

Aunt Cathy's Guide to Nutrition Support of Hemochromatosis Therapy

For Patients, Their Families, and
Their Health Care Providers:
My Specific "Best Guess" Suggestions –
(Subject to Change at Any Moment! ☺)



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People with hemochromatosis have too much iron stored in the liver and other body organs. Sometimes this is caused by a genetic problem in regulating how much iron is absorbed from foods. In other people, it can be due to a need for frequent blood transfusions. Regardless of the cause, excessive iron causes serious damage that leads to cirrhosis of the liver, liver cancer, heart damage, and other problems. [Hemochromatosis--from an underdiagnosed curiosity to a common disease. Tidsskr Nor Laegeforen. 2009 Apr 30;129(9):863-6. Hereditary haemochromatosis. Best Pract Res Clin Gastroenterol. 2009;23(2):171-83]

The **primary treatment** to remove excess iron is the removal of red blood cells (erythrocytes) because they contain an iron-rich substance called hemoglobin that carries oxygen to the tissues. The removal of red blood cells is called "**phlebotomy**," the same process that is used when donating blood. There are some medications that your doctor may use as well to help remove excessive iron.

In the past, removing iron from the diet was the primary treatment to minimize damage from hemochromatosis, but that approach (besides being quite difficult) does not have the advantage of removing excess iron that has already been deposited in the body.

However, nutrition still plays an important role in hemochromatosis because it can:

1. **Support the phlebotomy therapy** by optimizing production of red blood cells to improve the effectiveness of phlebotomy treatments and to allow for more frequent treatments as needed.
 2. **Decrease the anemia and fatigue** that are common problems related to regular phlebotomy treatments.
 3. **Decrease some of the damage** to organs from having too much iron.
 4. **Prevent serious nutritional deficiencies** that can result from regular phlebotomy and/or attempts to decrease dietary iron absorption.
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The following suggestions are not the official recommendations of any medical group, but they are simply a collection of things that I would do today if a family member had hemochromatosis. They will likely help and they will do no harm beyond the added cost of the supplements. Most of the supplements described can be obtained inexpensively in warehouse or discount stores. These nutrition suggestions are to be used **in addition to phlebotomy** or other treatments ordered by the physician, and they are not intended to be used instead of phlebotomy. The specific recommendations may change as more is learned about hemochromatosis. **As always, discuss any diet plan and supplement use with your physician, including any herbal products that you may be taking.**

Sometimes the general suggestions given here for helping to manage hemochromatosis need to be modified if a person has other issues that interact with nutrition, such as the use of certain medications, or if one already has serious liver disease. Additionally, some herbal products are particularly risky for people with any condition that injures the liver – some examples of herbs to avoid for this reason are kavakava, chaparrel and comfrey.

[Review of abnormal laboratory test results and toxic effects due to use of herbal medicines. Am J Clin Pathol. 2003;120(1):127-37.]

1. Starting point: Take a daily multivitamin/multimineral supplement with no iron.

Several products are iron-free, such as: "One a Day 55-plus," "Certa-Vite Golden," and "Centum Silver." There are many appropriate and inexpensive products. Besides "no iron", the minerals that should be included in the product are zinc and copper at the RDA levels, and magnesium at least at about 25% of the RDA. More information on zinc issues is found on pages 6-7.

2. Extra nutrients specifically to help make hemoglobin and red blood cells to support phlebotomy:

A. Extra Folic Acid: 1 to 4 tiny folic acid 400 mcg (microgram) tablets. These are cheap, very easy to take and very safe.

B. Extra Vitamin B12 and Vitamin B6: Take one "B-100 Complex" tablet daily. It provides very generous amounts of these nutrients and other important vitamins, and all are well within the safe range. This is true even though RDA levels of these vitamins are also present in the multivitamin.

