in the walls of the small airways to help keep your lungs clean and well lubricated. It is moved by tiny hairs called **cilia** that line your airways. They move back and forth sweeping a thin layer of mucus out of your lungs and into your throat. Unwanted materials stick to the mucus. When it reaches the throat, it's usually swallowed without you realising. If your mucus builds up or if you have an inflammation, coughing can help to clear it from the airways.

So the delicate structure of your lungs is beautifully adapted to breathe and, at the same time, helps protect your body from harm.

But your lungs can be damaged if you breathe in **cigarette smoke, polluted air** or **dusts and fumes in your workplace** over a sustained period of time. If your airways get damaged, you can get breathless.

Often it's hard to protect yourself from environmental risks such as air pollution. But you can help protect your lungs by **quitting smoking, improving the air quality in your home** and doing what you can to **reduce your exposure to air pollution**. Find out how to improve your indoor air quality: www.blf.org.uk/support-for-you/your-home-and-your-lungs/improving-air-quality

If you have a lung condition there is plenty of support and advice for you on how to **keep active**. Attending a **pulmonary rehabilitation** programme is another way to help improve your fitness and improve how you use the oxygen that is delivered to your muscles. Find out about the benefits of pulmonary rehabilitation at www.blf.org.uk/pr

Your lungs are very special. Remember to take good care of them.

Get in touch with us to find support near you.

Helpline: 03000 030 555

Monday to Friday, 9am-5pm

Ringing our helpline never costs more than a local call and is usually free, even from a mobile.

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We value feedback on our information. To let us know your views, and for the most up to date version of this information and references, call the helpline or visit blf.org.uk