

Iron

Facts:

- ◆ Iron is an essential mineral that carries oxygen and forms part of the hemoglobin in the red blood cells and myoglobin in muscle.
- ◆ Iron is primarily stored in the liver, spleen, and bone marrow in the form of ferritin.
- ◆ There are two forms of iron: heme and non-heme. ¹ Heme iron (found in meat, poultry, fish) is 15 to 45 percent absorbed. Non-heme iron is absorbed more poorly than heme iron (about 1 to 15 percent) depending on iron stores and other factors (*e.g.*, ascorbic acid, phytic acid in whole grains and legumes, polyphenols in tea, coffee, or red wine, calcium, etc.)

Functions:

- ◆ Iron is involved in the production of hemoglobin and myoglobin. Hemoglobin carries oxygen from the lungs to the body.
- ◆ Iron is essential for many enzymes and is important for growth, proper cognitive function.
- ◆ Iron is vital in energy production and in maintaining an optimal immune system.

Requirements:

The RDA for iron in women is higher than it is for males due to menstruation, pregnancy, poor iron intake. The RDAs for iron are as follows²:

Category and Age:	RDA (milligrams):
Infants: birth-6 mos.	6 mg
6 mos.-10 yrs	10 mg
Adolescent Males: 11-18 yr.	12 mg
Adolescent Females and Women: 11-50 yr. old	15 mg
Men (18+) and women over 50	12 mg
Pregnant	30 mg
Lactating	15 mg

Signs of Deficiency:

Iron deficiency is one of the most common mineral deficiencies in the world.¹ It can result from intestinal bleeding, excessive menstruation, etc. A diet high in phosphorous, poor digestion, long-term illness, ulcers, strenuous exercise, excessive perspiration, insufficient amounts of hydrochloric acid in the stomach and prolonged use of antacids all contribute to iron deficiency.³ Symptoms include: anemia, brittle hair and nails, cognitive impairment, digestive disturbances, dizziness, fatigue, fragile bones, hair loss, inability to concentrate, inflammation of tissues of the mouth, intolerance to cold, paleness and a general lack of well-being.¹⁻³ It is estimated that in women 20-49 years of age, iron deficiency anemia affects 5 percent of this group. In children, iron deficiency is associated with behavioral abnormalities and reduced cognitive performance (see below).⁴

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Interactions:

Moderate to large amounts of calcium, zinc, and vitamin E can interfere with the absorption of iron.^{1,3} Copper, manganese, molybdenum, vitamin A and B-complex vitamins also play an essential role for complete iron absorption.³ Vitamin C also enhances the absorption of iron.

Safety:

Iron supplements are not safe for people with iron storage disorders including hemosiderosis, idiopathic hemochromatosis, or thalassemias.⁴ Treatment of iron deficiency should only be done under medical supervision.

Pregnant women and nursing mothers should not take supplemental doses of iron higher than RDA amounts, unless recommended by a physician.

Iron can be fatal to children if taken in an overdose.

Signs of Toxicity:

High levels of iron can lead to increased production of free radicals within the body. Excessive amounts of iron have been linked with heart disease and cancer.

Current Research:

Cellular Function: In an iron-deficient state, iron-starved cells can shut down the activity of more than 80 genes in order to conserve what little iron there is in the body and still maintain essential physiological functions. Some of the genes damaged by iron deficiency are necessary for energy, protecting cells from free radicals, and copying cell's genetic code.⁴

Cognition: An iron deficiency in infancy can adversely affect one's sight and hearing years later even if the deficiency was corrected, according to researchers at the University of Michigan and the University of Chile. Researchers studied 84 Chilean children; 41 of whom had been diagnosed with iron-deficiency anemia in infancy while 43 had not. Researchers measured the children's response times to visual and auditory stimuli and found the children who had been iron-deficient as infants had a slower response time.⁵

Energy, Exercise, and Endurance: Iron supplementation can improve exercise performance. Animal studies have discovered that endurance capacity increased more than three-fold after iron supplementation.⁵ In women on low-calorie diets, supplemental iron has been reported to be of benefit.⁵

Immunity: Iron helps to ward off infections, according to researchers at Boston University. It enables phagocytes, or white blood cells, to defend the body against bacterial infections. Phagocytes depend on the oxygen iron brings in order to produce substances to kill bacteria. In addition, lymphocytes and the production of antibodies also depend on iron.⁷ Iron is also important in the case of viral infections.

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Cold Tolerance: In animal studies, anemic rats exposed to 39 degree Fahrenheit temperatures for 24 hours became ill compared to non-anemic rats who were more tolerant to exposure. In addition, the anemic rats displayed lower body temperatures, reduced oxygen consumption, reduced thyroid activity and less metabolic activity.⁷ This finding is backed by research conducted at the USDA Grand Forks Human Nutrition Research Center that the body's requirements for water, energy, minerals, and trace minerals increase during cold weather. The reason is that the body has to expend additional resources in order to maintain its core temperature in the cold. According to James Penland, deficiencies in iron, zinc, and copper impair thermoregulation. Studies conducted at Pennsylvania State University and the Grand Forks Human Nutrition Research Center have shown iron-deficient adults are unable to maintain their core body temperature when exposed to cold water and air versus people with normal iron status and equivalent body weight. In study subjects, iron supplementation improved one's ability to maintain core body temperature in the cold. The study demonstrates the importance of iron in thermoregulation. Incidentally, deficiencies in pyridoxine and thiamine may also impair the muscle activity involved in shivering.⁹

Spina Bifida: Women who do not consume enough iron, magnesium, and niacin may be five times more likely to give birth to a baby with spina bifida. Scientists comparing the nutrient intake of 106 mothers with spina bifida babies versus women who gave birth to healthy babies found that the mother of spina bifida babies had lower intakes of iron (6 percent), magnesium (6 percent), and niacin (10 percent).¹⁰ Further research, however, is needed.

References:

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