TEST

Lung diffusion testing

Lung diffusion testing measures how well gas moves from the air sacs in your lungs into your blood.

WHAT IT MEASURES
How well gas moves from your lungs into your blood

SAMPLE
Breath; sometimes a blood hemoglobin measurement

FASTING NEEDED?
No, but avoid a large meal beforehand

HOW LONG IT TAKES
About 15 to 30 minutes

RESULTS IN
Usually same day; laboratory reporting times differ

USED FOR
Diagnosis and monitoring of lung or blood-vessel conditions

MAIN LIMITATION
Breathing effort and hemoglobin level can mislead interpretation

Overview

Lung diffusion testing measures how easily gas passes from the tiny air sacs in your lungs into your bloodstream. It is often called a DLCO test , short for diffusing capacity of the lungs for carbon monoxide.

During the test, you breathe in a very small, safe amount of carbon monoxide mixed with other gases. You hold your breath briefly and then breathe out. The equipment measures how much carbon monoxide your blood has taken up. Carbon monoxide is used because it binds strongly to hemoglobin, the oxygen-carrying protein in red blood cells.

The test is usually part of a group of pulmonary function tests. These may also measure how much air your lungs hold and how quickly you can breathe out.

A diffusion result cannot diagnose a condition by itself. It must be considered with your symptoms, medical history, examination, and other test results.

Why the test is ordered

A clinician may order lung diffusion testing to investigate unexplained shortness of breath or an abnormal result from another breathing test.

It can help assess conditions that affect:

The test may also be used to monitor an existing lung condition, check for lung effects from certain medicines, or assess lung function before selected operations or treatments.

- The air sacs, such as emphysema
- The tissue between the air sacs and blood vessels, as in interstitial lung disease
- Blood flow through the lungs, including pulmonary vascular disease
- The amount or function of hemoglobin in your blood

Who should have the test

You may be offered lung diffusion testing if you have ongoing breathing symptoms, reduced exercise tolerance, an abnormal chest scan, or unusual spirometry results. Spirometry measures airflow but does not directly measure gas transfer.

People with known emphysema, interstitial lung disease, pulmonary hypertension, or some connective tissue diseases may have repeat tests to look for changes over time.

This is not usually a stand-alone screening test for people without symptoms or risk factors. Whether it is useful depends on the clinical question being investigated.

Tell the testing team if you recently had chest or eye surgery, a collapsed lung, coughing of blood, a heart attack, or severe heart or breathing symptoms. They can decide whether the test should be delayed or adapted.

How to prepare

Follow the instructions from your testing center, because preparation rules differ.

You can usually eat and drink, but avoid a large meal shortly before the appointment. Tight clothing can restrict deep breathing, so wear something comfortable.

Smoking or vaping before the test can lower the measured diffusion result. The testing center may ask you not to smoke for several hours or longer. Avoid carbon monoxide exposure from fires, engines, or poorly ventilated heaters.

Vigorous exercise can temporarily affect lung blood flow. You may be asked to avoid it before

the test.

Ask whether to take your usual inhalers. Diffusion testing itself is not usually changed much by a bronchodilator inhaler, but other breathing tests done at the same appointment may be affected. Do not stop prescribed medicine unless you have been told to do so.

Tell the team if you use supplemental oxygen. Do not turn it off on your own; staff will give specific instructions.

What happens during the test

A technician will explain the breathing steps and place a soft clip on your nose. You will breathe through a mouthpiece connected to the testing equipment.

For the most common method, you first breathe out fully. You then take a quick, deep breath containing the test-gas mixture. You hold your breath for about 10 seconds and breathe out into the machine.

The first part of the exhaled air is not used because it comes mainly from the larger airways. The next part is analyzed to see how much carbon monoxide was absorbed.

You will usually repeat the maneuver so the laboratory can check that the measurements agree. The test should not be painful, but a tight seal around the mouthpiece and your best breathing effort are important.

A small blood sample or a noninvasive hemoglobin reading may be taken. This helps adjust the result if your hemoglobin level is higher or lower than expected.

Understanding your results

The main result is called DLCO. It may be shown as a measured value, a percentage of a predicted value, or a z-score showing how far it is from the expected range.

Expected results are estimated from reference data. Ranges and interpretation vary by laboratory, age, sex, height, pregnancy status, medicines, hemoglobin level, smoking history, altitude, and clinical context. The laboratory should use an appropriate lower limit rather than relying only on a single universal percentage cutoff.

