

Iron Tests

 At a Glance +

 What is being tested? +

 Common Questions -

How is it used?

Iron tests are used to assess the amount of iron circulating in the blood, the total capacity of the blood to transport iron, and the amount of stored iron in the body. Testing may also help differentiate various causes of anemia.

Iron tests are often ordered together, and the results of each can help identify iron deficiency, iron deficiency anemia, or too much iron in the body (overload).

When is it ordered?

Iron tests may be ordered when results from a routine [complete blood count \(CBC\)](#) ([/understanding/analytes/cbc](#)), show that a person's [hemoglobin](#) ([/help/patient-test-info/hemoglobin](#)) and [hematocrit](#) ([/help/patient-test-info/hematocrit](#)), are low and their red blood cells are smaller and paler than normal (microcytic and hypochromic), suggesting iron deficiency anemia even though other clinical symptoms may not have developed yet.

Iron tests may be ordered when a person develops signs and symptoms of anemia, such as:

- Chronic fatigue/tiredness
- Dizziness
- Weakness
- Headaches
- Pale skin (pallor)

Iron tests may be ordered when iron overload is suspected. Signs and symptoms of iron overload will vary from person to person and tend to worsen over time. They are due to iron accumulation in the blood and tissues. These may include:

- Joint pain
- Fatigue, weakness
- Lack of energy
- Abdominal pain
- Loss of sex drive
- Organ damage, such as in the heart and/or liver

When a child is suspected to have ingested an excessive amount of iron tablets, a [serum iron test](#) ([/help/patient-test-info/iron](#)), is ordered to detect and help assess the severity of the poisoning.

What does the test result mean?

A summary of the changes in iron tests seen in various diseases of iron status is shown in the table below.

Disease	Iron (/help/patient-test-info/iron)	TIBC/Transferrin (/help/patient-test-info/transferrin-and-iron-binding-capacity-tibc-uibc)	UIBC (/help/patient-test-info/transferrin-and-iron-binding-capacity-tibc-uibc)	% Transferrin Saturation (/help/patient-test-info/transferrin-and-iron-binding-capacity-tibc-uibc)	Ferritin (/help/patient-test-info/ferritin)
Iron Deficiency	Low	High	High	Low	Low
Hemochromatosis/Hemosiderosis	High	Low	Low	High	High

Chronic Illness	Low	Low/Normal	Low/Normal	Low/Normal	Normal/High
Hemolytic Anemia	High	Normal/Low	Low/Normal	High	High
Sideroblastic Anemia	Normal/High	Normal/Low	Low/Normal	High	High
Iron Poisoning	High	Normal	Low	High	Normal

Iron deficiency

The early stage of iron deficiency is the slow depletion of iron stores. This means there is still enough iron to make red cells, but the stores are being used up without adequate replacement. The serum iron level may be normal in this stage, but the ferritin level will be low.

As iron deficiency continues, all the stored iron is used and the body tries to compensate by producing more transferrin to increase iron transport. The serum iron level continues to decrease and transferrin and TIBC and UIBC increase. As this stage progresses, fewer and smaller red blood cells are produced, eventually resulting in iron deficiency anemia.

Iron overload

If the iron level is high, the TIBC, UIBC and ferritin are normal and the person has a clinical history consistent with iron overdose, then it is likely that the person has iron poisoning. Iron poisoning occurs when a large dose of iron is taken all at once or over a short period of time. Iron poisoning in children is almost always acute, occurring in children who ingest their parents' iron supplements. In some cases, acute iron poisoning can be fatal.

A person who has mutations in the *HFE* gene is diagnosed with hereditary hemochromatosis. However, while many people who have hemochromatosis will have no symptoms for their entire life, others will start to develop symptoms such as joint pain, abdominal pain, and weakness in their 30's or 40's. Men are affected more often than women because women lose blood during their reproductive years through menstruation.

Iron overload may also occur in people who have hemosiderosis and in those who have had repeated transfusions. This may occur with sickle cell anemia, thalassemia major, or other forms of anemia. The iron from each transfused unit of blood stays in the body, eventually causing a large buildup in the tissues. Some people with alcoholism and with chronic liver disease also develop iron overload.

Do all people with iron deficiency have anemia? What are the symptoms?

