Iron's Dangers

From the original article in 2006. Author: Ray Peat.

Q: You believe iron is a deadly substance. Why?

Iron is a potentially toxic heavy metal. In excess, it can cause cancer, heart disease, and other illnesses.

Q: Could you tell us about some of these studies?

In the 1960s the World Health Organization found that when iron supplements were given to anemic people in Africa, there was a great increase in the death rate from infectious diseases, especially malaria. Around the same time, research began to show that the regulation of iron is a central function of the immune system, and that this seems to have evolved because iron is a basic requirement for the survival and growth of cells of all types, including bacteria, parasites, and cancer. The pioneer researcher in the role of iron in immunity believed that an excess of dietary iron contributed to the development of leukemia and lymphatic cancers. Just like lead, mercury, cadmium, nickel and other heavy metals, stored iron produces destructive free radicals. The harmful effects of iron-produced free radicals are practically indistinguishable from those caused by exposure to X-rays and gamma rays; both accelerate the accumulation of age-pigment and other signs of aging. Excess iron is a crucial element in the transformation of stress into tissue damage by free radicals.

For about 50 years, it has been known that blood transfusions damage immunity, and excess iron has been suspected to be one of the causes for this. People who regularly donate blood, on the other hand, have often been found to be healthier than non-donors, and healthier than they were before they began donating.

In one of Hans Selye's pioneering studies, he found that he could experimentally produce a form of scleroderma (hardening of the skin) in animals by administering large doses of iron, followed by a minor stress. He could prevent the development of the condition by giving the animals large doses of vitamin E, suggesting that the condition was produced by iron's oxidative actions.

Excess iron's role in infectious diseases is now well established, and many recent studies show that it is involved in degenerative brain diseases, such as Parkinson's, ALS (Lou Gehrig's disease), Huntington's chorea, and Alzheimer's disease. Iron is now believed to have a role in skin aging, atherosclerosis, and cataracts of the lenses of the eyes, largely through its formation of the "age pigment."

Q: How does excess iron accelerate our aging process?

During aging, our tissues tend to store an excess of iron. There is a remarkably close association between the amount of iron stored in our tissues and the risk of death from cancer, heart disease, or from all causes. This relationship between iron and death rate exists even during childhood, but the curve is downward until the age of 12, and then it rises steadily until death. The shape of this curve, representing the iron burden, is amazingly similar to the curves representing the rate of death in general, and the rate of death from cancer. There is no other relationship in biology that I know of that has this peculiar shape, with its minimum at the age of 12, and its maximum in old age at the time of death.

One of the major lines of aging research, going back to the early part of this century, was based on the accumulation of a brown material in the tissues known as "age-pigment." The technical name for this material, "lipofuscin," means "fatty brown stuff." In the 1960s, the "free radical theory" of aging was introduced by Denham Harman, and this theory has converged with the age-pigment theory, since we now know that the age-pigment is an oxidized mass of unsaturated fat and iron, formed by uncontrolled free radicals. Until a few years ago, these ideas were accepted by only a few researchers, but now practically every doctor in the country accepts that free radicals are important in the aging process. A nutrition researcher in San Diego suspected that the life-extending effects of calorie restriction might be the result of a decreased intake of toxins. He removed the toxic heavy metals from foods, and found that the animals which ate a normal amount of food lived as long as the semi-starved animals. Recently, the iron content of food has been identified as the major life-shortening factor, rather than the calories. [Choi and Yu, Age vol. 17, page 93, 1994.]

Q: Exactly how much iron do we need to eat?

Children's nutritional requirements are high, because they are growing, but there are indications that in the U.S. even children eat too much iron.

Some researchers are concerned that the iron added to cereals is contributing to the incidence of leukemia and cancers of the lymphatic tissues in children. [Goodfield, 1984.] During the time of rapid growth, children are less likely than adults to store too much iron. At birth, they have a large amount of stored iron, and this decreases as they "grow into it." It is after puberty, when growth slows and the sex hormones are high, that the storage of iron increases. [Blood, Sept., 1976.] In a study of the "malnourished" children of migrant fruit pickers in California, these children who were "seriously anemic" were actually more resistant to infectious diseases than were the "well nourished" middle class children in the same region.

