

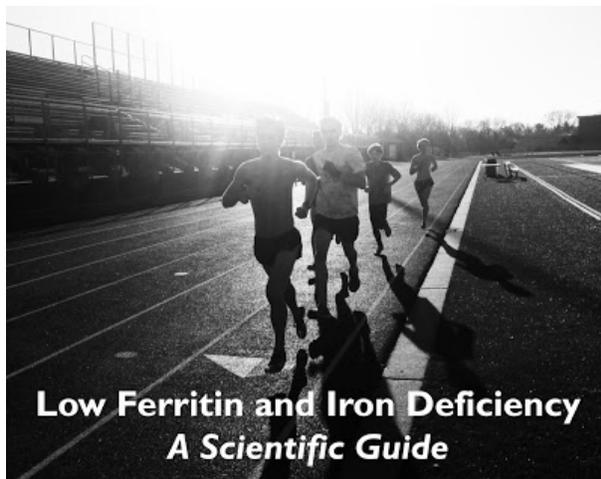


Thoughts and comments on long-distance training, injuries, and more from a student of the sport

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WEDNESDAY, APRIL 12, 2017

Low ferritin and iron deficiency anemia in distance runners: A scientific guide for athletes and coaches



When I see a runner getting fatigued early on in workouts or struggling mightily in races for no good reason, there's one potential cause I always consider first: low iron.

Iron deficiency is a significantly underdiagnosed problem in distance runners. Low levels of hemoglobin in the blood, or low levels of the iron storage protein ferritin, can have a profoundly negative impact

on your ability to have successful workouts and races.

Hemoglobin is the main building block for red blood cells, which carry oxygen from your lungs to your muscles. If you don't have enough hemoglobin, you can't make enough red blood cells, and as a result, your distance running performance will suffer. Furthermore, research and practical coaching experience suggests that low ferritin levels can cause poor performance, *even* when hemoglobin levels are normal.

We'll take a close look at the science behind low iron and distance running performance, then analyze the best ways to treat and prevent iron deficiency in runners.

THE BIOLOGY OF IRON AND RED BLOOD CELLS

Hemoglobin is an essential part of your body's oxygen delivery system. It's a protein with four iron atoms at its core, and these iron atoms are what grant red blood cells their ability to transport oxygen (as well as give them their red color).

Because red blood cells must be replaced fairly frequently, your body keeps extra iron on-hand in a storage protein called **ferritin**. Your body's iron reserves are mostly locked up in ferritin, which can be called upon

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 RunningWritings.com hit TWO MILLION all-time views last month!!! 🎉🎉🎉 I know I've been neglecting it recently but I've got big plans... 😊

Jul 20, 2017

John Davis @JDruns
 As of this weekend my time as a coach at Edina came to an end. It's been an incredible four and... [instagram.com/p/BVQMBKwICEH/](https://www.instagram.com/p/BVQMBKwICEH/)

Jun 12, 2017

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 Creatine use a risk factor for chronic exertional compartment syndrome

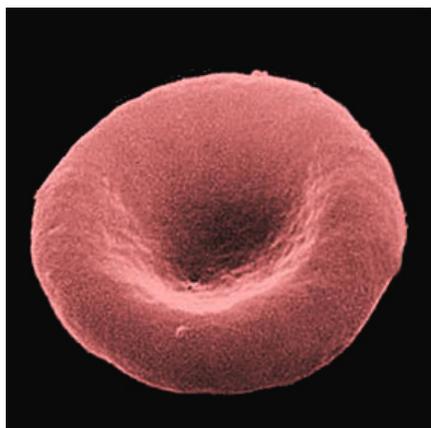
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when needed to synthesize hemoglobin for new red blood cells, or other proteins and enzymes in your body that also require iron. Low ferritin by itself is termed **iron deficiency**.

As you might guess, when ferritin levels in the body are inadequate, hemoglobin synthesis slows down and your body can't produce as many red blood cells. Abnormally low hemoglobin levels is a condition termed **anemia**, and when the cause is low iron, this is **iron deficiency anemia**.