Meats are among the best sources of vitamin B6 but they are also high in iron. If people are avoiding meats (as some folks with hemochromatosis do ... more on that later) it is a very good idea to assure a generous intake of this vitamin from a supplement. (Note -- extra vitamin B2 -- riboflavin -- will make urine a very bright yellow. No problem.)

Vitamin B12 in food sources can be poorly absorbed because of decreased stomach acid production due to aging or because of the use of acid-blocking medications. Proton pump inhibitors are medications that suppress acid production in the stomach, and they have been shown to decrease absorption of inorganic iron for that reason. This effect has been employed in the management of hemochromatosis. However, people who use this kind of medication must be sure to take vitamin B12 in a supplement form, because the absence of stomach acid impairs absorption of vitamin B12 from food sources. The amount described earlier is fine ... the issue is that it must be in the crystalline form found in vitamin supplements, and one cannot rely on the vitamin B12 naturally present in animal foods. Inadequate vitamin B12 will limit production of red blood cells, so this is particularly important.

[Effect of proton pump inhibitors on vitamins and iron. Am J Gastroenterol. 2009 Mar;104(2 Suppl):S5-9. Proton pump inhibitors suppress absorption of dietary non-haem iron in hereditary haemochromatosis. Gut. 2007 Mar 7.]

Another possible but less common cause of vitamin B12 deficiency to be aware of is called “pernicious anemia.” This genetic condition is not corrected by the usual oral supplements because it impairs absorption of all forms of vitamin B12. It makes it necessary to provide vitamin B12 by another route, such as by an injection or with newer approaches like nasal sprays and sublingual (under-the-tongue) tablets.

Pernicious anemia has been reported in a patient with hemochromatosis although it is not clear that there is actually a greater risk in the hemochromatosis population. However, the incidence of hemochromatosis is only now recognized as being much higher than previously believed. Many people with hemochromatosis have gone undiagnosed so any increased risk associated with it would not have been carefully evaluated. I mention it here because an increased risk of pernicious anemia has been found among people with certain other metabolic conditions like Type 1 diabetes and celiac disease. Unrecognized pernicious anemia is very serious health problem but it is easy to correct if it is recognized.

[Association of familial pernicious anaemia and hereditary haemochromatosis. Acta Haematol. 2008;119(1):12-4. Association of hereditary hemochromatosis and pernicious anaemia Rev Med Interne. 2004 Oct;25(10):759-61.]

- C. Copper** is involved in transporting iron in the body. The RDA amount of copper in your multivitamin should be adequate to move iron from the storage areas to the hemoglobin factories. Just check the label to be sure that it **DOES** contain about 2 mg.
- D. Get adequate protein.** (More on this later.) The “globin” part of hemoglobin is made of protein, as are a number of substances (like “transferrin”) needed to move iron from the storage area to the bone marrow where the red blood cells are made. Protein is also central to the operations of everything in your body, so inadequacy is never a good idea. Most Americans eat a very generous amount of protein, but whenever one tries to follow a diet with a lot of exclusions, it is a good idea to check the appropriateness of protein in the diet.
- E. Get adequate (appropriate) calories.** Without adequate calories, the protein you eat will be burned as fuel to make energy instead of being used to make the important protein substances described above. It’s like living in North Dakota in the winter and running out of fuel . . . we start burning the furniture!

2. Generous antioxidants to decrease tissue damage from having extra iron on board:

One way that excessive iron causes serious injury is by a process called **oxidation**, the same process that causes metal tools to rust, and cooking oil to turn rancid. To prevent or minimize this kind of damage, the body has a need for substances that act as “**antioxidants**.” When people have a condition that causes increased oxidation, more antioxidant protection than usual is needed. This is true for hemochromatosis, but also for many other health conditions like diabetes, arthritis and MS. Additionally, infants who are born with iron overload (“neonatal hemochromatosis”) have demonstrated benefit from including antioxidant therapy in their treatment plan.