If the normal amount of dietary iron causes an increased susceptibility to infections even in children, and if a subnormal amount of iron slows the aging process, I think we are going to have to reconsider our ideas of nutritional adequacy, to look at the long range effects of diet, as well as the immediate effects. My current studies have to do with analyzing our ability to handle stress safely, in relation to our diet. I believe our nutritional recommendations for iron have to be revised sharply downward.

Q. Don't women need extra iron?

That's a misunderstanding.

Doctors generally don't realize that only a few milligrams of iron are lost each day in menstruation. The real issue is that you can hardly avoid getting iron, even when you try.

Women absorb iron much more efficiently than men do. From a similar meal, women will normally absorb three times as much iron as men do. When pregnant, their higher estrogen levels cause them to absorb about nine times as much as men. Every time a woman menstruates, she loses a little iron, so that by the age of 50 she is likely to have less iron stored in her tissues than a man does at the same age, but by the age of 65 women generally have as much excess iron in their tissues as men do. (During those 15 years, women seem to store iron at a faster rate than men do, probably because they have more estrogen.) At this age their risk of dying from a heart attack is the same as that of men. Some women who menstruate can donate blood regularly without showing any tendency to become anemic.

Since the custom of giving large iron supplements to pregnant women has been established, there has been an increase in jaundice of the newborn. It has been observed that women who didn't take iron supplements during pregnancy have healthy babies that don't develop jaundice. I have suggested that this could be because they haven't been poisoned by iron. Those supplements could also be a factor in the increased incidence of childhood cancer.

Q: Don't you need iron supplements if you are anemic?

In general, no.

Many doctors think of anemia as necessarily indicating an iron deficiency, but that isn't correct. 100 years ago, it was customary to prescribe arsenic for anemia, and it worked to stimulate the formation of more red blood cells. The fact that arsenic, or iron, or other toxic material stimulates the formation of red blood cells doesn't indicate a "deficiency" of the toxin, but simply indicates that the body responds to a variety of harmful factors by speeding its production of blood cells. Even radiation can have this kind of stimulating effect, because growth is a natural reaction to injury. Between 1920 and 1950, it was common to think of "nutritional growth factors" as being the same as vitamins, but since then it has become common to use known toxins to stimulate the growth of farm animals, and as a result, it has been more difficult to define the essential nutrients. The optimal nutritional intake is now more often considered in terms of resistance to disease, longevity or rate of aging, and even mental ability.

An excess of iron, by destroying vitamin E and oxidizing the unsaturated fats in red blood cells, can contribute to hemolytic anemia, in which red cells are so fragile that they break down too fast. In aging, red cells break down faster, and are usually produced more slowly, increasing the tendency to become anemic, but additional iron tends to be more dangerous for older people.

Anemia in women is caused most often by a thyroid deficiency (as discussed in the chapter on thyroid), or by various nutritional deficiencies. Estrogen (even in animals that don't menstruate) causes dilution of the blood, so that it is normal for females to have lower hemoglobin than males. Q. What should I do if my doctor tells me I'm anemic? Is there any situation in which a person needs to take iron supplements?

Iron deficiency anemia does exist, in laboratory situations and in some cases of chronic bleeding, but I believe it should be the last-suspected cause of anemia, instead of the first. It should be considered as a possible cause of anemia only when very specific blood tests show an abnormally low degree of iron saturation of certain proteins. Usually, physicians consider the amount of hemoglobin or of red cells in the blood as the primary indicator of a need for iron, but that just isn't biologically reasonable.

If a large amount of blood is lost in surgery, a temporary anemia might be produced, but even then it would be best to know whether the iron stores are really depleted before deciding whether an iron supplement would be reasonable. Liver (or even a water extract of wheat germ) can supply as much iron as would be given as a pill, and is safer.