One red blood cell contains millions of hemoglobin proteins

THE PREVALENCE OF IRON DEFICIENCY AND ANEMIA IN DISTANCE RUNNERS

[According to research](#) from the Centers for Disease Control and Prevention, between 9 and 11% of teenage and adult women are iron deficient, while only 1% of teenage and adult men are iron deficient.¹ In this context, "iron deficient" means serum ferritin levels below the standard lab reference ranges for the general population (typically 12 ng/mL). As we'll soon see, these ranges need to be increased for endurance athletes.

Iron deficiency anemia (meaning low hemoglobin *in addition to* low ferritin) occurs in less than half of those who have low ferritin.

Among endurance athletes, iron deficiency and iron deficiency anemia are far more prevalent. A [1989 study](#) in the *Journal of Pediatrics* found that 34% of female and 8% of male high school cross country runners had serum ferritin levels below 12 ng/mL.² Another [study](#) in the *Journal of Adolescent Health Care* found similar results.

In a sample of high school cross country runners, about 3% of boys and 40% of girls were iron deficient at the beginning of the season.³ This study went a step further and followed the same sample of runners throughout the fall. By the end of the season, the prevalence of iron deficiency had increased to 17% of boys and 45% of girls. Even among those who were not classified as iron deficient, the majority had a decrease in their serum ferritin levels.

Adult male recreational runners are at less of a risk for iron deficiency, but the same is not true for women. A [2010 study](#) by researchers in Switzerland reported that 28% of female marathoners had iron deficiency, versus only 1.6% of male marathoners.⁴

Data from swimmers provides some interesting contrasts. Thomas Rowland and John Kelleher at Baystate Medical Center's Department of Pediatrics report a similarly high incidence of [iron deficiency in female swimmers](#)—47%—but a complete absence of low iron in male swimmers. Further, swim training does not seem to deplete iron levels like run training does.⁵ Rowland and Kelleher found no decrease in ferritin as the season progressed, unlike what happens with cross country runners.

WHY ARE FEMALE RUNNERS MORE LIKELY TO BE IRON DEFICIENT?

The data from the above scientific studies suggests three primary reasons for why female runners are at increased risk for iron deficiency.

First, their dietary intake of iron tends to be very poor. Rowland and Kelleher, for example, found that the female athletes in their study averaged less than half their recommended daily intake of iron.³

Second, the menstrual cycle induces a substantial loss of blood. This increases the body's demand for iron, since it must manufacture new red blood cells to replace the ones it loses.

► [2012](#) (22)

► [2011](#) (16)

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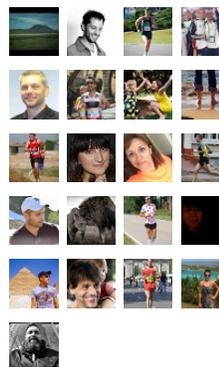
John Davis

I'm a graduate of Carleton College and a long-time student of distance running. My interests include elite training, biomechanics, injury prevention and treatment, long-term development for younger runners, and coaching philosophies. Currently, I live in the Twin Cities, write, and coach at Edina High School.

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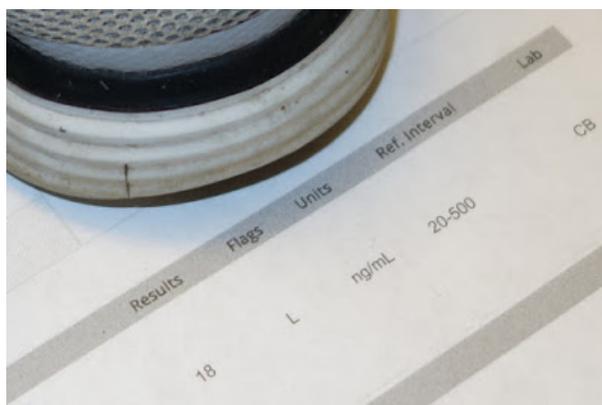
Third, running training induces an additional loss of iron. This happens primarily through gastrointestinal blood loss. A [very clever 1996 study](#) by researchers in Germany used radiolabeled iron to estimate the body's iron turnover during periods of rest, intensive training, and intensive racing among high-level distance runners.⁶ They found that periods of intensive training or racing were associated with a three to six-fold increase in gastrointestinal blood loss. No trace of iron was found in the sweat or urine of the volunteers, indicating that blood loss from minor bleeding in the gastrointestinal tract is the prime cause of high iron turnover in runners (in addition to menstruation in females).

