

Aunt Cathy's Guide to:

**Nutrition Support
of Iron Deficiency**



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Iron deficiency can result in poor ability to deliver oxygen to the body, loss of energy, poor ability to concentrate, impaired growth and mental development in children, impaired carnitine production, and many other problems.

Iron deficiency can be quite common and it can be caused by a variety of factors. It may be related to:

- 1. Diets that provide poor amounts of iron** or iron in forms that are poorly absorbed.
- 2. Abnormal iron losses**, such as hemorrhage, heavy menstrual periods, or losses related to childbirth or surgery.
- 3. Conditions that impair iron absorption**, such as Cystic Fibrosis, or intestinal diseases like Crohn's disease or Inflammatory Bowel Disease. "Bariatric" surgery for weight loss is also associated with significant iron deficiency. In many parts of the world, people commonly have severe iron deficiency because of intestinal parasites.
- 4. Conditions that increase requirements**, (such as rapid growth of tissues during pregnancy, infancy or childhood,) can result in inadequacy when the usually adequate intake of iron is not enough to meet all the increased iron needs.

A Cautionary Note:

Iron deficiency is NOT ALWAYS the cause of anemia.

There are conditions in which iron may only appear to be inadequate when a person has a low hemoglobin level in his/her blood that is detected by a laboratory test that measures hemoglobin. A low hemoglobin level can be related to problems that are quite unrelated to inadequate **iron** intake.

It is important to determine the likely cause of what may only look like iron deficiency, because giving more iron will not be helpful and it may actually be harmful. For example, conditions like Sickle Cell Anemia and Thalassemia cause red blood cells to break too easily. Their iron stores may even be generous, but the individual simply can't make new red blood cells fast enough to make up for the broken ones.

Chronic diseases like arthritis, and infections can also result in low hemoglobin measurements that look like iron deficiency anemia in the laboratory but for which inadequate iron is not the problem. This is called "the anemia of chronic disease." Inadequacies of other nutrients like copper can also cause hemoglobin to be low. **Iron deficiency is a common cause of anemia, but if providing generous absorbable iron does not correct it, it will not be helpful to just continue to give more and more iron.**

Detective work is in order in this case.

**Now back to the major focus of this paper:
Solving the problem when iron deficiency IS the problem:**

FOODS THAT ARE GENEROUS SOURCES OF WELL-ABSORBED IRON:

MEATS:

1. "Heme iron" vs "Inorganic iron" issues

Meats of all kinds contain iron in an especially absorbable form called "heme" iron. This is also called "**organic iron.**" Absorption of organic iron is not affected by the presence or absence of certain other substances in foods the way plant iron is. **Iron in this form is about 20% absorbed.**

Twenty percent absorption does not sound very high, but "**inorganic iron**" is much less well absorbed. **Inorganic iron is the kind in plants and in supplements with the word "ferrous" or "ferric" in them.** Ferrous sulfate and ferrous gluconate are examples you will see on most iron supplement labels. **An "organic iron" supplement that contains the well-absorbed "heme" form of iron is available though less commonly used. It is called "heme iron polypeptide."** However, if iron deficiency is not corrected by the usual inorganic iron supplements or diet changes, this can be a very helpful nutritional supplement. It is well absorbed, it does not compete with other substances for absorption, and it is better tolerated by many people than the inorganic iron supplements. The nature of these inorganic iron "tolerance" issues will be discussed below.

Like other nutrients, supplemental or dietary iron does no good at all if it is not absorbed into the bloodstream from the intestines. It just passes right out in the stools. **Ferrous sulfate, a very commonly used iron supplement product, is less than 2% absorbed. Some plant forms of iron in foods like spinach that naturally contain “oxalates” are only 0.025% absorbed!** Spinach is a terrific food to include in your diet for many reasons, but it is NOT a terrific iron source.

Often at the higher doses used to treat anemia, **inorganic iron supplements like ferrous sulfate can cause stools to turn a black color and they may also contribute to constipation.** Neither is an unmanageable problem – the color is not a problem, and the constipation can be addressed a variety of ways with certain helpful foods or by using a laxative.

However, the reality is that people often discontinue taking this form of supplement because of these problems. In fact, when you hear about children being poisoned by iron supplements, it is often because they got into the medicine cabinet and took a handful of the small but high-dose ferrous sulfate pills that some adult quit taking for just these reasons! And of course, no iron supplements will solve an iron deficiency problem if a person doesn't take them.

2. Meat Protein Factor”

In addition to being a generous source of absorbable iron, meat also has a special property of causing increased absorption of iron from the inorganic iron sources in the meal! In other words, the iron in chili beans will be much more easily absorbed if there is meat in the chili. This is called the “Meat Protein Factor” effect. It is not well understood how it works, but it clearly does increase absorption of inorganic iron in other foods and supplements, so it helps to further improve recovery from low iron stores.

