

Iron rich foods: A guide for the science-minded parent

<http://www.parentingscience.com/iron-rich-foods.html>

The smart use of iron rich foods

If your child is iron deficient, it makes sense to examine his diet. But boosting iron levels isn't just a matter of eating iron rich foods.

Some foods contain iron, but they also contain compounds that *decrease* the body's ability to *absorb* iron.

For instance, many grains, legumes, and vegetables contain phytates--chemical compounds which bind to iron and then pass through the small intestine unabsorbed.

Eggs and spinach are sometimes touted as good sources of iron. But experiments and laboratory analyses suggest that the iron in these foods is poorly absorbed (Gordon and Chow 1984; Insel et al 2004; Ishikawa et al 2007).

Other foods, like milk, contain calcium, which competes with iron for absorption by the body (Insel et al 2004). As a result, kids who consume lots of milk may be at higher risk of iron deficiency, particularly if their iron rich meals are always accompanied by 40 mg or more of calcium (Gunnarson et al 2007; Hallberg 1998).

There are also foods that enhance iron absorption. Vitamin C and "meat factor" (found in red meat, salmon, and other animal muscle proteins) help the body absorb iron and counteract the effects phytates.

In one study, adding 63 mg of vitamin C to a grain-based, iron rich meal boosted iron absorption by almost 300% (Fidler et al 2009).

Here I list some foods that the USDA nutrient database reports as being high in iron. As you'll note, these include

- Animal muscle tissue foods—shellfish, red meat, poultry, pork, and fish
- Iron-fortified grains (including breakfast cereals)
- Tomatoes
- Legumes
- Green leafy vegetables
- Dried fruits

Elsewhere, I offer [tips for designing meals that promote iron absorption](#). These tips include:

- **consuming iron rich foods in combination with sources of vitamin C (like citrus fruits, peaches, papayas, sweet red peppers, berries, broccoli, and peas)**
- **adding meat to meals rich in iron**
- **avoiding the consumption of high levels of calcium (>40 mg) during meals that are intended to boost iron levels**

You should also try to avoid other iron absorption inhibitors, like tea, coffee, peppermint and chamomile. For more information about enhancing iron absorption, [click here](#).

Iron rich foods: Sources of heme iron

Heme iron is the form of iron most easily absorbed by the body. It is found in animal muscle tissue. Here are some specific examples of heme iron rich foods, as rated by the USDA Nutrient Database.

Food (serving size)	Serving size	Iron content (mg)
Beef, chuck, blade roast, trimmed to 1/8 inch fat	3 oz / 84 g	2.62
Beef, ground, 85% lean, broiled	3 oz / 85 g	2.21
Chicken, dark meat, fried	3 oz / 84 g	1.24
Chicken, light meat, fried	3 oz / 84 g	0.96
Clams, mixed species, canned and drained	3 oz / 85 g	23.77
Crustaceans, shrimp, mixed species, canned	3 oz / 85.05 g	1.81
Fish, cod, Pacific	3 oz / 85 g	0.28
Fish, haddock	3 oz / 85 g	1.15
Fish, pollock	3 oz / 85 g	0.24
Fish, salmon, canned, with bones and liquid	3 oz / 85 g	0.71
Fish, salmon, sockeye	3 oz / 85 g	0.47
Fish, tuna, fresh, yellowfin	3 oz / 85 g	0.80
Fish, tuna, light, canned in water and drained	3 oz / 85 g	1.30
Oysters, wild Eastern, raw	6 medium / 84 g	5.59
Pork, cured ham, lean, roasted	3 oz / 85 g	0.80
Tukey, dark meat, roasted	3 oz / 84 g	1.96
Tukey, light meat, roasted	3 oz / 84 g	1.13
Tukey, ground	1 patty / 82 g	1.58

Iron rich foods: Sources of nonheme iron

Nonheme iron is found in plant foods, as well as in meat and eggs. Compared with heme iron, nonheme iron is less efficiently absorbed. Moreover, many sources of nonheme iron also contain phytates, which greatly reduce bioavailability. If you want to absorb significant quantities of nonheme iron, it's especially important to combine it with vitamin C or meat. Again, see my article on [iron absorption](#) for more information.