The high baseline level of iron deficiency in women and girls, coupled with the iron losses associated with menstruation and running training, results in a prevalence of iron deficiency in women that approaches 50%. And *this* is using the fairly conservative standards for ferritin levels used in the general population. As we're about to see, there is good evidence that distance runners can suffer from impaired performance even at iron levels at the low end of the "normal" reference range.

HOW TO GET YOUR IRON LEVELS CHECKED

The only way to determine if low iron is the cause of a runner's troubles is to get a blood test. You will need to request two separate tests: A "**CBC**," which stands for **complete blood count**, and a **serum ferritin test**.

Complete blood counts include an entire panel of tests, but the one you are interested in is your **hemoglobin level**. Hemoglobin is reported in grams per deciliter (g/dL), or sometimes grams per liter (g/L), which is just g/dL multiplied by ten.



A serum ferritin test, measured in ng/mL

A ferritin test requires a separate blood draw; the value you are interested in here is your **serum ferritin level**, which is typically reported in nanograms per milliliter, or ng/mL. You may also see it reported as micrograms per deciliter, or $\mu\text{g/dL}$ —these units are equivalent.

When your doctor calls to report your test results, make sure you ask for the **specific number and units** for both hemoglobin and serum ferritin.

Most medical labs now provide patients with the data from their blood tests (indeed, you are entitled to it because it is part of your medical record), so this is less of a concern than it used to be, but some runners have had issues with doctors who simply report that their values are "normal" or "a little low" without any context. You need to know the number to figure out the level of iron deficiency you are dealing with.

Another option is direct-to-consumer lab testing. If your insurance will not cover a lab test, or you have trouble convincing your doctor to order one, or if you simply don't want to bother with an office visit, you can pay for a lab test through so-called "direct access" labs. These tend to be far less expensive than going through a doctor if you are paying out-of-pocket.

Unfortunately, because of legal restrictions, direct access lab testing is currently unavailable in New York, New Jersey, Rhode Island, and Maryland. Residents of those states will have to see their doctor or go out-of-state.

There's a plethora of independent labs that offer consumers blood draws for relatively little expense. Amid concerns about the accuracy of independent labs, it can be tricky to figure out what labs you can trust.

Recommended direct access labs for iron testing

Order Ferritin Blood Test and Complete Blood Count (CBC) with Differential and Platelet Count Blood Test

PersonaLabs contracts directly with Quest Diagnostics and LabCorp, the two largest clinical lab testing providers in the United States. These two lab groups mostly conduct and process tests that *are* ordered by physicians, so you'll be getting the exact same standards of quality that you'd get through going to the doctor. I looked into a lot of different direct access labs, but PersonaLabs' professionalism and high quality reports stood out to me. I made a few customer service calls to PersonaLabs and to some of its competitors, and was impressed by PersonaLabs (and put off by a few others).

INTERPRETING A RUNNER'S COMPLETE BLOOD COUNT

Hemoglobin values tell you whether or not you have iron deficiency anemia. Standard reference ranges vary a bit from lab to lab, but [normal hemoglobin values](#) are 13.5-18.5 g/dL for men and 12.0-15.5 g/dL for women.

This brings us to an important point: many runners will fret after seeing their hemoglobin levels close to or slightly below this normal range, even when their ferritin is normal. However, these fears are misplaced: in most cases, this "anemia" is an illusion.

Endurance training can [increase your blood plasma volume](#) by up to 20%.⁷ If the number of red blood cells stays exactly the same, it's easy to see how such an increase would cause the *illusion* of anemia, because hemoglobin is measured terms of concentration. This situation is termed **dilutional pseudoanemia**.