Q. What foods contain iron?

Flour, pasta, etc., almost always contain iron which has been artificially added as ferrous sulfate, because of a federal law. Meats, grains, eggs, and vegetables naturally contain large amounts of iron. A few years ago, someone demonstrated that they could pick up a certain breakfast cereal with a magnet, because of the added iron. Black olives contain iron, which is used as a coloring material. You should look for "ferrous" or "ferric" or "iron" on the label, and avoid foods with any added iron. Many labels list "reduced iron," meaning that iron is added in the ferrous form, which is very reactive and easily absorbed.

Q.: Why does federal law require the addition of iron to those foods?

Industrially processed grains have most of the nutrients, such as vitamin E, the B vitamins, manganese, magnesium, etc., removed to improve the products' shelf life and efficiency of processing, and the government required that certain nutrients be added to them as a measure to protect the public's health, but the supplementation did not reflect the best science even when it was first made law, since food industry lobbyists managed to impose compromises that led to the use of the cheapest chemicals, rather than those that offered the greatest health benefits. For example, studies of processed animal food had demonstrated that the addition of iron (as the highly reactive form, ferrous sulfate, which happens to be cheap and easy to handle) created disease in animals, by destroying vitamins in the food. You should read the label of ingredients and avoid products that contain added iron, when possible.

Q: Can cooking in an iron frying pan put iron into food?

Yes, especially if the food is acidic, as many sauces are. The added iron will destroy vitamins in the food, besides being potentially toxic in itself.

Q: What about aluminum?

Aluminum and iron react similarly in cells and are suspected causes of Alzheimer's disease.

The aluminum industry started propagandizing more than 50 years ago about the "safety" of aluminum utensils, claiming that practically none of the toxic metal gets into the food. Recent research showed that coffee percolated in an aluminum pot contained a large amount of dissolved aluminum, because of coffee's acidity.

Q: What kind of cooking pots or utensils are safe?

Glass utensils are safe, and certain kinds of stainless steel are safe, because their iron is relatively insoluble. Teflon-coated pans are safe unless they are chipped.

Q: How do I know which stainless steels are safe?

There are two main types of stainless steel, magnetic and nonmagnetic. The nonmagnetic form has a very high nickel content, and nickel is allergenic and carcinogenic. It is much more toxic than iron or aluminum. You can use a little "refrigerator magnet" to test your pans. The magnet will stick firmly to the safer type of pan.

Q: Why is there iron in most multi-vitamin and mineral products?

Although several researchers have demonstrated that iron destroys vitamins, there is enough wishful thinking in industry, government, and the consuming public, that such mistakes can go on for generations before anyone can mobilize the resources to bring the truth to the public. 10 years ago, I thought it was a hopeful sign of increased awareness of iron's danger when the manufacturer of a new iron product mentioned in the Physician's Desk Reference that it hadn't yet been reported to cause cancer.

Q. I can't avoid all those foods, especially the bread and grains. What can I do to keep the iron I ingest from harming me?

Iron destroys vitamin E, so vitamin E should be taken as a supplement. It shouldn't be taken at the same time as the iron-contaminated food, because iron reacts with it in the stomach. About 100 mg. per day is adequate, though our requirement increases with age, as our tissue iron stores increase. Coffee, when taken with food, strongly inhibits the absorption of iron, so I always try to drink coffee with meat. Decreasing your consumption of unsaturated fats makes the iron less harmful. Vitamin C stimulates the absorption of iron, so it might be a good idea to avoid drinking orange juice at the same meal with iron-rich foods. A deficiency of copper causes our tissues to retain an excess of iron, so foods such as shrimp and oysters which contain abundant copper should be used regularly.

Q: How does copper help us?

Copper is the crucial element for producing the color in hair and skin, for maintaining the elasticity of skin and blood vessels, for protecting against certain types of free radical, and especially for allowing us to use oxygen properly for the production of biological energy. It is also necessary for the normal functioning of certain nerve cells (substantia nigra) whose degeneration is involved in Parkinson's disease. The shape and texture of hair, as well as its color, can change in a copper deficiency. Too much iron can block our absorption of copper, and too little copper makes us store too much iron. With aging, our tissues lose copper as they store excess iron. Because of those changes, we need more vitamin E as we age.