[Neonatal hemochromatosis: a case report. Adv Neonatal Care. 2009 Apr;9(2):72-6. Neonatal hemochromatosis: long-term experience with favorable outcome. Pediatrics 2006 Nov;118(5):2060-5. Antioxidant therapy in chronic liver diseases, Orv Hetil. 2006 June; 147(24):1113-8. Prediction of progression to cirrhosis by a glutathione S-transferase P1 polymorphism in subjects with hereditary hemochromatosis. Arch Intern Med. 2005 Sept;165(16):1835-40. Progress in treatment and outcome for children with neonatal haemochromatosis. Arch Dis Child Fetal Neonatal Ed. 2003 Mar;88(2):F124-7. Superficial siderosis of the central nervous system: pathogenetic heterogeneity and therapeutic approaches. Acta Neurol Scand. 2003 Jan;107(1):54-61. Iron toxicity and chelation therapy. Int J Hematol. 2002 Oct;76(3):219-28.]

Here are some suggestions for optimizing antioxidant defenses:

A. Vitamin E: Take a 400 iu capsule of this important antioxidant also called “alpha-tocopherol.” The “RDA” is 30 iu, but the RDA levels are designed to meet the needs of “98% of the healthy population,” This kind of general recommendation often does not apply when one is dealing with chronic health problems. The “natural” vitamin E products are usually more expensive than synthetic forms. The natural form of alpha-tocopherol will have the letter “d” in front of the name. Forms labeled “dl” are synthetic, and they have about ½ the strength of the d-alpha tocopherol. It appears, however, that there may also be advantages to using products that contain a natural source of “mixed tocopherols” instead of just d-alpha-tocopherol alone. These include substances like “gamma-tocopherol.” Vitamin E supplementation at high doses can interact with statin drugs, so as always, check with your doctor if you are taking these medications.

[The dose-dependent effects of chronic iron overload on the production of oxygen free radicals and vitamin E concentrations in the liver of a murine model. Biol Res Nurs. 2007 Apr;8(4):300-4. Anti-inflammatory properties of alpha- and gamma-tocopherol. Mol Aspects Med. 2007;28(5-6):668-91. Effects of alpha-tocopherol and mixed tocopherol supplementation on markers of oxidative stress and inflammation in type 2 diabetes. Clin Chem. 2007 Mar;53(3):511-9.]

There are supplements that provide “the mixed” form, and good food sources of mixed tocopherols are nuts, peanuts and the germ of grains. These food sources also contain generous magnesium and chromium, which is very beneficial. They contain some inorganic iron as well, but it is not absorbed efficiently enough to discourage eating these nutrient-rich foods. More on iron absorption later.

B. Selenium (part of a critically important antioxidant made in the body called “glutathione peroxidase”): Aim for 100-200 mcg/day. If your multivitamin has about the RDA level of 60 mcg (mcg is the abbreviation for micrograms), take a small 50 mcg tablet in addition. If your supplement has only a little (e.g. some products have none or only about 20 mcg), take two of the 50 mcg tablets. Some products already

have as much as 200 micrograms – in that case no additional selenium is needed. Selenium is potentially toxic: the recommended upper limit is 600 mcg/day, and the toxic dose is a chronic intake of 800 mcg/day. As you can see, the amount recommended here is not anywhere near the toxic level.

There is evidence that adequacy of selenium and vitamin E may work together to protect against some iron-overload-related heart muscle damage.

[The synergistic effects of vitamin E and selenium in iron-overloaded mouse hearts. Can J Cardiol. 1998 Jul;14(7):937-41]

Some areas have high amounts of selenium in the soil so people who eat plants or animals grown on that soil **may actually be getting too much selenium**. A good way to find out if your area is high in selenium is to ask the local county Agricultural Extension Service staff. Someone there will know whether a region has low selenium because farmers there have to add selenium to animal feed.