Here is a list of nonheme iron rich foods, compiled from the USDA Nutrient Database...

These tables represent only a small sampling of foods.

Food (serving size)	Serving size	Iron content (mg)
Raisins	1 cup / 145 g	2.73
Apricots, dried	10 halves / 35 g	0.93
Bananas, fresh	1 banana / 118 g	0.31
Beans, chickpea (garbanzo)	1 cup, 164 g	4.74
Beans, kidney, canned	1 cup/ 256 g	3.25
Beans, green snap, canned	1 cup / 135 g	1.17
Beans, lentils, cooked	1 cup / 198 g	6.59
Beans, soy, mature cooked	1 cup, 172 g	8.84
Cereals, ready-to-eat, Cheenios	1 cup / 30 g	9.53
Cereals, ready-to-eat, Kellog's Product 19	1 cup, 30 g	18.09
Commeal, degemmed, enriched yellow	1 cup / 138 g	5.96
Oats, cooked	1 cup / 234 g	2.11
Hummus	1 TBSP / 14 g	0.34
Wheat flour, white enriched, all purpose	1 cup / 125 g	5.80
Beans, black, cooked	1 cup / 172	3.61
Pumpkin, canned	1 cup / 245 g	3.41
Rice, white, enriched, long grain	1 cup / 185 g	7.97
Wheat flour, whole grain	1 cup / 120 g	4.66
Tofu, firm, Nigari	¼ block, 81 g	1.30
Tomato paste, canned	1 cup / 262 g	7.81
Greens, mustard, boiled and drained	1 cup / 140 g	.98
Broccoli, boiled and drained	1 cup / 156 g	1.05
Brussel sprouts, boiled and drained	1 cup / 156 g	1.87

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Boosting iron absorption: A guide for the science-minded

<http://www.parentingscience.com/iron-absorption.html>

Iron absorption in anthropological perspective

Back in the Paleolithic, iron deficiency was probably uncommon (Eaton et al 1999).

That's because the Paleolithic diet included

- animal muscle tissue (from mammals, birds, fish, and/or shellfish)
- plant-based sources of iron (e.g., green leafy vegetables), and
- foods rich in vitamin C (which can triple the bioavailability of iron)

Today, many people around the world are iron deficient. They can improve their iron status by changing their diets. But how does this work? Here is an overview of iron absorption--the factors that enhance it and the substances that inhibit it.

Heme versus nonheme iron

The bioavailability of iron depends on several factors. People who are iron-replete absorb iron less easily than people who are iron-deficient.

In addition, absorption depends on the specific form that iron takes.

Heme Iron

Heme iron is the most readily absorbed form of iron, and it's found in **shellfish, red meat, poultry, and fish** (see the chart in this article about iron rich goods). On average, people absorb between 15-35% of the heme iron they consume (Insel et al 2003).

Nonheme iron

Nonheme iron is found in plant foods, as well as in eggs, milk, and meat.

Compared with heme iron, it's less easily absorbed by the body.

Moreover, sources of nonheme iron often contain phytates, which bind to iron and carry it through the digestive tract unabsorbed.

As a result, the foods with high iron content aren't necessarily the best sources of iron. By weight, soybeans have roughly twice the iron of beef. But only about 7% of the iron in soybeans is absorbed. Spinach is also high in iron, but less than 2% of the iron in cooked spinach is absorbed (Scrimshaw 1991).

Iron absorption enhancers

Nonheme iron is harder to absorb. But this doesn't mean it's unimportant. What's needed is a way to improve the body's absorption of nonheme iron, and you can do this by adding one or more of these iron absorption enhancers to your meals:

- Vitamin C (Teucher et al 2004; Fidler et al 2009)
- Beef (Johnson and Walker 1992; Englemann et al 1998)
- Poultry (Hurrell et al 2006)
- Salmon (and, presumably, some other kinds of fish: Navas-Carretero et al 2008)
- Pork (Engle-Stone et al 2005)
- Citric acid (Hallberg and Rossander 1984)

How much difference do these additives make?