On account of this, it's wise to lower the bottom end of the normal range of hemoglobin in runners by about 1 g/dL, meaning **normal hemoglobin levels for runners are 12.5-18.5 g/dL for men and 11.0-15.5 g/dL in women**.

On a related note, the same principle applies to another value measured in the complete blood panel—your hematocrit. This measures what fraction of your bloodstream is made up of by red blood cells. Most runners assume that a higher hematocrit is better, chiefly because blood doping and EPO usage artificially boost hematocrit and lead to better performance. Anti-doping agencies set maximum hematocrit levels at around 50%, so most athletes assume that a higher hematocrit is better.

But blood doping and EPO usage have this result because they increase red blood cell production, but not blood plasma production. Standard endurance training increases red blood cell production *and* plasma production; the latter often to a greater extent.

Renato Canova, an Italian coach whose distance runners have won over 50 medals at the World Championships and Olympics, reports that many of his [top Kenyan distance runners](#) have quite low hematocrit values, and in fact, when athletes are more fit, they have *lower* hematocrit values, for blood plasma dilutional reasons.

INTERPRETING A RUNNER'S FERRITIN TEST RESULTS

Now the real controversy begins. For the general population, the [normal range for ferritin](#) is 12-500 ng/mL for men and 12-200 ng/mL for women.

For a long time, doctors and physiologists insisted that low iron cannot cause poor performance in runners unless it's also accompanied by low hemoglobin. It's hemoglobin, not ferritin, that carries oxygen to the muscles, so even if low ferritin could cause anemia *later*, if your hemoglobin levels are normal, how could your performance be suffering?

The prevailing medical wisdom ran counter to what coaches had witnessed for years. They would observe formerly fit runners succumb to fatigue and exhaustion abnormally early in their workouts and races, then send them in for iron testing. Inevitably, they would come back with low ferritin but normal hemoglobin, and yet, their performances would improve once they had increased their ferritin levels.

Coaches also noted that athletes with ferritin levels at the low end of "normal" for the general population were exhibiting many of the same symptoms as athletes with clinically low iron (<12 ng/mL).

These two observations spurred physiology researchers to study the role of ferritin in endurance exercise in greater detail. Now, we've finally got enough evidence to make a strong case for iron deficiency having an independent, detrimental effect on performance, even without anemia

WHY ENDURANCE ATHLETES NEED HIGHER FERRITIN LEVELS THAN THE GENERAL POPULATION

Research published in 2011 by Diane M. DellaValle and Jere D. Haas provides a good example of this phenomenon.⁸ In their study, 165 female collegiate rowers underwent iron screening and reported their recent personal best in a 2km row (an event that takes about eight minutes to complete at an all-out effort).

After running statistical analysis on the data, DellaValle and Haas showed that rowers whose ferritin levels were below 20 ng/mL averaged 21 seconds slower for their 2km row. The authors conducted additional statistical analysis and found that even ferritin levels as high as 25 ng/mL could decrease performance; rowers with ferritin levels of at least 30 ng/mL did not suffer performance inhibitions.

Results like this, which upended years of medical wisdom, were enough to spur further research. Enough additional experiments on the topic of endurance performance in iron deficient but nonanemic athletes were published to warrant a review study.

A 2014 [meta-analysis by Richard Burden](#) and other researchers at three universities in the UK pooled results from 17 individual studies on iron supplementation in athletes with low ferritin but normal hemoglobin.⁹

The combined results were clear: there is a marked benefit of iron supplementation in iron deficient athletes, both when it comes to increasing serum ferritin levels and to increasing aerobic performance. Furthermore, the results give some insights onto how long it takes to raise your iron levels. Statistical testing found that the effect of iron supplementation tends to taper off after 80-100 days.

One downside to ferritin testing is that your levels can vary by a significant amount day-to-day. [One study](#) by researchers at Penn State University followed 20 healthy men and women over the course of a month, taking blood samples every day.

They found that men's ferritin levels can vary by up to 15% from day to day, while women's can vary by up to 27%.¹⁰ This suggests we should raise the minimum threshold for optimal ferritin levels in runners to about **40 ng/mL**, as this takes the day to day variance in ferritin levels into account.

