KRESSER INSTITUTE FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

Nutrients to Be Cautious of Supplementing With – Part 1

Hey, everybody. In this presentation, we're going to talk about supplementation, in particular nutrients to be cautious with.

Iron is a part of several enzymes and proteins in the body, and it's found in foods as both heme and nonheme iron. Heme iron comes from hemoglobin and myoglobin in meat, poultry, and fish. Despite being only 10 to 15 percent of the iron found in food, it makes up more than one-third of what we absorb.

Nonheme iron is found in plants, dairy products, and in some meats. Unlike heme iron, nonheme iron absorption is significantly influenced by food components in the same meal. We discussed this at great length in the blood chemistry unit in this course. These things include enhancers such as vitamin C and other acids as well as sources of heme iron and inhibitors such as phytic acid, polyphenols, and soy protein.

8mg	18mg	27mg
Recommended **daily allowance for iron**	Recommended for **menstruating females**	Recommended for **pregnant women**

The recommended daily allowance for iron is 8 mg, except for in menstruating females, who need to get 18 mg, or pregnant women, who need to get 27 mg.

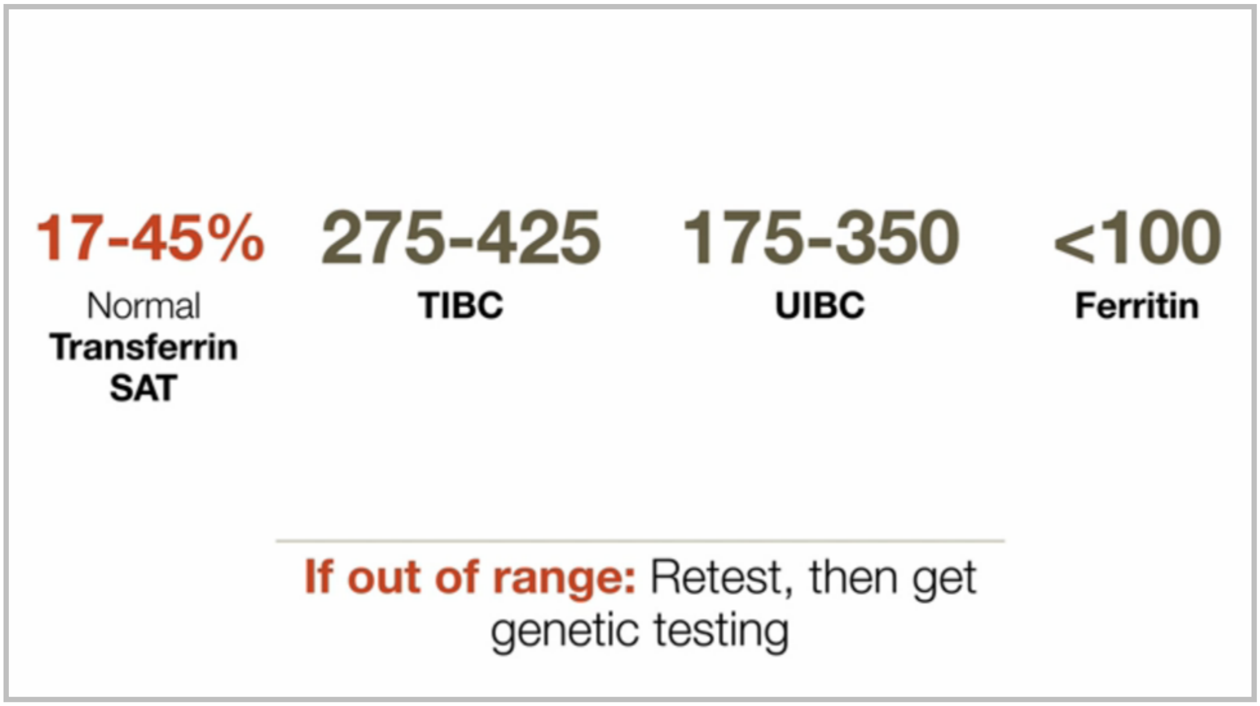
While iron is clearly an important nutrient, it is also essential to make sure a patient doesn't get too much of it. Hemochromatosis is a genetic disorder that causes aggressive iron storage and iron overload. It is associated with a broad range of adverse effects and health conditions such as liver disease, diabetes, metabolic syndrome, cardiovascular disease, Alzheimer's dementia, Parkinson's and other neurodegenerative disorders, impotence, infertility, and hypogonadism.