Summary:

Iron is a potentially toxic heavy metal; an excess can cause cancer, heart disease, and other illnesses.

Other heavy metals, including lead and aluminum, are toxic; pans and dishes should be chosen carefully.

Iron causes cell aging.

Drinking coffee with iron rich foods can reduce iron's toxic effects.

Use shrimp and oysters, etc., to prevent the copper deficiency which leads to excess storage of iron.

Avoid food supplements which contain iron.

Take about 100 units of vitamin E daily; your vitamin E requirement increases with your iron consumption.

Glossary:

Free radicals are fragments of molecules that are very destructive to all cells and system of the body.

Respiration refers to the absorption of oxygen by cells, which releases energy. The structure inside the cell in which energy is produced by respiration is called the mitochondrion. Oxidation refers to the combination of a substance with oxygen. This can be beneficial, as in normal respiration that produces energy, or harmful, as in rancidity, irradiation, or stress reactions. Antioxidants: Vitamin E and vitamin C are known as antioxidants, because they stop the harmful free-radical chain reactions which often involve oxygen, but they do not inhibit normal oxidation processes in cells. "Chain breaker" would be a more

suitable term. It is often the deficiency of oxygen which unleashes the dangerous free-radical processes. Many substances can function as antioxidants/chain breakers: thyroxine, uric acid, biliverdin, selenium, iodine, vitamin A, sodium, magnesium, and lithium, and a variety of enzymes. Saturated fats work with antioxidants to block the spread of free-radical chain reactions. Age pigment is the brown material that forms spots on aging skin, and that accumulates in the lens of the eye forming cataracts, and in blood vessels causing hardening of the arteries, and in the heart and brain and other organs, causing their functions to deteriorate with age. It is made up of oxidized unsaturated oils with iron.

Anemic means lacking blood, in the sense of not having enough red blood cells or hemoglobin. It is possible to have too much iron in the blood while being anemic. Anemia in itself doesn't imply that there is nutritional need for iron.

References

Allen, D. R., et al., "Catechol adrenergic agents enhance hydroxyl radical generation in xanthine oxidase systems containing ferritin: Implications for ischemia reperfusion," Arch. Biochem. Biophys. 315(2), 235-243, 1994.

M. Bartal, et al., "Lipid peroxidation in iron deficiency anemia--Reply," Acta Haematol. 91(3), 170, 1994.

R. J. Bergeron, et al., "Influence of iron on in vivo proliferation and lethality of L1210 cells," J. Nutrition 115(3), 369-374, 1985.

P. Carthew and A. G. Smith, "Pathological mechanisms of hepatic tumor formation in rats exposed chronically to dietary hexachlorobenzene," J. Applied Toxicology 14(6), 447-52, 1994.

Chen, Y., et al., "Weak antioxidant defenses make the heart a target for damage in copper-deficient rats," Free Radical Biol. Med. 17(6), 529-536, 1994.

J. J. C. Chiao, et al., "Iron delocalization occurs during ischemia and persists on reoxygenation of skeletal muscle," J. Lab. Clin. Med. 124(3), 432-438, 1994.

Choi, J. H. and B. P. Yu, "Modulation of age-related alterations of iron, ferritin, and lipid peroxidation in rat serum," Age 17(3), 93-97, 1994.

P. C. Elwood, "Iron, magnesium, and ischemic heart disease," Proc. of Nutrition Society 53(3), 599-603, 1994.

J. Goodfield, An Imagined World, Penguin Books, N.Y., 1984.

M. Galleano and S. Puntarulo, "Mild iron overload effect on rat liver nuclei," Toxicol. 93(2-3), 125-34, 1994.

E. C. Hirsch, "Biochemistry of Parkinson's disease with special reference to the dopaminergic systems," Mol. Neurobiol. 9(1-3), 135-142, 1994.