Some data also suggests that [ferritin levels can spike after an infection](#), so don't get your ferritin levels checked if you've been sick in the past week or so—they might appear to be higher than they really are.

HOW CAN LOW FERRITIN IMPACT RUNNING PERFORMANCE WHEN HEMOGLOBIN IS NORMAL?

The most plausible explanation for the paradox of impaired performance in athletes with iron deficiency but not anemia has nothing to do with red blood cells. Remember in the

introduction, when I mentioned that ferritin is an iron storage protein for hemoglobin manufacture, *as well as other proteins that require iron?*

Well, it turns out that there are several iron-containing enzymes that play a critical role in aerobic metabolism. As DellaValle and Haas write,

There are several iron-dependent enzymes involved in the transformation of chemical to mechanical energy during oxidative metabolism, which is the main energy pathway used by rowers [and runners] during endurance training and most competitive events performed submaximally, around the lactate threshold. During high-intensity activities such as a 2-km ergometer time trial [or a running race], impaired O₂ transport capacity, even in the absence of frank anemia, may result in increased reliance on anaerobic metabolism to produce energy.⁸

So, in layman's terms, iron deficiency can impair your production of enzymes important for creating aerobic energy, so you're forced to dig into your anaerobic energy systems earlier, thus becoming fatigued more rapidly.

After reviewing the research, this much becomes clear: **Runners should aim for ferritin levels above 40 ng/mL** to avoid fatigue and impaired performance from iron deficiency.

WHAT TO DO WHEN YOU HAVE LOW IRON

In most cases, the easiest and most straightforward way to fix iron deficiency is the most obvious one: increase your iron intake. This can involve increasing your dietary intake, taking an iron supplement, or, preferably, both.

Increasing dietary iron intake



Dietary sources of iron can be grouped into "heme" and "nonheme" categories. Heme iron is iron that's already been incorporated into an easily available format. Heme iron occurs *only* in meat, which makes sense—the animal you are eating has already done the absorption for you. Red meat is especially rich in heme iron. Heme iron is not only readily absorbed; it is very resistant to other factors which inhibit absorption.

All other dietary sources of iron, including grains, beans, and vegetables, are classified as nonheme iron.

According to an [exhaustive review article](#) by Charles Carpenter and Arthur Mahoney at Utah State University, because nonheme iron isn't already bound up in an easily-available format, it's not as easy to absorb. Additionally, many other foods in your diet

can impact the absorption of nonheme iron.¹¹

Things that promote nonheme iron absorption include meat, poultry, and fish (strange but true!) as well as vitamin C. Meat and vitamin C aid absorption by forming chemical bonds with the iron and incorporating it into compounds that are water-soluble and easily absorbed by your body.

The opposite is true for foods that inhibit nonheme iron absorption. These include antacids, tea, calcium, and a class of chemicals called polyphenols that are found in many fruits, vegetables, and spices. In the case of tea and polyphenols, these compounds form bonds with iron that are *not* soluble or readily absorbed.

Calcium inhibits iron absorption by blocking its absorption by the cells in your intestine. [A 1992 study](#) by researchers at the University of Göteborg in Sweden reports that the effect is significant enough that simply adding cheese to a hamburger could decrease the amount of iron you absorb by 50-60%.¹²

This also implies that the **iron in a multivitamin is almost useless**—most multivitamins have low iron content and high calcium content, so the availability of the iron is very poor. In addition, the phosphorus and magnesium in multivitamins further inhibits iron absorption.¹³

Designing a high-iron diet

By keeping in mind the factors that affect iron absorption, it's possible to arrange your diet in a way that maximizes your iron intake and iron absorption. Some characteristics of a high-iron diet include:

- High meat and especially red meat intake, if you aren't a vegetarian
- Consuming vitamin-C rich foods when you consume iron rich foods
- Reducing calcium and tea intake at iron-rich meals (though keep in mind that calcium is still an important nutrient for runners!)
- Avoiding antacids
- Cooking moist, acidic foods in cast iron pots ([yes, this really works](#))¹⁴

What type of iron supplement is best for runners?