- C. **Eat lots of brightly colored fruits and vegetables.** Many of the pigments that give plants their colors are also very potent antioxidants. These substances are sometimes called “phytochemicals” – which just means “plant chemicals.” Examples that are being studied extensively now are lycopene in tomatoes, lutein in dark leafy greens, anthocyanins in blueberries and beets, and many others. Even seemingly colorless fruits and vegetables (such as onions, garlic and mushrooms) contain important antioxidants ... white and brown are also colors!

Plant pigments provide terrific antioxidant protection. For example, the antioxidant activity of lycopene in tomatoes is about 200 times that of vitamin E. Eating lots of fruits and vegetables has many other important health benefits. Interestingly, the iron that is found in leafy greens and many other plants is very poorly absorbed, so enjoy your spinach! (Factors affecting iron absorption will be discussed more later.)

- D. **Vitamin C issues:** Any acid substance like vinegar or vitamin C can enhance iron absorption from sources of inorganic iron (the form of iron in pills or plants.) That effect is a much less important as a source of iron than the highly absorbable and generous iron found in meat (especially red meat). In spite of this, people with hemochromatosis are often erroneously advised to stop taking all vitamin pills that contain vitamin C, and to avoid fruits and vegetables that contain it.

One person’s story: One man that I saw was so conscientious about following this advice (given to him elsewhere) that he had developed actual evidence of scurvy, the vitamin C deficiency disease! He was also deficient in many other nutrients because of his efforts to avoid vitamin C, and inadequacy of those nutrients made it impossible for him to make red blood cells. That meant that his phlebotomy treatments to remove extra iron had to be put on hold. His anemia (lack of red blood cells) also made him feel extremely weak and fatigued. His situation prompted me to write this paper.

In addition to the absorption of inorganic iron issue, there has been concern that high doses of vitamin C may become a “pro-oxidant” (the opposite of the usual antioxidant)

role) in situations in which iron stores are excessive or in conditions like alcoholism. This has not been identified as a problem by subsequent research. Your multivitamin should contain about 100 mg of vitamin C, and it is very likely safe to take an 100 – 200 mg of vitamin C in addition in supplement form. Some will also be provided by the fruits and vegetables and you are strongly encouraged to continue to eat them. If you take extra vitamin C as a supplement, take it with milk or cheese to minimize or negate any increase in absorption of iron from plants or pills (that is, inorganic iron.)

5. Foods to eat MORE of because they can decrease absorption of (inorganic) iron:

- A. **Dairy foods** are notoriously poor sources of iron that **also decrease absorption of the iron** in plants and pills taken at the same time. Drinking milk daily will also help to provide some of the vitamin D you need. A multivitamin provides 400 iu of vitamin D, and there is 100 iu of vitamin D in an 8-oz cup of fortified milk.) This is a reasonable amount for some people, **although people in the northern latitudes have been shown to need 1000-2000 iu. to assure adequacy because of the diminished ability to make vitamin D in the skin at high latitudes.** The higher risk of vitamin D deficiency is also associated dark skin, old skin, being indoors much of the time, sunscreen use, being covered up, or using seizure-control medications.

Vitamin D deficiency is now regarded as “an unrecognized epidemic” in the northern half of the USA and certainly in Canada. It is a big contributor to a wide variety of health problems. [See my Top Five Recommendations handout for more detail on this.] Other dairy foods like cheese and yogurt are often NOT supplemented with vitamin D, but they do help reduce iron absorption as milk does. If you are not fond of milk you can use these foods and you can easily add extra vitamin D as separate 400-2000 iu capsules to solve the important vitamin D problem.

New information about checking for vitamin D deficiency:

For everyone (and especially those with serious metabolism issues like hemochromatosis) it is a good idea to have a serum vitamin D level measured at least once in the winter every year. This is because the doctor will want to see whether a “maintenance” intake level is enough (1000-2000) or if the individual actually is vitamin D deficient and in need of a “therapeutic” or treatment amount to correct inadequacy before switching to the maintenance amount. This may be done several ways, but as an example, it may require 50,000 iu/week for 8 weeks.

