



GENERAL HEALTH TESTING

Iron, Ferritin, Transferrin, TIBC Information Sheet

What is Iron?

Iron is a mineral with several essential functions in the body. It is required to transport oxygen around the body and is also essential for growth, normal cell function, and the production of connective tissue and some hormones (1).

Ferritin, Transferrin, TIBC

Approximately 25% of the iron in a normal adult is present in a storage form, with the most common form being ferritin (accounting for about 2/3 of storage iron) (2). Ferritin analyses provide a sensitive, specific, and reliable measurement for determining iron deficiency at an early stage (3), and are also useful for monitoring the reaccumulation of iron stores in iron-deficient individuals who are taking iron supplements.

Transferrin is the main protein that binds to and transports iron around the body. Transferrin saturation is an estimate of how many of the transferrin iron-binding sites are occupied by iron (1).

Total iron binding capacity (TIBC) refers to the total amount of iron that can be bound by proteins in the blood. Transferrin is the primary iron-binding protein; hence the TIBC measurement is a good indirect measurement of transferrin availability. However, TIBC and transferrin are not synonymous (4).

Healthy levels

Iron (5):

- 65 – 175 µg/dL for males
- 50 – 170 µg/dL for females

Ferritin (6):

- 40 – 300 ng/mL for males
- 20 – 200 ng/mL for females

Below 10 ng/mL indicates iron deficiency anemia, while above 300 ng/mL may indicate iron overload.

Transferrin (7):

- 174 – 364 mg/dL for adult males aged 14 – 60 years
- 180 – 382 mg/dL for adult females aged 14 – 60 years

Healthy transferrin levels are slightly lower over 60 years.

Average transferrin saturation is 25%, with a normal range of 14 – 50%. Below 10% indicates severe iron deficiency (8), and above 50% indicates iron overload (9).

Normal TIBC values are 240 – 450 µg/dL (4). High TIBC indicates low iron supplies. Low TIBC can indicate hemolytic anemia, hypoproteinemia, inflammation, liver disease, malnutrition, or sickle cell anemia (10).

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What are the signs of iron deficiency?

Low iron levels inhibit the production of hemoglobin, resulting in reduced red blood cells and a condition called anemia, which affects an estimated two billion people around the globe (11). Symptoms include:

- Tiredness
- Fatigue
- Pale skin
- Shortness of breath
- Headaches
- Dizziness

If left untreated, anemia can have serious repercussions, including impaired cognitive function, disturbances in the digestive system, and impaired immunity. Pregnant women, young children and frequent blood donors have an increased risk of iron deficiency (6).

What are the signs of excess iron?

Increased iron concentrations occur in hemochromatosis and acute liver disease (12). Excess iron cannot be naturally excreted from the body, so it accumulates in organs and tissues, eventually causing serious health complications. The symptoms of iron overload include:

- Fatigue
- Joint pain
- Abdominal pain
- Memory problems
- Depression
- Decreased sex drive
- Shortness of breath
- Heart flutters

Further serious complications can occur in untreated individuals, including heart failure, liver cirrhosis and disease, and endocrine problems (13).

References:

- (1) Bothwell TH, et al. (1989). Nutritional iron requirements and food iron absorption. *J Int Med.* 226(5), 357-365.
- (2) Skikne BS, Cook JD. (1981). Serum Ferritin in the Evaluation of Iron Status. *Lab Management.* 19, 31-35.
- (3) Bates HM. (1980). How to Detect Iron Deficiency Before Anemia Develops. *Laboratory Pathfinder.* 17-22.
- (4) Faruqi A and Mukkamalla SKR. (2020). Iron Binding Capacity. *StatPearls [Internet]. Treasure Island (FL).*
- (5) Tietz NW (2006). *Clinical Guide to Laboratory Tests*, 4th ed. St. Louis, MO: Elsevier Saunders: 634-635.
- (6) Camaschella C. (2015) Iron-deficiency anemia. *N Engl J Med.* 372(19):1832-43.
- (7) Ritchie RF, et al. (1999). Reference distributions for the negative acute-phase serum proteins, albumin, transferrin and transthyretin: a practical, simple and clinically relevant approach in a large cohort. *J Clin Lab Anal.* 13(6):273-9.
- (8) Bermejo F, García-López S. (2009). A guide to diagnosis of iron deficiency and iron deficiency anemia in digestive diseases. *World J Gastroenterol.* 15(37), 4638-4643.
- (9) Mainous AG, Gill JM, Carek PJ. (2004). Elevated Serum Transferrin and Mortality. *Ann Fam Med.* 2(2), 133-138.
- (10) Brittenham GM. (2018). Disorders of iron homeostasis: iron deficiency and overload. In: Hoffman R, et al, eds. *Hematology: Basic Principles and Practice.* 7th ed. Philadelphia, PA: Elsevier
- (11) Zimmermann MB and Hurrell RF. (2007). Nutritional iron deficiency. *The Lancet.* 370(9586), 511-520.
- (12) Witte DL, et al. (1996). Hereditary hemochromatosis. *Clinica Chimica Acta.* 245(2), 139-200.
- (13) Beutler E, Felitti V, Gelbart T, Ho N. (2001) Genetics of Iron Storage and Hemochromatosis. *Drug Metab Dispos.* 29(4):495-499.

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