Vitamin C may be a particularly powerful iron absorption enhancer. One study reported that adding just 63 mg of vitamin C to a meal rich in nonheme iron yielded a 2.9-fold increase in iron absorption (Fidler et al 2009).

Meat can also make a big difference. Experiments suggest that adding 50 to 85 grams of meat to a meal results in a 1.5- to 4-fold increase in iron absorption (Baech 2003; Baynes and Bothwell 1990; Cook et al 1976; Engle-Stone et al 2005; Navas-Carretero 2008).

Beef may more effective than other meats. In one experiment, beef protein enhanced iron absorption 80% better than did chicken protein (Hurrell et al 2006).

Iron absorption inhibitors

The flip side of the coin are substances that inhibit the absorption of iron:

- phytic acid (found in grains, legumes, and other plant foods)
- egg protein (from both the white and the yolk)
- minerals that compete with iron for absorption: calcium, zinc, magnesium, and copper
- tannic acid (in tea)
- certain herbs, including peppermint and chamomile
- coffee
- cocoa
- fiber

Notice that many nutritious, healthful foods contain iron absorption inhibitors. It's not desirable to cut these out of your child's diet--your child needs calcium, zinc, phosphorus, and fiber.

However, if your child is iron deficient, it might be helpful to avoid some of these foods just before, during, or after a meal that contains iron rich foods.

For instance, experiments have demonstrated that people absorb much less iron from bread when their meals include egg protein, tea, peppermint, chamomile, or coffee (Hurrell et al 1999; Hurrell et al 1988).

Similar experiments have demonstrated that calcium interferes with iron absorption (Hallberg 1998; Perales et al 2006).

What about phytic acid? Phytates, which are found in most plant foods, can reduce iron absorption by up to 80%. But vitamin C—consumed along with a meal--can counteract the effect. In one study, preschoolers with iron deficiency anemia were given vitamin C supplements twice a day—100 mg at each of two phytate-rich meals. After two months, most of the kids were no longer anemic (Seshahdri et al 1985).

This underscores the importance of vitamin C. Many grains and legumes (including soy) can be good sources of iron--if you consume them with vitamin C.

Other considerations

Iron-fortified foods really can help. Iron-fortified cereals--consumed with vitamin C--can be an effective way to improve your child's iron status. So can iron-fortified soy sauce (Chen et al 2005).

Cooking with iron cookware can add iron to your diet, particularly if you cook acidic foods at high temperatures (Kuligowski and Halperin 1992).

Although egg protein inhibits the absorption of iron, a few egg yolks might not hurt. In a study of healthy, iron sufficient weanling infants, researchers fed 6-month-old babies egg yolks from eggs enriched with n-3 fatty acids. Babies ate 4 cooked yolks a week for 6 months. At the end of the treatment, their iron status was similar to that of controls (Makrides et al 2002). The study didn't describe whether the eggs were eaten alone or in the context of a meal.

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What Every Vegetarian Needs to Know About Iron

Written by Matt Ruscigno

<http://www.nomeatathlete.com/iron-for-vegetarians/>

This is a guest post by Matt Ruscigno, who writes the blog [True Love Health](#).



True or False: The iron that our bodies require is the same element found in a cast-iron skillet.

This is a real true or false question on my college exam, and it fools a surprising number of my students. Iron is greatly misunderstood as a nutrient, especially when it comes to vegetarian and vegan diets.

The mineral is found all over the earth and is essential to red blood cells transporting oxygen and nutrients to every cell in our body, connecting us directly to the land we live on. Pretty amazing, right?

But iron deficiency is the most common nutrient deficiency in North America, with symptoms including fatigue, pale skin, weakness and inability to maintain body temperature. And as vegetarians and vegans, it's worth paying special attention to make sure we're getting enough.

