

IRON DEFICIENCY

Iron is the most abundant element on earth, but iron deficiency is the world's most common nutrient deficiency

Symptoms of iron deficiency may include some of the following:

- **Fatigue**
- **Shortness of breath** or low exercise tolerance
- **Weak/brittle fingernails**
- **Pale fingernail beds, conjunctiva, face**
- **Feeling chilly/cold intolerance**
- Heavy periods (women)
- Low-level anxiety
- *May* contribute to symptoms of depression
- **Palpitations or fluttering in the chest, arrhythmia, heart racing**
- Brain fog or headaches, difficulty concentrating
- Behavioural problems in children
- *May* contribute to sleeping problems
- Tinnitus
- **Easy bleeding/bruising**
- **Restless legs** syndrome/nocturnal cramping/twitching
- **Dizziness/low blood pressure**
- **Hair loss**
- Inflammation of the tongue
- Pica (desire to eat ice, sand/dirt)
- Spoon nails
- Poor appetite
- Rapid breathing

Who is most at risk for iron deficiency?

Adolescents
Women with heavy or prolonged menstruation
High-performance athletes
Vegetarian or vegans
Those with eating disorders and/or underweight

Why is it so important?

Many people feel tired. When we are tired, we cannot do all the things that we want to

do or make the changes that we'd like to make. We don't make the best choices when we are low in energy.

Low iron can also lead to anxiety, which is an energized state which, when maintained for prolonged periods of time, can contribute further to fatigue.

Whatever the cause, fatigue can be kind of depressing. Thus, it is essential to properly assess iron when we are trying to understand mild to moderate anxiety and depression.

In the western world, low iron is most commonly caused by:

- Decreased ingestion (e.g. vegan)
- Impaired absorption (e.g. drugs such as antacids, ulcers, celiac disease)
- Loss (e.g. gastrointestinal, hemolysis)
- Increased requirements (e.g. pregnancy and rapid growth in children)
- *Less common but still worth mentioning* - parasites and intestinal infections may directly or indirectly contribute to deficiencies

Are you low in iron?

Evaluation of Iron Status

- Hemoglobin is not enough! It will not be affected in the early stages of iron deficiency
- The normal range for ferritin (the biomarker used in the evaluation of iron storage) is approx 5-272 ng/ml is arguably far too wide (i.e. it includes iron-deficient individuals in the "normal" range).
- Ferritin may be "falsely elevated" in inflamed persons (it is an "acute phase reactant") so results must be evaluated in the context of other laboratory markers and clinical signs, symptoms
- Transferrin (and Transferrin Saturation) are critical for a more thorough evaluation of your iron status. If you don't test all of these *in light of clinical signs and symptoms* a deficiency may be missed.

The Analogy

Iron = Cash
Transferrin = Brinks Trucks
Transferrin Saturation = How "full" are the Brinks Trucks
Ferritin = Long-term Savings

Serum Iron

- The amount of iron ("cash") in your wallet (just a snapshot of your short term iron "wealth")
- Goes up and down fairly quickly (cash burns a hole in your wallet)

Transferrin

- A protein that delivers the "cash" to your tissues
 - The Brinks Trucks

Transferrin Saturation

- How full are the Brinks trucks that carry the "cash" (iron)?
- Normally 20–40% full
 - Lower if
 - there is less Iron ("cash") to deliver
 - Higher if
 - you have a lot of iron or
 - you have too few Brinks trucks
 - are inflamed

Ferritin

- Your long-term savings of iron
- Not easily dispensable like cash
 - *"Falsely" elevated in inflammatory states!!!*
- In light of signs and symptoms, typically a level of 80 ng/ml is desired, *especially in cases of inflammation* (e.g. elevated ESR, CRP)

**YOU CANNOT THOROUGHLY ASSESS IRON STATUS
WITH HEMOGLOBIN ALONE.**

More about iron ...

- The absorption of iron is tightly controlled -- too much iron can cause physiological damage to the body

- Iron is critical for red blood cells and more than 180 biochemical reactions in the human body, but it is also an indispensable nutrient for many disease-causing germs and microbes and can lead to damaging oxidative stress. Thus, proper assessment is key.
- A typical European or Western diet may provide about 15 mg per day, of which only 10% is absorbed
- Iron absorption is the result of complex mechanisms that take place in the upper parts of the gut

REFERENCES:

1. Muñoz M, Gómez-Ramírez S, Besser M, et al. Current misconceptions in diagnosis and management of iron deficiency. *Blood Transfus.* 2017;15(5):422–437. doi:10.2450/2017.0113-17.
2. Waldvogel-Abramowski S, Waeber G, Gassner C, et al. Physiology of iron metabolism. *Transfus Med Hemother.* 2014;41(3):213–221. doi:10.1159/000362888
3. Dev S, Babitt JL. Overview of iron metabolism in health and disease. *Hemodial Int.* 2017;21 Suppl 1(Suppl 1):S6–S20. doi:10.1111/hdi.12542
4. Clénin GE. The treatment of iron deficiency without anaemia (in otherwise healthy persons). *Swiss Med Wkly.* 2017;147:w14434. Published 2017 Jun 14. doi:10.4414/smw.2017.14434