A high-iron diet is a good idea for most runners, but if you are iron deficient, a more straightforward solution—and one that's usually necessary if you have low ferritin levels—is taking an iron supplement. It provides the most direct and quantitative way to increase your iron intake and raise your ferritin levels.

Despite the vast raft of research on iron deficiency and iron supplementation, there's still some confusion on the optimal type of iron to take and what kind of dosage is necessary.

When shopping for an iron supplement, you'll run into several different types of iron. Here's an overview of the three types of products you'll encounter:

Ferrous sulfate, gluconate, or fumarate tablets

These are all inorganic salts of iron, pressed into a tablet. They are all fairly inexpensive, widely available, and effective.

These compounds are similar in their ability to deliver iron, but ferrous sulfate tend to be cheaper than ferrous fumarate, and has a higher iron content by mass than ferrous gluconate.

Because of this, ferrous sulfate is the weapon of choice in most clinical studies on iron supplementation. Like all iron supplements, it is nonheme iron, so take it with a vitamin C supplement and avoid tea, calcium, or antacids within several hours.

Some ferrous sulfate, gluconate, or fumarate supplements come with a slow release coating to help mitigate the undesirable side effects of taking an iron supplement (mostly constipation or an upset stomach).

However, Michael Alleyne, McDonald Horne, and Jeffrey Miller at the National Institutes of Health recommend [avoiding these slow-release formulas](#) because the slow release coating prevents iron from being absorbed effectively. Instead, you should take your supplemental iron on an empty stomach before bed to minimize side effects.¹³

If ferrous sulfate causes you too many issues with side effects, try using ferrous fumarate or gluconate instead, or split your dosage into smaller portions throughout the day. A different form of iron, or a lower dosage, can often have gentler effects.

Recommended iron salt supplements:



- **Ferrous sulfate: Nature Made Iron** - This is what I recommend to most runners as a first-line treatment for iron deficiency. It's inexpensive, widely available, and has relatively few unnecessary ingredients.
- **Ferrous fumarate: Ferretts Iron Supplement** - If ferrous sulfate gives you gastrointestinal issues, try using this fumarate salt and spread your dosage out during the day.
- **Ferrous Gluconate: Nature's Blend Ferrous Gluconate** - Likewise, this gluconate salt may help with constipation or stomach pain, on account of its lower iron dosage per pill.

Liquid iron

Liquid iron consists of a dissolved iron salt, paired with flavorings and/or herbal extracts. These iron elixirs are popular, partially because some coaches claim they can be absorbed better than iron supplement tablets.

I found no evidence that liquid iron is absorbed any better than iron tablets, but it does have several obvious drawbacks. The first is that the dosage is very difficult to measure accurately, unless you happen to have a micropipette handy. The second is that a number of liquid iron supplements include herbal extracts or fruit and vegetable concentrates that could have a negative impact on your iron absorption.

Recommended liquid iron supplements:

- I *do not recommend* taking liquid iron

Chelated iron

Some supplements provide iron that is bonded by amino acids into a large organometallic molecule called a chelate. These claim to be more readily bioavailable and less likely to cause side effects. The most common iron chelate on the market is ferrous bisglycinate.

[According to Lindsay Allen](#) at the University of California-Davis, whether or not amino acid chelates like ferrous bisglycinate cause fewer side effects is unclear, but they do offer one distinct advantage—they are better absorbed in situations where absorption-inhibiting foods like tea or dairy are consumed at the same time as iron.¹⁵

Amino acid chelates of iron are another option to try if you struggle with adverse effects from standard iron tablets. They can also be very valuable if you take a calcium supplement for bone strength, as the amino acid chelate should help prevent some of the inhibitory effects of calcium on iron absorption.

One specific form of chelated iron that's also worth a try is actual heme iron. If you read the section on the science of iron absorption, you know that heme iron is much easier to absorb than non-heme iron. Research on the usefulness of heme iron supplements is contradictory.