So how much iron do we actually need?

Recently in the U.S., the Dietary Reference Intakes (DRI) gave [new recommendations for iron](#), specifically for vegetarians, that are 1.8 times higher than the general population. As my colleague [Jack Norris points out](#), this increase is not based on actual research on vegetarians, but simply because the iron in plant foods is not as easily absorbed as the iron in animal products (more on this in just a minute).

As a result, many experts in vegetarian nutrition believe that these recommendations are much higher than needed.

My take on it: if you eat a varied, healthy plant-based diet that includes a balance of grains, legumes, nuts and seeds, and fruits and vegetables — and follow the recommendations below — I don't believe it is necessary to keep close track of iron intake.

Iron from plants vs. iron from animals

To better understand what we need to do to ensure our bodies are getting enough iron, we first have to accept two facts about iron — painful as they are for vegetarians and vegans to hear:

1. There are two types of iron — heme, which is found in animal foods, and non-heme, which is from plants. It is true that heme iron (the kind from animals) is better absorbed than non-heme iron.
2. Vegetarians and vegans may have lower iron stores than omnivores.

But don't fret your vegetarian brain over these issues. We'll see that in fact it's not all that difficult to get the iron you need on a plant-based diet.

As for #2, it's important to note that while vegetarians have *lower stores of iron* than omnivores, they *do not have higher rates of anemia*. In the research, many vegetarians' stores are “low-normal,” but this does not mean less than ideal! Actually, there's some evidence that says low-normal iron stores are beneficial: improved insulin function and lower rates of heart disease and cancer.

How to get enough iron on a plant-based diet

You can start by making sure that you're eating foods that contain substantial amounts of iron. Some of the best plant sources of iron include:

- Legumes: lentils, soybeans, tofu, tempeh, lima beans
- Grains: quinoa, fortified cereals, brown rice, oatmeal
- Nuts and seeds: pumpkin, squash, pine, pistacio, sunflower, cashews, unhulled sesame
- Vegetables: tomato sauce, swiss chard, collard greens,
- Other: blackstrap molasses, prune juice

But here's the key: **It's not how much iron you consume, but how well you absorb it.**

So paying attention to make sure you're absorbing your iron is just as important as making sure you're taking in enough. And fortunately there is a lot you can do to increase the absorption of non-heme iron!

5 ways vegetarians and vegans can absorb more iron

1. The less you eat, the better it is absorbed.

Seriously! I know people who take one 15 milligram pill a day and think they are covered, but it doesn't work that way. When consuming higher amounts of iron at one time, the percentage that

our bodies absorb is actually lower than when your meal contains only a few milligrams. Plant-based foods may contain less iron than animal foods, but eating smaller amounts throughout the day is a great way to increase absorption.

2. Eat non-heme iron foods with vitamin C foods, and absorption can increase as much as five times.

Five times! Culturally these combinations are already happening: think [beans and rice](#) with salsa, [falafel](#) with tomatoes and hummus with lemon juice. The iron in beans, grains and seeds is better absorbed when combined with the vitamin-C found in fruits and vegetables. Bonus: some iron sources, like leafy greens, broccoli, and tomato sauce already contain vitamin-C.

3. Avoid coffee and tea when eating high-iron meals.

Coffee (even decaf!) and tea contain tannins that inhibit iron absorption. I recommend avoiding them an hour before or two hours after your meal.

4. Cast-iron skillets increase iron absorption.

The answer to the true or false question is true! Cooking with an old school cast-iron skillet increases the iron in your meal — especially when you cook a vitamin-C containing food in it.

Even better, a cast-iron skillet purchase puts you in the realm of official serious cook. I bought mine almost 10 years ago for \$8 and it is one of my most valued possessions. (Yes, I'm that much of a food nerd that a skillet is one of my most valued possessions!)