Iron deficiency refers to a decrease in the amount of iron stored in the body, while iron deficiency anemia refers to a drop in the number of [red blood cells \(RBCs\)](#) ([/help/patient-test-info/red-blood-cell-count-rbc](#)), [hemoglobin](#) ([/help/patient-test-info/hemoglobin](#)) and [hematocrit](#) ([/help/patient-test-info/hematocrit](#)), caused by not having enough stored iron (there are many other causes of anemia). It typically takes several weeks after iron stores are depleted for the level of hemoglobin and production of RBCs to be affected and for anemia to develop. There usually are few symptoms early in iron deficiency, but as the condition worsens and blood levels of hemoglobin and RBCs decrease, then ongoing weakness and fatigue can eventually develop.

As your iron continues to be depleted, you may have shortness of breath and dizziness. If the anemia is severe, chest pain, headaches, and leg pains may occur. Children may develop learning (cognitive) disabilities. Besides the general symptoms of anemia, there are certain symptoms that are characteristic of iron deficiency. These include dysphagia, pica (cravings for specific substances, such as ice, corn starch, licorice, chalk, dirt, or clay), a burning sensation in the tongue or a smooth tongue, sores at the corners of the mouth, and spoon-shaped fingernails and toenails.

What are some other tests that might be done to detect iron deficiency or iron overload?

Several other tests can also be used to help recognize problems with iron status.

- [Hemoglobin](#) ([/help/patient-test-info/hemoglobin](#)) and [hematocrit](#) ([/help/patient-test-info/hematocrit](#)), are tests that are performed as part of a [complete blood count \(CBC\)](#) ([/help/patient-test-info/complete-blood-count-cbc](#)). A low value for either test indicates that a person has anemia. Iron deficiency is a very common cause of anemia. The average size of red cells (Mean Corpuscular Volume or MCV) and the average amount of hemoglobin in red cells (Mean Corpuscular Hemoglobin or MCH) are also measured in a CBC. In iron deficiency, insufficient hemoglobin is made, causing the red blood cells to be smaller than normal. Both MCV and MCH are low. In addition, the hemoglobin concentration in red cells (Mean Corpuscular Hemoglobin Concentration or MCHC) is decreased; the red cells in iron deficiency anemia look much paler than normal ones.
- [Soluble transferrin receptor \(sTfR\)](#) ([/help/patient-test-info/soluble-transferrin-receptor](#)). This test may be used to detect iron deficiency anemia and distinguish it from anemia caused by chronic illness or inflammation. In patients with iron deficiency, the sTfR level is elevated.
- [Zinc Protoporphyrin \(ZPP\)](#) ([/help/patient-test-info/zinc-protoporphyrin](#)). The amount of zinc protoporphyrin in red cells is increased in iron deficiency. ZPP is sometimes used as a screening test in children and teens. However, the test is not specific for iron deficiency; thus, elevated values must be confirmed by other tests.
- *HFE* gene test. Hemochromatosis is a genetic disease, found primarily in Caucasians, that causes the body to absorb too much iron. It is usually due to an inherited mutation in the *HFE* gene that affects the amount of iron absorbed from the digestive tract. The *HFE* gene test determines whether a person has the mutations that cause the disease. Read the article on Hemochromatosis to learn more.

What are some causes of anemia besides iron deficiency?

There are many different conditions that can cause anemia other than iron deficiency. Some examples include vitamin B12 and folic acid deficiencies, cancer (e.g., leukemia, lymphoma, myelodysplastic syndrome), chronic infection or inflammation, and genetic disorders such as sickle cell disease and thalassemia. However, iron deficiency is a very common cause, which is why iron tests are so frequently performed. If iron tests rule out iron deficiency, another source for the anemia must be found. Read the article on Anemia to learn more.

What foods contain the most iron?

Heme iron is the easiest form of iron for the body to absorb. It is found in meats and eggs. Non-heme iron is found in a wide variety of plants and in iron supplements. Iron-rich sources include green leafy vegetables such as spinach, collard greens, and kale, wheat germ, whole grain breads and cereals, raisins, and molasses. If you have been diagnosed with iron deficiency anemia or you are pregnant or breast feeding, vitamin pills or tablets may be needed to provide extra iron. Ask your healthcare practitioner about the right supplement for you.

Who needs iron supplements?

The people who typically need iron supplements are pregnant women and those with documented iron deficiency. People should not take iron supplements before talking to their healthcare practitioner as excess iron can cause chronic iron overload. An overdose of iron pills can be toxic, especially to children.

Is there anything else I should know?

Recent consumption of iron-rich foods or iron supplements can affect test results, as can recent blood transfusions.