Liver disease	Asthma	Epilepsy
Diabetes	IBD	Restless leg syndrome
Metabolic Syndrome	Lupus	Osteoporosis
CVD	Macular degeneration	Rheumatoid arthritis
Alzheimer's	Psoriasis	Osteoarthritis
Dementia	Gout	Hearing loss
Parkinson's & other neurodegenerative disorders	Lung disease	SIDS
	Cancer	Infections of all types
Impotence	Hypothyroidism	
Infertility	Hypoparathyroidism	
Hypogonadism	Splenomegaly	

As you can see on this slide, the list is very long. It's because iron is a pro-oxidant. It causes oxidative stress, and it literally leads to the organs and tissues in our body rusting. Another example of oxidative stress would be when you take a bite out of an apple, and you leave it out on the table, it turns brown. That's exactly what happens inside of our body when we have too much iron.

A lesser known fact, though, is that even mild iron overload where iron levels are still in the upper end of the typical reference range can cause increased morbidity and mortality. For example, the range for iron saturation in the U.S. typically goes up to about 55 percent, but studies show that increased mortality happens as iron saturation climbs above 50 percent. Likewise, many of the lab ranges for ferritin in men go up to about 400 in the U.S. and in other parts of the industrialized world, but studies suggest that you see an increase in blood sugar and an increase in morbidity and mortality in men as ferritin climbs above 150 or 200. These are people who don't necessarily have hereditary hemochromatosis, or perhaps they are a carrier for hemochromatosis. Even though in the sort of conventional paradigm, carriers are not considered to be at risk for higher iron levels, there is a lot of research that contradicts that and suggests that carriers not only are at risk but often do have higher iron levels and higher risk of several diseases.

Iron overload is significantly associated in particular with impaired insulin sensitivity and glucose tolerance. If your patient has high blood sugar, you should definitely screen him for iron overload. Iron reduces insulin synthesis and secretion. It decreases insulin sensitivity in the liver, and iron deposits in the liver can decrease glucose uptake.



I've listed my optimal ranges for the various iron indices on this slide here, and these are different than the standard laboratory reference range. They're based on the recommendations from the Iron Disorders Institute, which is a group that advocates for greater understanding of the effects of both iron overload and iron deficiency. It has done exhaustive research in the literature, and it has suggested ranges based on that research and based on optimal levels to avoid increased risk of disease and mortality. So for iron or transferrin saturation, it would be 17 to 45 percent. The lab range is typically more like 15 to 55 percent. For TIBC, total iron binding capacity, 275 to 435, and the range is usually 250 to 450. For UIBC, unsaturated iron binding capacity, it would be 175 to 350. The typical lab range is 150 to 375. For ferritin, the Iron Disorders Institute recommends a very narrow range of perhaps 25 to 75. I think that might be a little overly aggressive, in fact. I'm not convinced that ferritin levels below 100 are problematic in men, and for women, a range of under 100 may be optimal, particularly postmenopausal women, but I would say less than 100 certainly is a conservative target so that you'll be catching a broader number of people who may have iron overload. It doesn't mean that if their ferritin is under 100 it is automatically a problem. You have to look at the other markers and interpret them all in the context together.

If you see a patient with metabolic disease, diabetes, metabolic syndrome, liver abnormalities, weakness, lethargy, or skin hyperpigmentation, and he has iron levels that are outside of these ranges that are above the ranges—and remember TIBC and UIBC are inverse markers, so low levels of these mean high iron—then you should be thinking about hemochromatosis or iron overload. You should either do additional testing yourself or refer out for additional testing if that's not within your scope of practice.