As noted earlier, actual vitamin D deficiency is much more common than previously thought and it is very common in people with liver damage of the type associated with hemochromatosis. And although deficiency is very harmful it is also generally invisible except when we look for it with a blood test. The test is called a “25-hydroxycholecalciferol” level. [Vitamin D and parathyroid hormone in outpatients with noncholestatic chronic liver disease. Clin Gastroenterol Hepatol. 2007 Apr;5(4):513-20]

Back to the discussion of dairy foods:

Milk actually decreases absorption of iron, and each cup provides a nice 8 grams of protein. (Remember that ice cream, and most yogurt and cheeses do not have vitamin D added at this time.) Some types of yogurt have vitamin D added and others do not. Other than the ice cream, these foods do provide good protein, so milk, yogurt and cheese are good replacements for meat in meals. **For example, have a cheese sandwich instead of a meat sandwich**. An ounce of meat has 7 grams of protein but lots of easily absorbable iron. Cheese has the same amount of protein, and a cup of yogurt or milk has 8 grams of protein, but much less iron, and as noted above, in addition it interferes with iron absorption from other foods. Low fat or skim milk products are usually best for other reasons.

- B. Tea contains “tannins,” plant substances that bind (inorganic) iron in the intestinal tract very well and significantly reduces its absorbability.** This has been shown to be effective in hemochromatosis specifically (see the excerpt below.) Tea is looking good for a lot of other reasons as well (e.g. anti-cancer qualities, antioxidant properties,) in addition to having the marked effect of decreasing absorption of plant iron.

Clinical trial on the effect of regular tea drinking on iron accumulation in genetic haemochromatosis. Gut. 1998;43(5):699-704. “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. **Conclusions: Regular tea drinking with meals reduces the frequency of phlebotomies required in the management of patients with haemochromatosis.**”

- C. 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! These foods also contribute many terrific nutrients as well. Interestingly, broccoli is low in oxalate, so the iron and other minerals like calcium are pretty well absorbed from this vegetable. So, although broccoli is a leafy and green vegetable, and a very nutritious food, it does not decrease absorption of iron.
- D. Bran** (the fibrous outer part of grain) contains “**phytates**” which impair iron absorption as tannins and oxalates do.
- E. Eggs** Interestingly, although egg yolk used to be fed to infants as an iron source, the form of iron in eggs has been found to be very poorly absorbed. Eggs are an excellent source of protein (the protein in an egg is like 1 oz of meat) and other nutrients as well such as choline. Further, the egg white has most of the protein (6 of the 7 grams) and essentially none of the iron at all. So, substituting egg dishes for meats is another way to decrease the amount of iron available to absorb.

5. Things to eat LESS of (not necessarily to "never" eat):

- A. **Meats** of all kinds contain iron in an especially absorbable form called “**heme**” **iron**. This is also sometimes called “**organic iron**.” (Think of organic iron as coming from “organisms” – animals and not plants. Absorption of organic iron is not affected by the presence or absence of vitamin C or acid the way plant iron is. That means that severely restricting vitamin C is not at all effective in reducing absorption of the greatest sources of iron in foods, and as described earlier, it can cause harm.

Iron in the “organic” (animal) form is about 20% absorbed. Twenty percent absorption does not sound very high, but “inorganic iron” (the kind in supplements or plants) is less than 2% absorbed. Some plant forms of iron, in foods like spinach that contain oxalates, are only 0.025% absorbed!

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 other words, the iron found in chili beans will be much more easily absorbed if there is meat in the chili. This effect is called “**Meat Protein Factor**.”

Of all the food-related factors that affect iron absorption, limiting meat intake is one of the most influential, but even that appears to be less of an issue if a person is able to undergo phlebotomy regularly. And, as described earlier, maintaining a generous intake of all the OTHER nutrients needed to make red blood cells is key to being able to continue to have the phlebotomy treatments.