3. Meat: Variable AMOUNT of Iron

The total AMOUNT of iron in different kinds of meat varies. Red meat is the highest in absorbable iron. Poultry and fish have much less iron than red meat, but what they have is still a much greater amount than what is found in plant foods, and it also much better absorbed than inorganic iron. Additionally, white meat chicken/turkey has less iron than dark meat. Think of the iron content of meat as “color-coded” ... darkest is highest and lightest is lowest. But all have the “Meat Protein Factor” effect described above, and the form of iron is well absorbed.

Of the different types of meat, liver is an extremely generous source of absorbable iron. This also includes foods made from liver like paté or liverwurst. Not surprisingly, the iron content of blood is high and it is in an absorbable “heme” form, so things like Scandinavian/ German “blood sausage,” and “blood pudding” are rich in iron. This is not a universally popular choice, however.

FOODS THAT INCREASE ABSORPTION OF (INORGANIC) IRON:

Acid

Any acid substance, including vinegar, citric acid and vitamin C (ascorbic acid) can enhance iron absorption from sources of inorganic iron (the form of iron found in pills or plants, like ferrous sulfate.) Because of this, people with iron deficiency are often advised to take their iron supplement or iron fortified cereal with orange juice, or some other acidic beverage. However, the size of the increase in absorption is not as great as many people think, so that intervention alone is not likely to be that helpful.

For example, as noted earlier inorganic iron is generally only about 2% (or less) absorbed, with some forms being much less absorbable than that because of substances in some foods that interfere with absorption. For that reason, the “take with orange juice” effect is a much less important factor affecting iron absorption than the highly absorbable and generous heme iron found in meat (especially red meat.)

As described above, the presence of acid and/or meat will contribute to improved absorption of inorganic iron. Other food substances can significantly impair absorption of inorganic iron but they have minimal effect on absorption of organic iron. For example, the organic iron forms like “heme” iron are about 20% absorbed, which is at least ten times as well absorbed as any inorganic iron. In addition, the per cent of absorption of inorganic iron is much more likely to be negatively affected by other substances in a meal.

FOODS THAT DECREASE ABSORPTION OF (INORGANIC) IRON:

Dairy foods

Dairy foods are notoriously poor sources of iron that also decrease absorption of the iron in plants and pills. That means that taking iron supplements with milk, or putting milk on iron-fortified cereal, or cheese on a sandwich can result in less of the iron present in the pill, cereal or bread being absorbed. This is one of the issues behind the phenomenon of iron deficiency anemia in infants and toddlers who have cow or goat milk in place of mother’s milk or iron fortified formulas. Those who drink quite a lot of milk will be displacing other foods that are good sources of iron, in addition to actually impairing iron absorption. Not surprisingly, this effect is most likely seen in children who do not eat much meat and do not take a multivitamin with minerals. The presence of milk does not impair absorption of the generous organic iron in meat.

Tea

Tea contains “tannins,” a plant substance that binds iron very well in the intestines and significantly reduces its absorbability. This effect is so marked that tea is the one food shown to be interfere with iron absorption enough to be helpful for people who have hemochromatosis, a serious genetic problem of absorbing way too much iron. And, as seen before, it has the most marked effect in decreasing absorption of inorganic iron.

Tea has many other excellent healthful properties, but for the anemic individual it is important to remember that improving iron status is not one of them.

Clinical trial on the effect of regular tea drinking on iron accumulation in genetic hemochromatosis.
“A significant reduction in iron absorption was observed when the test meal was accompanied by drinks of tea instead of water. In the tea drinking group, the increase in storage iron was reduced by about one third compared with that of the control group.” Gut. 1998;43(5):699-704.

Hemochromatosis is dangerous and it is now known to be much more common than previously thought. For information on nutrition factors that can be helpful in this dangerous condition of excessive iron absorption, please see “**Nutrition Support of Hemochromatosis Therapy**” at www.meritcare.com. Other nutrition topics can also be found there. Put my name (Cathy Breedon) in the search box, press enter, and click the line that says “Cathy Breedon’s Handouts.”

Leafy greens

Many foods like spinach contain “**oxalates**” that bind up iron in the intestinal tract and make it too big a molecule to be absorbed well. This is true even though the iron and vitamin C content are generous. Some green plants like broccoli do not have oxalates and so their iron is better absorbed. As noted before, these are extremely nutritious foods ... it is just that the oxalate-containing ones should not to be relied on to solve the problem if a person is iron deficient.

Bran

The bran is the fibrous coating on grains. Bran contains “**phytates**” which impair iron absorption as tannins and oxalates do. For that reason, taking a bowl of iron-fortified bran cereal in milk along with a cup of tea is not the best way to get iron where you want it to go. Some grains naturally contain less phytate than others, but it is still an issue.

Eggs

Interestingly, although in the 1950s egg yolk used to be fed to infants as an iron source, the form of iron in eggs has been found to be poorly absorbed. Eggs are an excellent source of protein (the protein in one egg is like the amount in 1 ounce of meat) and other nutrients as well. The egg white has most of the protein (6 of the 7 grams) and essentially none of the iron at all. Nearly all of the iron is in the yolk.

