



Breathing and lung function tests

Tests to measure your oxygen levels

Tests to check the level of oxygen in your blood can be helpful in diagnosing or monitoring lung disease. Tests used include:

- pulse oximetry
- blood gas test
- long term oxygen therapy (LTOT) assessment
- hypoxic challenge (fitness-to-fly) test

Pulse oximetry

What is pulse oximetry?

Oxygen is carried around in your red blood cells by a molecule called haemoglobin. Pulse oximetry measures how much oxygen the haemoglobin in your blood is carrying. This is called the oxygen saturation and is a percentage (scored out of 100). It's a simple, painless test which uses a sensor placed on your fingertip or earlobe.

What's pulse oximetry used for?

People with a lung condition may have a blood oxygen level lower than normal, so pulse oximetry can help to diagnose if there is a problem.

The more the lungs are damaged, the more likely there is to be a problem with oxygen uptake. Pulse oximetry can also be used to measure to how badly a person's lungs are affected.

The test can be done as a one-off spot measurement.

It can also be used to measure your oxygen levels over a period of time, for example during exercise like walking – or when you are asleep.

How can I prepare for a pulse oximetry test?

Nail varnish or false nails can block the light and affect the reading. So you'll be asked to remove it on one finger only. This will help get an accurate result.

Pulse oximetry results can be affected by medical conditions including anaemia and Raynaud's syndrome. Talk to your health care professional if you're concerned about this.

What happens during a pulse oximetry test?

You will have a small device clipped to your finger or earlobe, called an oximeter. This gadget shines light through your fingertip or earlobe. It works out how much oxygen is in your blood.

How a pulse oximeter works

A pulse oximeter measures how much light is absorbed by your blood. This tells us how much oxygen your blood contains.

The pulse oximeter shines 2 lights through your fingertip or earlobe: one red light and one infrared light.

Blood containing lots of oxygen absorbs more infrared light and lets more red light pass through it.

Blood without enough oxygen absorbs more red light and lets more infrared light pass through it.

If your blood cells do not have enough oxygen, they will appear bluer.

Can I do a pulse oximetry test at home?

Home use oximeters are available for sale online and in chemists. These can be used to measure the levels of oxygen in your blood, but sometimes give poor or inaccurate measurements.

Before testing at home, talk to your health care professional.

What will the results look like?

The oximeter display shows the percentage of oxygen in your blood. For someone who's healthy, the normal blood oxygen saturation level will be around 95–100%.

If the oxygen level is below this, it can be an indicator that there is a lung problem. People with low oxygen level may need additional **oxygen** ([blf.org.uk/support-for-you/oxygen](https://www.blf.org.uk/support-for-you/oxygen)) or other treatment. Your health care professional will discuss this with you.

Current guidelines recommend that people with a resting stable oxygen saturation of 92% or less should be referred for a **blood gas assessment** ([blf.org.uk/support-for-you/breathing-tests/blood-gas-test](https://www.blf.org.uk/support-for-you/breathing-tests/blood-gas-test)) to see if oxygen therapy is appropriate.

Usually you will need to have a number of **blood gas tests** before oxygen is prescribed.

A change in your oxygen level may mean that your lung condition has got worse.

In people with pneumonia and in **children with lung problems** ([blf.org.uk/support-for-you/children](https://www.blf.org.uk/support-for-you/children)), oxygen saturation can help to decide if someone needs to be looked after in hospital.

Blood gas test

What is a blood gas test?

A blood gas test is used to measure more accurately how much oxygen and carbon dioxide there is in your blood. The test is called:

an arterial blood gas test if the sample is taken from your wrist
a capillary blood gas test if the sample is collected from your earlobe

What's it used for?

A blood gas test is used to check how well your lungs are working and whether they're able to **exchange oxygen and carbon dioxide efficiently** (blf.org.uk/support-for-you/how-your-lungs-work/oxygen-and-blood).

It can be used to see if you need **oxygen therapy** (blf.org.uk/support-for-you/oxygen).

What happens during a blood gas test?

The tester will take a small sample of your blood. They will normally take this by using a needle and a syringe in one of the arteries of your wrist. Or they may take blood from the inside of your elbow. Sometimes, they will use some local anaesthetic.

Some hospitals check blood gas by taking a blood sample from your earlobe.

- Your tester will put a special cream on your earlobe that helps increase blood flow. This makes your ear go red and feel hot.
- The blood vessels in your ear lobe will then contain about the same amount of oxygen as blood taken from your artery.
- After a few minutes the tester can take a sample by pricking the earlobe and catching the blood droplet that forms. This isn't painful - it's similar to the way blood sugar levels can be checked from a pinprick on the fingertip.