- B. Of the different types of meat, **liver is extremely high in very absorbable iron**, so it would be best to avoid it. This includes foods made from liver like paté, or liverwurst. Scandinavian/German “blood sausage” would also be a poor choice.
- C. **Red vs white meat:** Next to liver, red meat is the highest in absorbable iron, but unless phlebotomy is not working, complete avoidance of red meat does not appear to be necessary. Poultry and fish have much less iron than red meat, but what they have is still more than in plant foods, and like the iron in red meat, the iron is also well absorbed. Additionally, the white meat of chicken and turkey has less iron than dark meat. The iron content can be thought of as somewhat “color-coded” in meats. However, all meats have the ability to increase absorption of iron from OTHER foods in the meal as described above (the “Meat Protein Factor”)
- D. **Alcohol should generally be avoided.** Iron overload is a cause of serious liver injury, and alcohol can make the damage worse.

[Alcohol Clin Exp Res. 2007 Jan;31(1):138-43. Effects of alcohol consumption on iron metabolism in mice with hemochromatosis mutations. J Nutr Sci Vitaminol (Tokyo). 2004 Apr;50(2):78-86. Low dose-ethanol modulates toxic effect of iron-overloading in the liver.]

- E. Raw seafood:** As with people who abuse alcohol, people with hemochromatosis or anyone with potential liver damage from any cause should be especially careful to avoid raw seafood like raw oysters and sushi. It often contains micro-organisms of the “Vibrio” family that cause cholera and other serious diseases. It is extremely dangerous to anyone with liver problems, even in amounts that would be considered safe for other people.

[Necrotizing fasciitis from *Vibrio vulnificus* in a patient with undiagnosed hepatitis and cirrhosis. J Clin Microbiol. 2007 Mar;45(3):1058-62. *Vibrio vulnificus*-necrotizing fasciitis in patient with cirrhosis. Intern Med. 2007;46(3):143. A fatal case of *Vibrio vulnificus* septicemia from a nongulf state: a public health alert for patients with chronic liver disease. Am J Emerg Med. 2006 Sep;24(5):621-4. Chronic liver disease and consumption of raw oysters: a potentially lethal combination--a review of *Vibrio vulnificus* septicemia. Am J Gastroenterol. 2005 May;100(5):1195-9.]

- F. Sometime one can decrease iron intake by choosing a similar plant food that contains less iron.** The form of iron in all of the following foods is “inorganic” iron and therefore not highly absorbable, but the total amount in some of these foods make them less desirable products for people with hemochromatosis.

However, this suggestion is way down on the list in terms of importance as long as phlebotomy is working. I mention them here because invariably someone asks about them.

Iron-fortified foods: Example: “Quick” iron-fortified cream-of-wheat has over 15 mg iron per cup, but unfortified cream-of-wheat or oatmeal only has about 2 mg. Iron fortified foods 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.**

“**Enriched**” means that the iron was added back to the original level in a food after it was removed during processing. Enriched flour is an example of this.

“**Fortified**” means that the iron (or another nutrient) was added to achieve a level higher than would naturally be in the food. “Total” cereal is an example of this: 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 “Wheaties.”

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 is not the best choice of juice – it contains quite a lot of iron (over 9 mg per cup compared with about 1 mg per cup of other fruit juices.) It may have other effects as well. ☺

Iron Content of Food in General: The chart on the last page shows the iron content of a number of types of foods and some factors that affect its absorption. **As you can see, the foods that are highest in absorbable iron tend to also be highest in absorbable zinc, and vice versa.** This relationship is the reason that the multivitamin with minerals for people with hemochromatosis should provide the RDA level of zinc:

if people are cutting back on dietary iron, they will also be accidentally cutting back on zinc intake as well. This is particularly important because inadequate zinc can also impair the production of red blood cells needed for phlebotomy to continue.