5. It pains me to say this, but you may want to avoid spinach as an iron source.

Spinach contains oxalates that block absorption. Sucks, right? There is some disagreement in the research about this, but with all of those other iron-containing plant foods, why not try some new ones?

And for the record, even if you take an iron supplement, you should still follow the advice above. I recommend that if my clients take one, they break it in half and take half in the morning and half at night, always with meals or juice.

Iron doesn't have to be a problem in a plant-based diet

Follow these principles, eating good sources of iron throughout the day and keeping up with the absorption principles above, and you'll find that it's not hard to get enough iron in your diet, even as a vegetarian or vegan.

All of that said, iron is one of the few nutrients where a deficiency both immediately affects your health and is detectable, so if you have any iron-deficiency symptoms I recommend getting blood work with your doctor. It is affordable, reliable and easy to interpret. And iron levels bounce back quickly when using the methods above or supplementation.

I'll leave you with a fun fact about iron in plant-based diets (well, fun to a food nerd at least):

Some research shows that vegans have higher iron levels than vegetarians.

How?

The difference between vegetarians and vegans is eggs and dairy products, and the latter contain almost no iron. When someone goes from vegetarian to vegan they are replacing dairy products with plant-based ones, all of which contain some iron, therefore increasing the total iron in the diet.

With this information and a little effort you can get all of the iron you need from plants to be a healthy and strong vegetarian!

Matthew Ruscigno, MPH, RD is a vegan of 15 years, Chair of the [Vegetarian Nutrition Group](#) of the American Dietetic Association and is an athlete that has completed iron-distance triathlons, solo 24-hr mountain bike races and ultra-runs. He writes at [True Love Health](#) and recently launched his [Day in the Life of Vegan Athletes](#) video series.

Dietary Sources of Iron for Vegetarians

[Vegetarians](#) need more [iron](#) in their diets than nonvegetarians because the iron in plant foods is not absorbed as efficiently as the iron in meat. Surprisingly, vegetarians tend to get substantially more iron in their diets. [Vegans](#) get the most because the dairy products that other vegetarians eat contain virtually no iron and tend to displace iron-containing plant foods.

You can't go wrong with fruits and vegetables. One national campaign urges everyone to eat five servings of fruits or vegetables. Of course, they're talking about small, half-cup servings. For most vegetarians, a goal of five half-cup servings would mean cutting *back*!

Iron is available everywhere you look in the plant world. Rich sources include whole or enriched breads and cereals, legumes, nuts and seeds, dark green, leafy vegetables, and some dried fruits. Vegetarians typically don't have trouble getting enough iron. The following shows a selection of vegetarian foods and their iron values.

Vegetarian Sources of Iron

Food	Iron Content (milligrams)
1 cup bran flakes	8.1
1 slice whole wheat bread	0.9
1 cup cooked oatmeal	1.6
1 cup steamed brown rice	1.0
1 cup cooked black beans	3.6
1 cup cooked garbanzo beans	4.7
1 cup lentil soup	2.7
1 cup cooked navy beans	4.5
1 cup cooked pinto beans	4.5

1 cup cooked soybeans	8.8
4 ounces tempeh	1.9
4 ounces firm tofu	1.8
1 cup vegetarian chili	3.5
2 tablespoons peanut butter	0.6
2 tablespoons almond butter	1.2
1 cup sunflower seeds	1.0
1 cup dried apricots	1.5
1/4 large cantaloupe	0.4
1 cup prunes	1.1
8 ounces prune juice	3.0
1.5 ounces raisins	0.9
1 cup diced watermelon	0.3
1 cup cooked bok choy	0.4
1 cup cooked broccoli	1.3
1 cup cooked brussels sprouts	1.9
1 cup cooked collard greens	0.9
1 cup cooked kale	1.2
2 tablespoons kelp (seaweed)	0.3
1 cup cooked mustard greens	1.0
1 cup cooked Swiss chard	4.0
1 cup cooked turnip greens	1.2
2 tablespoons blackstrap molasses	7.0

The Best Sources Of Iron That You'll Actually Want To Eat

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You know you can get iron from liver and red meat, but if you're in the mood for something different, these unexpected alternatives might hit the spot.

