TEST

LDH isoenzyme blood test

An LDH isoenzyme blood test examines different forms of an enzyme released when cells are damaged.

WHAT IT MEASURES
Patterns of five forms of lactate dehydrogenase in blood

SAMPLE
Blood

FASTING NEEDED?
No

HOW LONG IT TAKES
Usually less than five minutes for the blood draw

RESULTS IN
Usually several days; turnaround varies by laboratory

USED FOR
Diagnosis support and occasional monitoring of tissue injury

MAIN LIMITATION
Sample hemolysis can falsely raise red-cell LDH forms

Overview

Lactate dehydrogenase, usually shortened to LDH, is an enzyme that helps cells produce energy. It is present throughout the body. When cells are damaged or destroyed, LDH can leak into the blood.

LDH occurs in five slightly different forms, called isoenzymes. They are numbered LDH-1 through LDH-5. Each form is more common in certain tissues, although no form belongs to only one organ.

An LDH isoenzyme blood test measures the pattern of these five forms. It may help suggest where an increased total LDH level is coming from. It cannot usually identify the exact cause by itself.

This test is used less often than it once was. More specific blood tests, scans, and other investigations can now assess many causes of tissue damage. For example, troponin is preferred when heart muscle injury is suspected.

Why the test is ordered

The test may be ordered after a total LDH result is higher than expected and the source remains unclear. It can sometimes help distinguish a pattern linked with blood cells, liver, skeletal muscle, lungs, kidneys, or other tissues.

Possible reasons for ordering it include:

LDH isoenzymes have also been used in the assessment of some cancers. However, the result does not diagnose cancer and is not a general cancer screening test.

Historically, the test helped assess suspected heart attacks. Troponin blood tests are now more accurate for detecting heart muscle injury and are generally used instead.

- Investigating unexplained tissue or blood-cell damage
- Supporting an assessment for red blood cell breakdown
- Adding information when liver or muscle tests are unclear
- Occasionally following a known condition that affects LDH

Who should have the test

An LDH isoenzyme test is not part of routine screening for people without symptoms or relevant test findings. You may be offered it when a total LDH result is raised and other information has not shown which tissue may be involved.

Whether it is useful depends on your symptoms, examination, previous results, medicines, and medical history. In many situations, a more specific test provides clearer information.

A normal LDH isoenzyme pattern does not rule out every condition affecting the heart, liver, blood, lungs, kidneys, or muscles.

How to prepare

Fasting is not usually needed. You can normally eat, drink water, and have coffee before the blood draw. If other blood tests are being collected at the same time, follow the instructions for those tests because they may require fasting.

Avoid unusually strenuous exercise before the test unless you have been told otherwise. Hard exercise can temporarily release LDH from skeletal muscle and make the result harder to interpret.

Tell the healthcare professional arranging the test about:

Do not stop a medicine just to prepare for this test unless the prescriber has told you to do so.

- Prescription and non-prescription medicines
- Vitamins, supplements, or herbal products
- Recent vigorous exercise, injury, surgery, or injections into muscle
- A recent blood transfusion
- Pregnancy
- A recent illness

What happens during the test

A healthcare professional places a small needle into a vein, usually in your arm. Blood flows into a collection tube. You may feel a brief scratch or stinging sensation.

The blood draw usually takes less than five minutes. The sample may be sent to a specialist laboratory because not every laboratory performs isoenzyme testing on site.

The laboratory separates the LDH forms using a method such as electrophoresis. This method separates proteins according to how they move through a material under an electrical field.

Understanding your results

Results may show the amount or percentage of each isoenzyme. Laboratories may use different methods and reporting formats, so use the reference information printed with your own report.

The five forms are commonly associated with these tissues:

These associations overlap. An increase in one form does not prove that a particular organ is damaged.

For example, an LDH-1 result higher than LDH-2 is sometimes called a "flipped" pattern. It can occur when red blood cells break down, including inside the collection tube. It was also historically associated with heart muscle injury, but it is not specific enough to confirm either cause.

Higher LDH-5 may occur with liver or skeletal muscle injury. Other blood tests are usually needed to distinguish between them.

There is no single universal normal pattern or reference range for every laboratory. Ranges and interpretation vary by laboratory method, age, sex, pregnancy status, medicines, and clinical context.