[One study](#) by researchers in Colorado found that a heme iron supplement led to a greater spike in acute iron levels in the blood, though it should be noted that this study was funded by a company that makes a heme iron supplement, and the protocol seems to have been designed to intentionally sabotage the non-heme iron supplement—the two products were consumed after a calcium-rich meal!¹⁶ Obviously, a chelated form of iron would fare a lot better than an iron salt in this situation.

A [different study](#) on restoring iron levels in blood donors compared heme and non-heme iron, but found no difference between the two when it comes to efficacy. This study did find that the heme iron was associated with fewer side effects, though.¹⁷

Recommended iron amino acid chelates:



- **Solgar Gentle Iron** - An inexpensive and effective chelated form of iron in a respectably-sized dose. This is what I recommend as a fall-back option for runners who struggle with inorganic iron salts, or for female runners with a history of stress fractures who take high doses of calcium supplements.
- **Proferrin ES** - Proferrin makes three variants of its heme iron supplement: Proferrin ES, Proferrin Sport, and Proferrin Forte. ES, the "basic" version, is actually the best one to get—the Forte version, while it contains iron, contains about three times as much iron but is four times as expensive. The Sport version contains powerful antioxidants which could counteract your body's adaptation to exercise. Proferrin ES is very expensive in terms of iron per serving, but theoretically at least it should be absorbed 3-7x better than iron salts. This means a dose of about **two to five tablets a day** (21-52.5 mg elemental iron in heme form) is equivalent to 120-200 mg of elemental iron in salt form.

OTHER TYPES OF IRON; VITAMIN C RECOMMENDATIONS

I do not recommend taking "natural" or "raw" iron supplements. These usually include substances known to decrease iron absorption, sometimes substantially. Keep it simple and straightforward when it comes to iron supplements. As mentioned earlier, you cannot rely on your multivitamin to meet your iron needs either.

Whatever kind of iron you decide to take, you should always combine it with about 100-250 mg of vitamin C. You don't want to overdo it with the vitamin C, because it's a powerful antioxidant and some evidence suggests it can actually [inhibit your adaptation to training](#) when taken to excess.¹⁸

I recommend buying a simple 500 mg vitamin C supplement and using a pill cutter to split the tablets into quarters of around 125 mg each. It only takes 100 mg of vitamin C to [substantially boost](#) iron absorption, so even if your cuts aren't perfect, you should be just fine.¹⁹

Recommended vitamin C supplements:



- **Nature's Bounty C 500 mg** and **Ezy Dose Pill Cutter** - Use the pill cutter to split up the vitamin C pills into quarters—they'll provide around 125 mg per dose, and the bottle will last you for years.

THE OPTIMAL IRON SUPPLEMENT DOSAGE TO BOOST FERRITIN LEVELS: 120-200 MG PER DAY

As reported by Burden et al., studies vary widely in the dosage of iron supplements they use, from 20 mg per day at the low end to over 400 mg per day at the high end.⁹

Alleyne, Horn, and Miller recommend a dose of 150-200 mg of elemental iron per day. Though this paper concerns iron deficiency *with* anemia, that range is a good starting place for runners with low ferritin.¹³

In a 1989 paper in the *Journal of Pediatrics*, researchers in Wisconsin reported that a dosage of 60 mg of elemental iron per day was able to prevent iron deficiency in 65% of female cross country runners, but the remaining 35% needed a dosage of 180 mg per day.²

Notably, they also found that dietary counseling failed to increase dietary iron intake in any meaningful way. This suggests that most iron-deficient athletes can't recover simply through dietary interventions—a supplement is the best way to go.

You'll have to check the label on your iron supplement closely—don't make the mistake of confusing elemental iron for the total content of the iron-containing compound. A typical iron tablet might contain 325 mg of ferrous sulfate, but that's only 65 mg of elemental iron. Taking three per day would provide a dosage of 195 mg of elemental iron.

If you experience negative side effects, Alleyne, Horn, and Miller recommend lowering your daily dosage, or trying a different type of iron supplement. It may take longer to raise your iron levels, but that's okay if it prevents side effects that would cause you to prevent taking iron at all.

