MAYO CLINIC LABORATORIES

Test Definition: SFEC

Iron and Total Iron-Binding Capacity, Serum

Overview

Useful For

Screening for chronic iron overload diseases, particularly hereditary hemochromatosis

Screening for iron deficiency as the cause of anemia

Monitoring treatment for iron deficiency anemia

This test **should not be used** as the primary test for iron deficiency.

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
IRON	Iron	No	Yes
TIBC	Total Iron Binding Capacity	No	Yes
SAT	Percent Saturation	No	Yes

Testing Algorithm

For more information see Hereditary Hemochromatosis Algorithm.

Special Instructions

- Hereditary Hemochromatosis Algorithm

Method Name

IRON: Colorimetric Assay

TIBC: Turbidity/Calculation

SAT: Calculation

NY State Available

Yes

Specimen

Specimen Type

Serum

Ordering Guidance

The recommended primary test for assessment of iron deficiency is serum ferritin. Order FERR1 / Ferritin, Serum.

Additional Testing Requirements

Although measurement of serum iron, total iron-binding capacity, and percent saturation should not be used as primary testing for iron deficiency, they may be helpful when used in conjunction with ferritin and soluble transferrin receptor, especially in patients with inflammation. Order both FERR1 / Ferritin, Serum; and STFR1 / sTfR (Soluble Transferrin Receptor), Serum with this test.

Specimen Required

Patient Preparation:

1. Fasting: 8 hours, preferred but not required
2. For 24 hours before collection, patient **should not** take iron-containing supplements.

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)

Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Submission Container/Tube: Plastic vial

Specimen Volume: 1 mL

Collection Instructions:

1. Draw blood before noon (preferred).
2. Within 2 hours of collection, serum gel tubes should be centrifuged.
3. Within 2 hours of collection, red-top tubes should be centrifuged, and the serum aliquoted into a plastic vial.

Forms

If not ordering electronically, complete, print, and send 1 of the following forms with the specimen:

-Kidney Transplant Test Request

-Benign Hematology Test Request Form (T755)

Specimen Minimum Volume

0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	7 days	
	Frozen	180 days	

Clinical & Interpretive

Clinical Information

Transferrin is the plasma iron transport protein that binds iron strongly to keep iron nonreactive in circulation and deliver it to cells with transferrin receptors. The rate of transferrin synthesis in the liver can be altered according to the body's iron requirements and iron reserves. The circulating concentration increases in response to iron deficiency and decreases in response to iron overload. Transferrin is generally only 25% to 30% saturated with iron. Total iron-binding capacity (TIBC) is estimated from the transferrin concentration using the molecular weight of transferrin, accounting for each transferrin molecule that can bind 2 atoms of iron.

Iron deficiency, iron overload, and anemia of chronic disease are the most prevalent disorders of iron metabolism. Serum iron, TIBC, and percent saturation are widely used for the diagnosis of iron deficiency and iron overload disorders, such as hemochromatosis. Iron concentration and percent saturation decrease with iron deficiency and increase when iron is in excess. However, serum ferritin is a much more sensitive and reliable test for demonstration of iron deficiency.

Anemia of chronic disease is often observed in patients with autoimmune diseases, chronic kidney diseases, inflammatory bowel disease, and chronic heart failure. It is diagnosed when serum iron concentrations are low despite normal serum ferritin concentrations indicating adequate iron stores. However, in the presence of inflammation, ferritin can mask iron deficiency; therefore, measuring soluble transferrin receptors is suggested.

The biologic variation of iron and, therefore, iron saturation is notable in normal healthy persons and in various clinical disorders owing to both diurnal variation and post-prandial effects. The intraindividual day-to-day variation of iron and iron saturation is approximately 25% to 30%.(1) Recommendations for blood sampling for iron and iron saturation measurements are contradictory, however; minimizing influence of these effects can be accomplished by collecting during the morning after an overnight fast.

Reference Values

IRON
Males: 50-150 mcg/dL
Females: 35-145 mcg/dL

TOTAL IRON-BINDING CAPACITY
250-400 mcg/dL

PERCENT SATURATION
14-50%

Interpretation

Serum iron concentration is elevated in iron overload conditions including hemochromatosis.(1)

Serum iron concentration is decreased in iron deficiency, iron deficiency anemia, and anemia of chronic disease.(1)

Total iron-binding capacity values are elevated in anemia of chronic disease and iron overload conditions.(1)

Total iron-binding capacity values are decreased in iron deficiency, iron deficiency anemia, and iron-refractory iron deficiency anemia.(1)

Percent saturation often exceeds 45% in hereditary hemochromatosis and 90% in advanced iron overload states.(2)

Percent saturation less than 16% is generally used to screen for iron deficiency, but a threshold of 20% is used in the presence of inflammation.(3)

For more information about hereditary hemochromatosis testing, see Hereditary Hemochromatosis Algorithm.

Cautions

Serum iron, total iron-binding capacity, and percent saturation are widely used for the diagnosis of iron deficiency. However, serum ferritin is a much more sensitive and reliable test for demonstration of iron deficiency.

Measurement of serum iron, total iron-binding capacity, and percent saturation should not be used as the primary test for iron deficiency. It may be helpful in conjunction with ferritin and soluble transferrin receptor, especially in patients with inflammation.

Clinical Reference

1. Swinkels DW. Iron metabolism. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:chap 40
2. Kowdley KV, Brown KE, Ahn J, Sundaram V. ACG Clinical Guideline: Hereditary Hemochromatosis [published correction appears in Am J Gastroenterol. 2019 Dec;114(12):1927. doi:10.14309/ajg.0000000000000469]. Am J Gastroenterol. 2019;114(8):1202-1218. doi:10.14309/ajg.0000000000000315
3. Lopez A, Cacoub P, Macdougall IC, Peyrin-Biroulet L. Iron deficiency anaemia. Lancet. 2016;387(10021):907-916. doi:10.1016/S0140-6736(15)60865-0

Performance

Method Description

Iron:
Under acidic conditions, iron is liberated from transferrin. Lipemic samples are clarified by the detergent. Ascorbate reduces the released Fe(3+) ions to Fe(2+) ions which then react with FerroZine to form a colored complex. The color intensity is directly proportional to the iron concentration and can be measured photometrically.(Package insert: IRON2. Roche Diagnostics; V9, 09/2019)

Transferrin:
Human transferrin forms a precipitate with a specific antiserum, which is determined turbidimetrically.(Package insert:TRSF2 reagent. Roche Diagnostics; v10.0, 04/2022)

Calculations:
Total iron-binding capacity (TIBC) = Transferrin x 1.18
Percent saturation = (Iron/TIBC) x 100

PDF Report

No

Day(s) Performed

Monday through Sunday

Test Definition: SFEC

Iron and Total Iron-Binding Capacity, Serum

Report Available
Same day/1 to 2 days

Specimen Retention Time
7 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information
83540-Iron
83550-Iron-binding capacity

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
SFEC	Iron and Total Fe Binding Cap, S	50190-8

Result ID	Test Result Name	Result LOINC® Value
SAT	Percent Saturation	2502-3
IRON	Iron	2498-4
TIBC	Total Iron Binding Capacity	2500-7