Normal iron levels are maintained by a balance between the amount of iron taken into the body and the amount of iron lost. Normally, a small amount of iron is lost each day, so if too little iron is taken in, a deficiency will eventually develop. Unless a person has a poor diet, there is usually enough iron to prevent iron deficiency and/or iron deficiency anemia in healthy people.

In certain situations, there is an increased need for iron. Persons with chronic bleeding from the digestive tract (usually from ulcers or tumors such as colorectal cancer) or women with heavy menstrual periods will lose more iron than normal and can develop iron deficiency. Women who are pregnant or breast feeding lose iron to their baby and can develop iron deficiency if not enough extra iron is taken in. Children, especially during times of rapid growth, may need extra iron and can develop iron deficiency. Iron deficiency can also be seen in malabsorption diseases such as celiac disease.

Low [serum iron \(/help/patient-test-info/iron\)](/help/patient-test-info/iron) can also occur in states where the body cannot mobilize and use storage iron properly. In many chronic inflammatory conditions, especially in cancers, autoimmune diseases, and with chronic inflammations or chronic infections (including AIDS), the body cannot properly use iron to make more red cells. Under these conditions, production of [transferrin \(/help/patient-test-info/transferrin-and-iron-binding-capacity-tIBC-uIBC\)](/help/patient-test-info/transferrin-and-iron-binding-capacity-tIBC-uIBC) decreases, and serum iron is low because little iron is being absorbed from the gut and storage iron can't get mobilized, and [ferritin \(/help/patient-test-info/ferritin\)](/help/patient-test-info/ferritin) increases.

Related Content

- Articles
- Related Conditions
 - Hemochromatosis
- Elsewhere on the Web
 - [American Society of Hematology: Anemia \(http://www.hematology.org/Patients/Anemia/\)](http://www.hematology.org/Patients/Anemia/)
 - [MedlinePlus: Iron Deficiency Anemia \(https://medlineplus.gov/ency/article/000584.htm\)](https://medlineplus.gov/ency/article/000584.htm)
 - [KidsHealth: Iron \(http://kidshealth.org/en/parents/iron.html\)](http://kidshealth.org/en/parents/iron.html)
 - [NIH Office of Dietary Supplements: Iron \(https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/\)](https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/)
 - [National Heart, Lung and Blood Institute: Iron Deficiency Anemia \(https://www.nhlbi.nih.gov/health-topics/iron-deficiency-anemia\)](https://www.nhlbi.nih.gov/health-topics/iron-deficiency-anemia)
 - [National Heart, Lung and Blood Institute: Hemochromatosis \(https://www.nhlbi.nih.gov/health-topics/hemochromatosis\)](https://www.nhlbi.nih.gov/health-topics/hemochromatosis)
 - [National Institute of Diabetes and Digestive and Kidney Diseases: Hemochromatosis \(https://www.niddk.nih.gov/health-information/health-topics/liver-disease/hemochromatosis/Pages/facts.aspx\)](https://www.niddk.nih.gov/health-information/health-topics/liver-disease/hemochromatosis/Pages/facts.aspx)
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 - [Iron \(/help/patient-test-info/iron\)](/help/patient-test-info/iron)
 - [Ferritin \(/help/patient-test-info/ferritin\)](/help/patient-test-info/ferritin)
 - [Transferrin and Iron-binding Capacity \(TIBC, UIBC\) \(/help/patient-test-info/transferrin-and-iron-binding-capacity-tIBC-uIBC\)](/help/patient-test-info/transferrin-and-iron-binding-capacity-tIBC-uIBC)
 - [Zinc Protoporphyrin \(/help/patient-test-info/zinc-protoporphyrin\)](/help/patient-test-info/zinc-protoporphyrin)
 - [Complete Blood Count \(CBC\) \(/help/patient-test-info/complete-blood-count-cbc\)](/help/patient-test-info/complete-blood-count-cbc)

- [Hemoglobin \(/help/patient-test-info/hemoglobin\)](/help/patient-test-info/hemoglobin).
- [Hematocrit \(/help/patient-test-info/hematocrit\)](/help/patient-test-info/hematocrit).
- [Reticulocytes \(/help/patient-test-info/reticulocytes\)](/help/patient-test-info/reticulocytes).
- [Soluble Transferrin Receptor \(/help/patient-test-info/soluble-transferrin-receptor\)](/help/patient-test-info/soluble-transferrin-receptor).

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