- LDH-1: red blood cells, heart, and kidneys
- LDH-2: red and white blood cells and other tissues
- LDH-3: lungs and several other tissues
- LDH-4: kidneys, placenta, and pancreas
- LDH-5: liver and skeletal muscle

What affects the results

Hemolysis is the most important source of a misleading result. Hemolysis means red blood cells have broken open. Because these cells contain substantial LDH, damage during collection, transport, or processing can falsely increase total LDH and alter the isoenzyme pattern.

Hemolysis can occur if the blood draw is difficult, the tube is shaken, or processing is delayed. The laboratory may reject a visibly hemolyzed sample, but smaller amounts are not always obvious.

Other factors include:

Tell the person interpreting the result about these factors. A repeat sample may be more useful than trying to interpret a result affected by hemolysis or recent heavy exercise.

- Strenuous exercise: may temporarily increase LDH released from skeletal muscle
- Recent injury, surgery, or muscle injections: may change the pattern
- Recent transfusion: donor red blood cells can affect blood-related isoenzymes
- Pregnancy: placental LDH and pregnancy-related changes affect interpretation
- Age: expected LDH values and patterns can differ in children and adults
- Kidney or liver function: changes may raise LDH or alter how a pattern is interpreted
- Medicines: some medicines can affect the liver, muscles, or blood cells and indirectly change LDH
- Sample handling: temperature, storage time, and delayed separation can affect some isoenzymes

Accuracy and limitations

LDH isoenzyme testing does not have one fixed rate for correctly detecting disease. Its accuracy changes according to the condition being investigated, when the sample is collected, and whether more than one tissue is affected.

The test can miss a problem if tissue damage is small, localized, or no longer releasing enough LDH into the blood. A normal pattern therefore does not exclude disease.

It can also suggest tissue damage when there is no new medical problem. Hemolysis during collection, heavy exercise, recent trauma, and overlapping tissue sources can all produce a misleading increase.

More specific tests are usually better when a particular organ is suspected. These may include:

The LDH isoenzyme result is most useful when considered with your symptoms, examination, total LDH, and other test results.

- Troponin for heart muscle injury
- Creatine kinase for skeletal muscle injury
- ALT, AST, alkaline phosphatase, and bilirubin for liver or bile-duct problems
- Blood count, reticulocytes, bilirubin, and haptoglobin for red blood cell breakdown
- Imaging or tissue sampling when blood tests cannot show the cause

Risks and complications

A blood draw may cause a small bruise, brief soreness, or light-headedness. Serious complications are uncommon.

What happens next

If the sample was hemolyzed or the result does not fit your other findings, the test may be repeated. You may be asked to avoid strenuous exercise before the repeat blood draw.

An abnormal pattern usually leads to routine follow-up with more specific blood tests or imaging. The next step is based on the likely tissue source and the reason the test was ordered, not on the LDH pattern alone.

Do not wait for an LDH result if you develop emergency symptoms such as new chest pressure, severe difficulty breathing, fainting, sudden one-sided weakness, or difficulty

speaking. Seek emergency medical help.

If you feel well and receive an abnormal result without emergency symptoms, arrange routine follow-up with the healthcare professional who ordered the test.

Common questions

Can I drink coffee before the test?

Usually, yes. The LDH isoenzyme test does not normally require fasting. Coffee may not be allowed if another test collected at the same time requires fasting.

Does the time of day matter?

There is usually no required time of day. Collecting repeat samples under similar conditions can make comparison easier.

Can I exercise beforehand?

Avoid unusually hard exercise before the blood draw if possible. Strenuous exercise can release LDH from muscle and produce a misleading result.

Should I stop my medicines?

No medicine should be stopped without instructions from its prescriber. Bring an up-to-date medicine and supplement list so possible effects can be considered.

Why does my result say the sample was hemolyzed?

It means red blood cells broke open in the tube. This releases LDH and can make the result unreliable, even when nothing new is wrong in your body. Another blood sample may be needed.

How quickly will I get the result?

Because this is often specialist testing, results commonly take several days. Turnaround varies by laboratory and whether the sample is sent elsewhere.

Sources

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