G. M. Kainova, et al., "Activation of endogenous lipid peroxidation in the brain during oxidation stress induced by iron and its prevention by vitamin E," Bull. Exp. Biol. & Med. 109(1), 43-45, 1989.

S. Kiechl, et al., "Body iron stores and presence of carotid atherosclerosis--results from the Bruneck study," Arterioscler. Thromb. 14(10), 1625-1630, 1994.

A. V. Kozlov, et al., "Role of endogenous free iron in activation of lipid peroxidation during ischemia," Bull. Exp. Biol. Med. 99(1), 1984.

D. J. Lamb and D. S. Leake, "Iron released from transferrin at acidic pH can catalyse the oxidation of low density lipoprotein," FEBS Lett 352(1), 15-18, 1994.

E. E. Letendre, "Importance of iron in the pathogenesis of infection and neoplasm," Trends in Biochemical Sci., April, 1985, 166-168.

V. M. Mann, et al., "Complex 1, iron and ferritin in Parkinson's disease substantia nigra," Ann. of Neurology 36(6), 876-81, 1994.

Z. Maskos and W. H. Koppenol, "Oxyradicals and multivitamin tablets," Free Radical Biol. & Med. 11, 669-670, 1991.

S. Ozsoylu, "Lipid peroxidation in iron deficiency anemia," Acta Haematol. 91(3), 170, 1994.

Pecci, L., et al., "Aminoethylcystein ketimine decarboxylated dimer protects submitochondrial particles from lipid peroxidation at a concentration not inhibitory of electron transport," Biochem. Biophys. Res. Commun. 205(1), 264-268, 1994.

M. Savoiardo, et al., "Magnetic resonance imaging in progressive supranuclear palsy and other parkinsonian disorders," J. Neural Trans. (suppl. 42), 93-110, 1994.

J. J. Strain, "Putative role of dietary trace elements in coronary heart disease and cancer," Brit. J. Biomed. Sci. 51(3), 241-251, 1994.

Vanrensburg, S. J., et al., "Lipid peroxidation and platelet membrane fluidity--implications for Alzheimer's disease?", Neuroreport 5(17), 2221-2224, 1994.

L. J. Wesselius, et al., "Increased release of ferritin and iron by iron-loaded alveolar macrophages in cigarette smokers," Amer. J. Respir. Crit. Care Med. 150(3), 690-695, 1994.

Transfusions: Amer. J. of Surgery 155, p. 43, 1988. *A Finnish study, two years ago, indicated that high iron stores may increase heart attack risk: In People magazine, 1994: "Is iron a killer?" Dr. Jerome L. Sullivan, director of clinical labs of Veterans Affairs Medical Center at Charleston, S.C., in 1983 proposed that excess iron contributes to heart attacks. University of Kuopio in Finland: Large-scale study (nearly 2,000 men, for up to five years; next to smoking, excess stored iron is the most significant identifiable risk factor for heart attacks. It is a stronger risk factor for heart attack than high blood pressure and cholesterol.

*Dec. 7, page 6E, Register Guard (Eugene, OR): US studies showed a weak connection between iron and heart disease, and a weak connection with the iron in red meat. Epidemiologists at the Pacific Northwest Laboratory in Washington have reported that the greater the concentration of iron in a person's blood, the greater his or her risk of cancer. Richard Stevens and his co-workers found the connection from examining cancer rates in more than 8,000 people who participated in the l971 National Health and Nutrition Examination survey. A second Finnish study with similar findings accompanied Stevens's report in the International Journal of Cancer, and suggets that there may be cause for concern. Register Guard (Eugene, OR), Jan. 16, 95; p 7A: Number of heart failures doubles, AP: 1982-92, heart disease death rate dropped 24.5%; number of cases of congestive heart failure doubled during roughly the same period. It killed 39,000 Americans in 1991, costs system

$40 billion per year. Cancer is the biggest killer of women under 64, heart disease far surpasses cancer in women of ages 65-84.