IRON INFUSIONS AND INJECTIONS



An iron infusion IV drip

An intravenous infusion of iron into your bloodstream is a more direct solution to low iron. Burden et al. note that, while intravenous iron infusions have been used successfully to rapidly treat anemia, there's no solid research on the best protocol for treating iron deficiency in runners without anemia.⁹

The advantage of an iron infusion is that you can directly deliver a large dose of iron directly to the bloodstream; the main drawbacks are cost, convenience, and a lack of evidence. If your iron deficiency is low for a runner, but not low according to standard lab reference ranges, it may be difficult to get your insurance to cover an iron infusion. For safety reasons, they must be done at a doctor's office.

Intramuscular injections of iron can also be used to deliver high doses of iron effectively, though Burden et al. found that they were less effective at increasing performance in iron deficient athletes than an oral protocol.

Given the lack of standardized protocols, and the low cost of over the counter iron supplements, oral supplementation is probably the best course of action for most runners. If you think otherwise, you'll have to talk to your doctor.

WHAT TO DO WHEN IRON SUPPLEMENTATION FAILS

Don't expect an iron supplement to work right away. Burden et al. write that it may take **three to six months** for an oral iron supplement to raise ferritin levels. But if it's been a few months and your iron levels and performances are not improving, what should you do?

The first possibility to eliminate should be celiac disease: if gluten is aggravating your intestines, they will not absorb iron (or a number of other nutrients) as effectively. A simple

blood test can act as a first-line screening tool, though an endoscopy with a biopsy might be necessary.

Hugh James Freeman at the University of British Columbia [notes](#) that other gastrointestinal conditions can cause poor iron absorption or increased blood loss, too. If iron supplementation is not raising your ferritin levels, you should work with your doctor to figure out the cause.²⁰

SHOULD ALL RUNNERS TAKE IRON?

One very important final note concerns those overzealous runners who might decide to save themselves the cost and inconvenience of a blood test by taking an iron supplement without any knowledge of their ferritin levels.

Doctors caution that this is irresponsible: in a subset of the population with a genetic disease called hereditary hemochromatosis, the intestines absorb an abnormally high amount of iron, which causes iron levels in the blood to skyrocket and has a number of serious health consequences.

In the United States, the [prevalence of hereditary hemochromatosis](#) is somewhere between one in 200 and one in 500. However, your genetic heritage strongly influences this—the mutation is much more common in Northern Europeans, and far less common in people from the rest of the world.

As you might guess, taking an iron supplement, or even eating a high-iron diet, could be extremely dangerous for people with hemochromatosis.

Fortunately, a hallmark sign of hemochromatosis is very high ferritin levels. The lesson here is simple—**get a ferritin test before taking an iron supplement.**

CONCLUSION

We've had to work through a lot of scientific research, but here are the most important things we know about iron deficiency in distance runners:

- **Low ferritin is extremely common among runners**, affecting 2-17% of male runners and 28-45% of female runners. An even higher proportion have iron levels that are low enough to impair performance but do not fall outside standard reference ranges for the general population.
- Low ferritin, even in the absence of low hemoglobin, causes impaired performances in distance runners. Runners should aim for a serum ferritin level of **at least 40 ng/mL**.
- If you have low ferritin, a high-iron diet can help, but the best course of action is to take an iron supplement. Taking a ferrous sulfate supplement, at a dosage of **120-200 mg of elemental iron per day**, is a good starting place. If you have gastrointestinal side effects, you can try other iron salt supplements, or chelated iron.
- Take your iron supplement on an empty stomach with 100-250 mg of vitamin C. Small doses can be hard to find, so use a pill splitter to cut up larger vitamin C supplements.
- Avoid taking your iron supplement within a few hours of anything that can impair iron absorption, like tea, calcium-rich foods or supplements, or antacids. Iron works best when taken on an empty stomach.
- **Do not take an iron supplement** or adopt a high-iron diet without getting a ferritin test first. See your doctor or [go to a direct access lab like PersonaLabs](#) and get tested.

Armed with this knowledge, you are in a much better position to prevent, identify, and treat iron deficiency in runners.

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