By Corrie Pikul

A Bonanza for Seafood Lovers



What it is: A raw-bar feast

How much iron you get: Per 3-ounce serving, oysters have 6.2 mg iron and clams have 23.8 mg iron (no, that is not a typo).

Why it's great: This is one area where shellfish have the advantage over land-dwellers. A 3-ounce serving of beef, which is usually considered a respectable source of iron, has 3 mg of iron—that's less than half the amount in oysters, and a teensy fraction of what you'll find in clams.

One more thing: Iron is a critical component of hemoglobin, a protein in our red blood cells that stores and transports oxygen through the body, explains Janis Jibrin, MS, RD, a registered dietician and the author of [The Pescatarian Plan](#). When iron levels are low, we don't get enough oxygen, which can cause [fatigue, foggy thinking and even heart failure](#). Women are more likely than men to be deficient in iron, partly because we lose it during menstruation. Aim for about [18 mg a day](#)—but stay well under the way-upper limit of 45 mg, because an extreme excess of iron is linked to a higher risk of heart disease and cancer.

The Best for Vegetarians



What it is: A bean burrito topped with fresh tomato salsa

How much iron you get: A cup of cooked beans has about 3 to 4 mg of iron.

Why it's great: Iron from plant foods isn't as well-absorbed as iron from animal or fish sources, Jibrin says. Eating vegetarian iron sources, like beans, with foods high in vitamin C, like tomatoes, can enhance the iron absorption up to sixfold.

One more thing: Other smart pairings include mixed bean salad with cauliflower, or oatmeal topped with strawberries (1/3 cup dry oats has 1.5 mg iron). One not-so-smart pairing: Any iron-rich meal with black or green tea, which has tannic acid that binds to iron, making it harder for the body to process.

A Sweet Option for Women



What they are: Gingerbread cookies with blackstrap molasses

How much iron you get: One tablespoon of [blackstrap molasses has 3.5 mg of iron](#).

Why it's great: Blackstrap molasses is the thick brown liquid left after the third boiling during the sugar-making process, and it's the most concentrated and the richest in nutrients (especially iron) of all types of molasses.

One more thing: Blackstrap molasses is often recommended to pregnant women who need to bulk up on iron ([the RDA for premenopausal women is 18 mg a day; pregnant women need 27 mg a day](#)). On its own, this syrup is bitter and medicinal-tasting, but something magical happens when it's mixed with butter and sugar and baked in the oven. Fortunately, says Jibrin, cooking at high temperatures doesn't affect the iron content of blackstrap molasses. Depending on the cookie recipe, you could get as much as 7 mg of iron per serving (as in [this recipe](#), which uses an entire cup of blackstrap molasses).

The Best Way to Get Iron From Spinach



What it is: Tofu, chicken and spinach stir-fry

How much iron you get: Three ounces of tofu has about 1 to 2 mg of iron; spinach has 3.2 mg per half-cup—but keep reading.

Why it's great: Eating animal protein as part of your meal is another way to help your body absorb the iron in plant sources, Jibrin says.

One more thing: Spinach is known for being an iron powerhouse (thanks, Popeye). However, Jibrin says that the iron in spinach is very poorly absorbed by the body. It needs a little extra help; that's why the chicken in this recipe is essential.

The Best Gluten-Free Choice



What it is: Lentils, brown rice and red peppers

How much iron you get: One cup of cooked lentils has 7 mg of iron.

Why it's great: These three ingredients work exceptionally well together: The vitamin C in the peppers enhances your body's absorption of the iron in the lentils, and the brown rice combines with the lentils to make a complete protein.

One more thing: Those with Celiac disease and other gluten-sensitivity issues have a hard time absorbing nutrients from food, says Jibrin, so they have to work extra hard to get the iron they need. This healthy meal is ideal for them, as it's entirely gluten-free.