A low result means less test gas moved into the blood than expected. Possible reasons include damage to air sacs, thickening of lung tissue, reduced blood flow through the lungs, anemia, or an incomplete breath during the test.

A high result can occur with increased blood volume in the lungs, a high red blood cell level,

recent bleeding into the lungs, or some conditions such as asthma. It does not identify the cause by itself.

The report may also include alveolar volume , an estimate of the lung volume reached by the test gas, and KCO , gas transfer divided by that volume. KCO should not be interpreted as a simple correction for small lungs.

What affects the results

Several factors can change the number even when the equipment is working correctly:

Age, sex, and height also affect the expected value and are included in prediction equations. Some medicines can cause genuine changes in lung tissue, but they do not usually create a false result directly.

- Incomplete inhalation: Not filling your lungs fully can produce a misleadingly low result
- Leaks: Air escaping around the mouthpiece affects the gas measurement
- Smoking or carbon monoxide exposure: Carbon monoxide already in the blood can lower the measured uptake
- Hemoglobin level: Anemia can lower DLCO, while a high red blood cell level can raise it
- Recent transfusion: This can change hemoglobin and therefore the corrected result
- Supplemental oxygen: Recent oxygen use can affect the measurement
- Recent vigorous exercise: Exercise changes blood flow through the lungs
- Body position: Sitting, standing, and lying down can produce slightly different results
- Altitude: Air pressure and hemoglobin adaptation affect interpretation
- Pregnancy: Normal changes in blood volume, hemoglobin, and lung mechanics may influence results

Accuracy and limitations

A well-performed test is repeatable, but it relies on your ability to take a full breath, hold it, and breathe out as instructed. Poor technique may make the result look abnormal when gas transfer is actually normal.

Hemoglobin correction improves interpretation, but the result may still be misleading if the hemoglobin value is unavailable or outdated. Smoking shortly before testing is another important source of falsely low results.

DLCO can detect reduced gas transfer, but it cannot show exactly where or why the problem is occurring. Different conditions can produce similar numbers. A normal result also does not rule out early, mild, or localized lung disease.

Depending on the question, spirometry, lung-volume testing, a chest CT scan, heart ultrasound, blood tests, or exercise testing may provide more useful information.

Risks and complications

Lung diffusion testing is noninvasive and has few risks. Deep breathing and breath-holding can briefly cause coughing, light-headedness, or shortness of breath.

The carbon monoxide dose is very small. If blood is drawn for hemoglobin testing, you may have a small bruise or feel faint.

Tell staff immediately if you develop chest pain, severe breathlessness, or feel as though you may pass out. Persistent or severe symptoms after leaving are not expected and need urgent medical assessment.

What happens next

A clinician will review whether the measurement was technically reliable and compare it with your expected range, previous results, symptoms, and other tests.

A mildly abnormal result may lead to routine follow-up, repeat testing, a blood count, or another lung or heart test. Repeat measurements are often more useful when they are performed using the same method and compared over time.

Seek emergency help for severe difficulty breathing, blue or gray lips, fainting, new confusion, or chest pain that is severe or does not settle. These are not expected effects of the test and should not wait for routine result review.

Common questions

Can I drink coffee before lung diffusion testing?

Usually, yes. Coffee does not directly interfere with DLCO in most people. Follow your center's instructions if other breathing or exercise tests are planned at the same visit.

Does the time of day matter?

Small changes can occur during the day, but timing is usually less important than good

technique and consistent preparation. For repeat monitoring, testing at a similar time may make comparisons easier.

Can I exercise beforehand?

Avoid vigorous exercise shortly before the test if instructed. Exercise can temporarily change blood flow through the lungs and affect the measurement.

Should I take my inhalers first?

Take them unless your testing center has told you to withhold them. Instructions may be different when spirometry or bronchodilator like albuterol or salmeterol testing is being done at the same appointment.

Can I smoke or vape before the test?

No. Smoking exposes you to carbon monoxide and can make the result appear lower. Follow the center's instructions about how long to avoid smoking or vaping beforehand.

Can I have the test while using oxygen?

Yes, but the testing team needs to plan for it. Do not stop oxygen without instructions, especially if you need it to remain comfortable or maintain a safe oxygen level.

Sources

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