The earlobe method can't usually be used if you need to have the test when you are unwell (such as when you're admitted to hospital with a flare-up of COPD symptoms).

What will the results look like?

The results will be a set of readings showing

- oxygen
- carbon dioxide
- acidity / alkalinity (pH)

Abnormal results may mean your body is not getting enough oxygen or is not getting rid of enough carbon dioxide.

A high level of carbon dioxide may mean that your breathing is shallow at night and you may benefit from using a **ventilator device at home** (blf.org.uk/support-for-you/copd/treatment#niv).

Long-term oxygen therapy (LTOT) assessment

What is a long-term oxygen therapy assessment?

Some people with very low oxygen levels may benefit from using **oxygen therapy**.

A long-term oxygen therapy assessment is a set of tests to measure the levels of oxygen in your blood to see if they are low enough for oxygen therapy to be helpful.

What's it used for?

A long-term oxygen therapy assessment is used to test oxygen levels in people who have a long-term condition such as **COPD, pulmonary fibrosis, asthma, pulmonary hypertension** or **cystic fibrosis**.

The outcome can help your health care professional decide if you should have oxygen therapy.

What happens during an oxygen assessment?

An oxygen assessment usually happens when your lung condition is stable and you don't have a chest infection. Oxygen levels can dip down during infections, but unless your oxygen level stays low it is usually not necessary to have oxygen at home.

The assessment involves measuring your **blood gases** on 2 occasions, a few weeks apart.

Your oxygen levels will be tested while you're sitting down. You'll have a **pulse oximetry test** ([blf.org.uk/support-for-you/breathing-tests/pulse-oximetry-test](https://www.blf.org.uk/support-for-you/breathing-tests/pulse-oximetry-test)) and you may also have a lung function test using a **spirometer** ([blf.org.uk/support-for-you/breathing-tests/spirometry-and-reversibility](https://www.blf.org.uk/support-for-you/breathing-tests/spirometry-and-reversibility)).

Sometimes you'll be asked to do a walking test to see if your oxygen levels go down as you exercise and, if that happens, whether extra oxygen means you can walk further.

Some people who don't need to use oxygen all the time can benefit from oxygen when they exert themselves. This is called ambulatory oxygen. This is only beneficial in people whose oxygen levels fall significantly when they walk.

What happens if I have low levels of oxygen?

If your oxygen levels are low and you need to be started on **oxygen therapy**, your **blood gases** will be checked again while you are breathing in extra oxygen. The oxygen is delivered by small see-through tubes known as nasal cannulae or a face mask covering the nose and mouth. This check will help work out how much oxygen you need to improve the level of oxygen in your blood.

Hypoxic challenge (fitness-to-fly) test

What is the hypoxic challenge test?

The hypoxic challenge test simulates the conditions inside the cabin of an aeroplane during a flight. That means you'll be breathing reduced levels of oxygen, just as you would on a plane. It's sometimes called a fitness-to-fly test, though it only covers the question of whether oxygen is needed.

What's it used for?

It's used to see if you will need oxygen while you are flying.

If you live with a lung condition, your oxygen levels may be lower than normal. During a flight, the oxygen level in the cabin air is only around 15%, compared to 21% at sea level. This means that during flight your blood oxygen levels can fall even further, to a level where there is a risk of heart problems or other complications. This can be avoided by having oxygen in flight.

The results will help decide if you will need extra oxygen when you fly.

If you are planning a flight, ask your health care professional if you need this test well in advance. This will help you plan your trip.

What happens during a hypoxic challenge test?

While you're sitting down, you'll breathe a low oxygen mixture using a face mask. Your oxygen levels and heart rate will be monitored. At the end of the test, a small blood sample may be taken from your earlobe or your wrist.

If your oxygen levels go down during the test, your health care professional will add extra oxygen to see if your oxygen levels go back to normal.

What do the results mean?

At the end of the test, your doctor can make a decision about your need for oxygen during flight. If your oxygen goes down during the test, even after adding extra oxygen, it may be unsafe for you to fly. If your health care professional was able to bring your oxygen to a stable level, they'll know the amount of extra oxygen you need to be able to fly safely.

If you are already on oxygen you will definitely need additional oxygen in flight. Ask your health care professional about this.

Get in touch with us to find support near you.

Helpline: 03000 030 555

Monday to Friday, 9am-5pm

Ringing our helpline will cost the same as a local call.

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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**