Iron-fortified foods and enriched grains

Iron “fortification” involves adding inorganic iron to foods that would not usually have iron, such as milk-based infant formulas or similar “nutrition beverages” for adults or children. “Fortified” also can mean that the iron (or another nutrient) was added to achieve a level higher than would naturally be in the food. Total-type cereals are an example: it is fortified to provide **18 mg of iron per cup compared with 4.5 mg iron in a cup of a similar but unfortified whole wheat cereal like regular wheat flakes.**

“Enrichment” means that a nutrient was removed by processing but then it was added back to the level it contained before processing. In America, iron is added back to refined grains. The available iron naturally in the grains is in the “germ” part of the grain that is lost when grains are refined. Unfortunately, we do not add back any other minerals; only iron and three B vitamins are added back (B1, B2 and B3.) That is all ... no magnesium, no chromium, no vitamin E, etc. This is one of the reasons why “**whole grain**” products (containing the germ and bran) are nutritionally superior to enriched grains. In 1998, processed grains products, whole or enriched, began to have the B vitamin “folic acid” added to improve the folic acid status of Americans. This was food “fortification”... a nutrient was added that was not there very much naturally.

The iron content of commercial cereals can be quite variable, depending on the enrichment or fortification of the product. For example, “Quick” iron-fortified cream-of-wheat has over 15 mg of (inorganic) iron per cup, but unfortified cream-of-wheat or oatmeal only has about 2 mg. Foods that have had iron added will indicate that they are fortified or enriched with iron if you check the label. The words “ferrous” or “ferric” in the ingredient list is an indication of iron being added.

The amount of iron contained naturally in some other foods

Legumes like lima beans and peas have 5-6 mg of iron per cup, but vegetables like corn and carrots have only about 1 mg. Prune juice contains quite a lot of iron (over 9 mg per cup compared with about 1 mg per cup of other fruit juices) and it naturally contains some other substances that help one avoid the constipation issues. Absorbability of the iron has not been well studied, however.

Iron and Zinc Content Chart of Food in General

The chart on the next page shows the iron and zinc content of a number of foods and some factors described earlier that affect absorption of both minerals. **As you can see, the foods that are highest in absorbable iron tend to also be high in absorbable zinc, and vice versa.** This is important in anemia because inadequate zinc can also impair the production of red blood cells. Zinc is involved in over 200 processes in the body but it is harder to evaluate with labs than iron is. **Iron deficiency is the most often recognized nutrient deficiency in the USA, but that is in part because it is the one we actually look for by checking hemoglobin levels.** So unless the person is anemic because of blood loss, a person who is found to be iron deficient in an “iron fortified/enriched” world could easily have unrecognized poor zinc status as well.

MeritCare Health Systems

Aunt Cathy's Guide to Nutrition:

Iron and Zinc in Food



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(Data Source: Agriculture Handbook No. 8-4 US Dept. of Agriculture Science & Education Admin.)

<u>Food</u>	<u>Amount</u>	<u>Zinc (mg)</u>	<u>Iron (mg)</u>
Meats			
oysters (eastern)	2 raw	25.5	1.9
oysters (western)	2 raw	4.7	1.5
liver	3 oz.	4.6	6.6
beef	3 oz.	4.0	3.0
crab	1/2 cup	3.5	0.7
lamb	3 oz.	3.5	3.1
turkey	3 oz.	2.5	3.8
pork	3 oz.	2.4	2.7
chicken	3 oz.	2.0	1.0
fish	3 oz.	0.5	1.0
Legumes			
dried beans (cooked)	1/2 cup	1.0	2.2-3.0
split peas (cooked)	1/2 cup	0.9	1.7
Grains*			
fortified cereals	1 cup	1.5-4.0	8.0 (4-18)
wheat germ	2 tablespoons	2.4	1.8
brown rice	1 cup	1.2	0.8
oatmeal	1 cup	1.2	8 if fortified; 1.7 if not
bran flakes	1 cup	1.0	1.3
white rice	1 cup	0.8	1.4
bread, whole wheat	1 slice	0.4	0.8
bread, white	1 slice	0.2	0.6
Nuts and Seeds			
pecans	1/4 cup	2.0	0.6
cashews	1/4 cup	1.8	0.9
sunflower seeds	1 oz.	0.5	1.1
peanut butter	2 tablespoons	0.9	0.6
Milk and Dairy Products*			
cheddar cheese	1 oz.	1.1	0.3
milk	1 cup	0.9	tr
American cheese	1 oz.	0.8	0.2
Fruit			
prune juice	4 oz.	0.3	4.3
dried apricots	1/2 cup	0.4	2.5
prunes	5 med.	0.2	2.0
raisins	1/4 cup	0.2	1.3
Vegetables			
spinach, cooked*	1/2 cup	0.7	2.3
peas	1/2 cup	1.0	1.6
asparagus	2 cup	0.4	1.5

* Phytates in whole grains and bran and oxalates in some leafy greens decrease absorption of iron and zinc.

Consumption of dairy products decreases absorption of iron in that meal.

Tea decreases absorption of iron even from other meals.