TEST

Sickle cell test

A sickle cell test checks blood for hemoglobin S and related inherited hemoglobin changes.

WHAT IT MEASURES
Presence and pattern of sickle hemoglobin and other hemoglobins

SAMPLE
Blood

FASTING NEEDED?
No

HOW LONG IT TAKES
Usually less than 10 minutes

RESULTS IN
Often several days; timing varies by laboratory

USED FOR
Screening and diagnosis

MAIN LIMITATION
Recent blood transfusion can mask an inherited hemoglobin pattern

Overview

A sickle cell test checks for hemoglobin S, often written as HbS. Hemoglobin is the protein inside red blood cells that carries oxygen. HbS is an inherited form of hemoglobin associated with sickle cell trait and sickle cell disease.

"Sickle cell test" can mean several different blood tests. Newborn screening usually examines the pattern of hemoglobin types in a small blood spot. Older children and adults generally have blood taken from a vein.

Laboratories may use high-performance liquid chromatography, capillary electrophoresis, or isoelectric focusing. These methods separate different types of hemoglobin. The names describe laboratory techniques; the important point is that they show which hemoglobins are present and their relative amounts.

A positive screening result does not always establish the exact condition. A second blood test, and sometimes genetic testing, may be needed.

Why the test is ordered

The test may be ordered to:

Sickle cell disease occurs when a person inherits certain hemoglobin gene changes from both biological parents. Sickle cell trait usually means inheriting one HbS gene and one usual hemoglobin gene. Trait is not the same as sickle cell disease.

Testing may also identify other hemoglobin variants, such as hemoglobin C or beta-thalassemia. Beta-thalassemia reduces the body's production of part of the hemoglobin protein. These findings can affect how an HbS result is interpreted.

- Screen a newborn for sickle cell disease and other hemoglobin conditions
- Find out whether you have sickle cell trait
- Investigate unexplained anemia or unusual red blood cell findings
- Confirm an earlier screening result
- Help identify the type of sickle cell disease
- Support reproductive or pregnancy planning

Who should have the test

In the United States, newborn screening programs test all babies for sickle cell disease. Screening practices differ between countries and regions.

Testing may also be appropriate if you:

Sickle cell gene changes are more common among people whose families come from parts of Africa, the Mediterranean, the Middle East, India, the Caribbean, and Central or South America. However, ancestry alone cannot confirm or rule out an inherited hemoglobin change.

A healthcare professional or genetic counselor can help you decide which test fits your reason for testing.

- Did not have newborn screening or cannot find the result
- Have a biological relative with sickle cell disease or trait
- Have a partner with sickle cell disease, trait, or another hemoglobin variant
- Are pregnant or planning a pregnancy and want carrier information
- Have anemia or blood test findings that need further investigation

- Had a previous result that needs confirmation

How to prepare

You do not need to fast. You can usually eat, drink water, and take your regular medicines as normal.

Tell the person arranging the test if you recently had a blood transfusion. Donated red blood cells can change the hemoglobin pattern and may temporarily hide your own result. The date and type of transfusion help the laboratory interpret the test or decide whether testing should be delayed.

Also mention whether the test is being done during pregnancy, after a stem cell or bone marrow transplant, or because of a previous newborn screening result. Bring any earlier hemoglobin test reports if you have them.

What happens during the test

For an adult or older child, a healthcare worker places a small needle into a vein, usually in the arm. Blood is collected into a tube. The blood draw normally takes only a few minutes.

For a newborn, a healthcare worker usually makes a small heel prick. Drops of blood are placed onto a special card and sent to a screening laboratory.

Some rapid screening methods use a finger-prick sample. If a rapid or basic screening test finds HbS, a more detailed laboratory test is usually needed to confirm the result and identify the hemoglobin pattern.

Understanding your results

Results may list hemoglobin types using letters, such as HbA, HbF, HbS, or HbC. HbA is the main usual adult hemoglobin. HbF is fetal hemoglobin, which is naturally present in high amounts in newborns and falls during infancy.

A result showing only usual hemoglobin types generally means HbS was not detected. A result containing both HbA and HbS may fit sickle cell trait, but the complete pattern and clinical context matter.

A pattern containing HbS without HbA may suggest a form of sickle cell disease. It can also occur after certain treatments or in other circumstances, so confirmation is important.

Combinations such as HbS with HbC or beta-thalassemia can represent other forms of sickle cell disease.

Newborn reports may use patterns rather than a final diagnosis because babies have a large amount of HbF. Follow-up testing helps distinguish the possibilities.