Treatment for iron overload is typically either blood donation or prescription phlebotomy, so it's the same. Phlebotomy is the removal of blood, typically a unit of blood at one time. It's the same when you donate blood or get a prescription for phlebotomy. There is also a substance called apolactoferrin. It's a natural protein that can help remove iron from tissues in the body, iron that is already stored in the body. The dosage there would be 300 mg of lactoferrin one to two times a day on an empty stomach. Note that things such as IP6, phytate, and phytic acid, while they inhibit the absorption of iron, they can't actually remove iron that is already stored in the body. As far as we know, apolactoferrin is the only natural substance that can do that. There are other prescription pharmaceutical chelators, but they are much more dangerous, and they're typically reserved for people who have iron overload but also have severe anemia.

Patients with hemochromatosis should not take supplements that contain iron. Unfortunately, you'll often see people with iron overload who weren't aware that they had it who are taking iron supplements. They may also need to avoid foods that are very high in iron. If you look at the chart here, you'll see that the biggest offenders, or in the case of iron deficiency the most beneficial foods, are shellfish and organ meats.

Food	**Iron** (per 100g)
Clam	28 mg
Chicken liver	13 mg
Oyster	12 mg
Octopus	10 mg
Beef liver	7 mg
Venison	5 mg
Mussel	4 mg
Beef chuck	4 mg
Bison, ground	3 mg

Clams have a whopping 28 mg of iron per 100 g serving. Chicken liver is next with 13 mg. Then you have oysters at 12 mg, octopus 10 mg, beef liver 7 mg, and then venison, mussel, beef chuck, and ground bison, all between 3 and 5 mg. What I've found is that patients with iron overload definitely need to avoid shellfish and organ meats. Some studies suggest that just standard muscle meat such as beef and bison don't make a huge difference for most people, so we start by telling them to avoid the organ meats and the shellfish. If that's not enough, along with other changes to get their iron levels down, then we have them limit some of these other more iron-rich foods.

I also want to advise patients to cook with ceramic, stainless steel, or glass instead of iron skillets. Patients can actually absorb a significant amount of iron from iron skillets.

Substance	Comments
Alcohol	Limit to 2 drinks/week
Supplemental Vitamin C	Limit to 200 mg between meals
Betaine HCL	Avoid completely
Zinc	Interferes with copper/iron metabolism
Beta-carotene	May increase cancer risk

We also advise them to avoid substances that enhance the absorption of iron. This includes alcohol, so we ask them to limit consumption to two drinks a week or avoid entirely if they can. Supplemental vitamin C, which we limit to 200 mg taken between meals, because if it is taken with a meal, it enhances absorption. Betaine hydrochloric acid, which, of course, many take to improve digestion. You need to avoid that completely because it dramatically increases iron absorption from food when taken with meals. High doses of zinc interfere with copper and iron metabolism. Beta-carotene actually enhances the absorption of iron and may increase cancer risk as a result.

Substance	Comments
Tannins	Tea & coffee (non-heme)
Oxalates	Sweet potato, spinach, etc. (non-heme)
Eggs	Non-heme
Phytic acid	Greens, nuts, etc. (non-heme)
Phosphates	Non-heme
Calcium	Heme and non-heme

On the other hand, we have patients consume substances that inhibit iron absorption, so these include tannins in tea and coffee. These inhibit nonheme iron, plant-based forms of iron. Oxalates, oxalic acid in foods such as sweet potatoes, spinach, etc., also inhibit nonheme iron absorption. Eggs surprisingly inhibit nonheme iron absorption, particularly egg whites. Phytate that is found in dark, leafy greens and nuts inhibits nonheme iron absorption. Phosphates that are in dairy products can inhibit nonheme iron absorption. Calcium is the only substance that we know of in the diet that inhibits both heme iron absorption from animal products and nonheme iron absorption from plants. There have been some recommendations out there that patients with iron overload take calcium supplements at mealtimes to inhibit iron absorption, up to 300 mg per meal. However, I'm not a fan of that recommendation because calcium supplementation now has almost universally been shown to be harmful for both men and women because it can increase the amount of calcium in the soft tissues and increase the risk of heart disease, so I don't think that's a particularly good trade-off, and I think there are other ways, better ways, of limiting iron intake and absorption.