6. Increased Absorption of lead

The same mechanism that results in excessive iron absorption appears to also increase risk of absorption of lead. Lead seriously injures **the brain and other organs, and is a great contributor to high blood pressure. It also can** contribute to hearing loss.

[Examples: Variants in iron metabolism genes predict higher blood lead levels in young children. Environ Health Perspect. 2008 Sep;116(9):1261-6. Low-level environmental exposure to lead and progressive chronic kidney diseases. Am J Med. 2006 Aug;119(8):707.e1-9.]

Sources of lead can include:

Calcium supplements made from oyster shells, bone or clay (dolomite.)

[Lead in pharmaceutical products and dietary supplements. Regul Toxicol Pharmacol. 2007;48(2):128-34. Lead content in 70 brands of dietary calcium supplements. Am J Public Health. 199 ;83(8):1155-60.]

Water from wells that have brass or bronze immersible pumps or water that flows through old lead pipes.

(For these reasons, a water filter that removes lead from the water would be a very good idea.) Drinking water is not a major contributor to total lead exposure ordinarily but it appears that lead in drinking water is probably absorbed more completely than lead in food. Adults normally absorb 35-50 percent of the lead they drink and the absorption rate for children may be greater than 50 percent. **People with hemochromatosis will absorb even**

more. [More information about lead in water, pumps and filters can be found at: <http://extoxnet.orst.edu/factsheets/leadpump.quest>]

Old lead-based paint and the dust from it when it disintegrates.

Older homes may have been painted with it, and paint chips and dust can be significant sources of lead. Remodeling and demolition work will stir up the lead to increase exposure via the lungs but indirectly through the digestive tract as well. The person with hemochromatosis will absorb much more than others exposed to the same situation.

Some imported pottery, pewter and lead crystal.

The lead content of crystal appears to only become a factor when acidic beverages are in contact with the lead in the crystal for quite a while, or if the lead crystal is used on a daily basis. However, many folks use it only about twice a year, so it is not a big problem to toast the New Year using the heirloom crystal. [Estimation of lead intake from crystalware under conditions of consumer use. Food Addit Contam. 2000;17(3):205-18. Lead migration from lead crystal wine glasses. Food Addit Contam. 1996;13(7):747-65.]

Miscellaneous Sources of Lead:

Although the issue of increased absorption of lead in hemochromatosis is related only to lead that is consumed, sometimes it is accidentally taken in via other routes. Here are a few examples to be aware of. Most are not common problems, but they are of interest:

Some Cosmetics:

There have been reports recently of lead being found in several brands of lipstick, and many women do end up swallowing quite a lot of lipstick. Another example is kohl, is a lead-based eye make-up common in other countries that finds its way to the US.

[<http://www.4woman.gov/faq/cosmetics.pdf>. www.safecosmetics.org;

[http://www.leadsafe.org/elements/uploads/files/fileManager/Cosmetics distributorceaseslead_basedeye_liner.pdf](http://www.leadsafe.org/elements/uploads/files/fileManager/Cosmetics%20distributor%20ceases%20lead%20based%20eye%20liner.pdf).]

Many folk remedies contain lead:

There is an excellent resource on line. [<http://www.oregon.gov/DHS/ph/lead/docs/homeremedies.pdf>.]

Hunting related: [Intoxication from an accidentally ingested lead shot retained in the gastrointestinal tract. Environ Health Perspect. 2005 Apr;113(4):491-3.]

Pica (a craving that results in eating or chewing on non-food items): [Pica-associated cerebral edema in an adult. J Neurol Sci. 2004 Oct 15;225(1-2):149-51.] Happily, “pencil lead” is not really lead so chewing on pencil lead will not lead to lead absorption from that source. However, based on recently identified problems with lead-based paint on toys and other products imported from China, it might be prudent for pencil-chewers to ask where that pencil came from before proceeding.

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.