Do not compare percentages from different laboratories without guidance. Expected patterns and interpretation vary by laboratory, age, sex, pregnancy status, medicines, transfusion history, treatment, and clinical context.

What affects the results

A recent blood transfusion is one of the most important influences. Donor red blood cells may add HbA or dilute HbS, making the pattern look different from your inherited pattern. This can last for weeks or months.

Other factors include:

Eating, coffee, exercise, and the time of day do not usually change whether you inherited HbS. Sample labeling, storage, or collection problems are uncommon but may require a repeat sample.

- Age: Newborns have high HbF, which can make some conditions harder to separate
- Pregnancy: Blood volume and red cell production change, although inherited variants remain present
- Hydroxyurea treatment: This medicine can increase HbF and change hemoglobin percentages
- Stem cell or bone marrow transplant: Donor cells may create a new hemoglobin pattern
- Recent severe bleeding or increased red cell breakdown: New red cells may alter measured proportions
- Iron deficiency: This may affect some hemoglobin measurements and can complicate the recognition of beta-thalassemia
- Laboratory method: Some variants overlap or appear similar with one method but separate with another

Accuracy and limitations

Modern hemoglobin-separation methods are good at detecting HbS, but no single test

answers every question.

A basic sickle solubility test checks whether HbS is present. It can miss low HbS levels and is not reliable for newborn screening because newborns have high HbF. It can also say HbS is present when another rare hemoglobin behaves similarly. Most importantly, it cannot reliably distinguish sickle cell trait from sickle cell disease.

Detailed methods provide more information but can still confuse hemoglobin variants that behave alike. If the pattern is unclear, the laboratory may repeat the test with another method or use genetic testing.

Transfusion can cause a false reassuring pattern by masking HbS. Some treatments can also change hemoglobin percentages without changing the inherited genes.

Genetic testing may be the better test when blood results remain uncertain, transfusion makes them difficult to interpret, or a family needs the exact gene change for reproductive testing.

Risks and complications

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

A newborn heel prick can cause brief discomfort and a small spot of bruising. Genetic testing done on the same type of blood sample does not add physical risk, although its results may have implications for biological relatives.

What happens next

A normal screening result usually needs no further testing unless symptoms, family history, or a transfusion make the result unreliable.

If HbS or another variant is found, routine follow-up may include a confirmatory blood sample, a full blood count, genetic testing, or referral to a blood specialist. If you have sickle cell trait, genetic counseling can explain the chance of passing the gene to a child and whether partner testing may be useful.

An abnormal newborn screen needs prompt follow-up because early confirmation supports timely care. This is important, but the screening result alone is not usually an emergency.

Seek urgent medical care for symptoms such as chest pain, trouble breathing, signs of stroke, severe weakness, or a child who is very unwell. A person known or suspected to have sickle cell disease should also receive prompt medical advice for fever. These actions relate to

symptoms and possible illness, not to the blood test itself.

Common questions

Can I drink coffee before a sickle cell test?

Yes. Coffee does not usually affect whether HbS is detected. If other blood tests are being taken at the same appointment, check whether those require fasting.

Does the time of day matter?

No. HbS is inherited, so morning and afternoon testing should give the same basic answer.

Can I exercise beforehand?

Usual activity does not change your inherited hemoglobin pattern. Very intense exercise may affect some unrelated blood measurements, so follow any instructions given for other tests.

Can pregnancy change the result?

Pregnancy does not create or remove an inherited HbS gene. It can change blood volume and some measured percentages, so the laboratory should know that you are pregnant.

How long after a transfusion should I wait?

There is no single waiting time for everyone. It depends on the transfusion date, the reason for testing, and the method used. Tell the testing service about every recent transfusion before the sample is taken.

Can the test tell trait from sickle cell disease?

Detailed hemoglobin analysis often can, but a basic sickle solubility test cannot. Confirmation or genetic testing may be needed when the pattern is uncertain.

Sources

- Centers for Disease Control and Prevention. About Sickle Cell Disease .
- Centers for Disease Control and Prevention. Screening for Sickle Cell Disease .
- National Heart, Lung, and Blood Institute. Sickle Cell Disease: Diagnosis .
- MedlinePlus. Sickle Cell Tests . U.S. National Library of Medicine.
- American Society of Hematology. Sickle Cell Trait .

- Clinical and Laboratory Standards Institute. Newborn Screening for Sickle Cell Disease and Other Hemoglobinopathies , 1st edition, NBS06.