ipomoea have hallucinogenic properties, others, such as *I. batatas,* are cultivated and the tuberous roots eaten as a vegetable. The nutritious sweet potato (whose leaves are also considered a vegetable) provides feed for livestock and a stomach, spleen and kidney tonic prescribed by Chinese practitioners. Kangkong, both vegetable and medicine, is thought to be a tonic, laxative and food-poisoning antidote. The seeds of *I. hederacea* induce menses and abortion and counteract constipation, intestinal worms and scanty urine. The plant itself is used as a purgative.

In Ayurvedic medicine, vidari-kanda (*Ipomoea digitata*) provides a nutritive tonic, diuretic and aphrodisiac.

Irish moss (carrageenan) A colloid (a substance whose particles are distributed throughout another substance), named after Carragheen (near Waterford), Ireland. The colloid is extracted from red algae and used commercially as a food stabilizer or thickener. In Ayurvedic and other herbal medicine, Irish moss—*Chondrus crispus,* of the Gigartinaceae family—is nutritive because of its iodine, amino acids, polysaccharides and other biochemical constituents, and considered an effective demulcent, emollient, tonic, antitussive and laxative. Herbalists prescribe Irish moss for patients suffering from lung irritations and diseases, dry throat and cough, ulcers and dysentery. Ayurvedic practitioners believe Irish moss to be a sweet, heating agent with nutritive, demulcent and emollient capabilities.

iron A metallic element commonly found in soil, combined with other minerals and as salts and in mineral waters. Widely used in medicine, it is essential in humans for hemoglobin, cytochrome and other enzymes essential for life. Its chief roles are in the transport of oxygen to the tissues and in oxidation reactions in the cells.

As much as 30 percent of iron is stored in the spleen, liver and bone marrow as ferritin and hemosiderin. Iron is absorbed from the intestinal mucosa or lining and regulated by a complex balance between total iron stores, the amount and type of iron in food and by other dietary factors. Although the ability to absorb more iron increases in the presence of iron deficiency, eventually there may be insufficient dietary supply to keep up with iron loss to prevent anemia.

Historical Background

Iron has been known since ancient times and used in tools and weapons. In the Egyptian Ebers papyrus, an ointment containing rust is mentioned as a treatment for baldness. Male impotency was treated with an iron and wine solution in early Greece. In the 17th century, chlorosis, a condition later recognized as being related to iron deficiency, was treated empirically with iron. Chlorosis, a disorder in which the skin turns greenish-yellow, frequently seen in adolescent females in the past, is rare today.

A case of iron overload was first described in 1871. Although the first nutritional study on iron deficiency was reported in 1895, it was not until 1932 that the value of iron therapy was proven.

Recommended Dietary Allowances (RDA)

The RDA for iron is based on achieving iron stores of 300 mg to meet the nutritional requirements for healthy people. That level of stored iron is sufficient for several months of an iron-deficient diet. To maintain adequate stores, the RDA for healthy menstruating adolescent and adult women is 15 mg daily. The RDA for postmenopausal women and adult men is 10 mg daily.

The daily dietary allowance of 1.0 to 1.5 mg of iron per kilogram of body weight should be sufficient for most infants. During pregnancy, an estimated total requirement of 1,040 mg of iron is needed to allow for an expanding need for mother, placenta and fetus. Although there is no need for routine supplementation during the first trimester, additional iron is necessary during the later stages of pregnancy. An average increment of 15 mg daily throughout pregnancy should satisfy the requirements of most women.

A diet needs to contain 30 to 90 grams of meat, poultry or fish, all of which provide heme iron, a complex molecule that is highly absorbed. Ascorbic acid (vitamin C) found in plant foods improves the absorption of nonheme iron and is beneficial for people not consuming adequate animal protein. However, there is probably no benefit to adding vitamin C to the easily absorbed ferrous-sulfate form of iron found in most supplements.

TABLE 20 MOST COMMON CAUSES OF IRON DEFICIENCY IN THE UNITED STATES

Stage of Life	Cause
Early childhood (6 months–4 years)	Low iron content of milk inadequate to meet needs of rapid growth
Adolescence	Rapid growth requires increasing number of red blood cells
Childbearing age	Menstrual blood loss
Pregnancy	Expanding blood volume of mother, fetus and placenta; blood loss at delivery
Women peri- or post-menopausal	Abnormal vaginal bleeding (cancer must be ruled out)
Adult men and post-menopausal women	Abnormal blood loss from gastrointestinal tract (cancer must be ruled out)

Deficiency

As iron deficiency progresses, iron stores are at first diminished without functional impairment. Eventually there is a reduction in quantity of erythrocytes, or red blood cells, and hemoglobin, and the red cells become smaller than normal. The World Health Organization has established that anemia occurs when hemoglobin concentration falls below 13 grams/decaliter in adult men and 12 grams in nonpregnant women. During pregnancy 11, 10.5 and 11 grams of hemoglobin respectively, for the first, second and third trimester, are the lower levels of normal.

Iron deficiency may result in reduced physical tolerance even before a fall in hemoglobin is seen. Changes in several constituents of the immune system may also occur, although resistance to infection is questionable. Children may experience apathy, attention deficit, irritability and difficulty learning.

Iron is also essential, with protein, vitamin E and zinc in the metabolism of vitamin A. A high calcium intake may interfere with the absorption of iron and other minerals.

Dietary Iron and Supplements

Iron supplements are preparations or natural sources of the mineral iron that are added to the diet, especially in the incidence of anemia or other indication of iron deficiency. The only times that iron supplementation are recommended for healthy people is during infancy and pregnancy. However, because of poor dietary habits, many menstruating women should probably take iron supplements also. The average American diet fails to provide adequate iron during pregnancy, and these women should receive daily supplements of 15 mg. Although menses is usually absent during lactation, nursing mothers should continue taking iron supplements for about three months postpartum because of the blood loss during delivery.

In the United States wheat flour is enriched with 20 mg of iron per pound. In Sweden and some other countries, an even greater amount of iron is added. Since ferrous sulfate imparts an undesirable taste to bread, reduced metallic iron is used. However, this form of iron is not well absorbed, and commercially available bread is now about equal to beef in iron content but only 1 to 12 percent of the iron is absorbed by normal persons. Iron-deficient individuals do absorb a somewhat greater amount.

The second National Health and Nutrition Examination Survey (NHANES II), reported in 1987, showed that not only did supplement-takers consume greater quantities of vitamin C, fruits and vegetables than non-supplement users, but users of vitamin supplements with iron did not have significantly higher levels of iron in their bodies than non-users.

Once the cause of iron deficiency has been found and corrected, the anemia is usually easily corrected by the oral supplementation of iron salts, usually ferrous sulfate. Ferrous sulfate is easily absorbed, and about 20 percent of the iron in each tablet is absorbed. This salt is the standard by which other iron salts are measured. Large quantities of vitamin C increase absorption of iron. Constipation and gastric upset are the most frequent adverse effects of iron supplements. Iron-deficient persons who require full therapeutic doses should start with one tablet daily and gradually increase to the full adult dose of three tablets daily. Most persons can tolerate the 40 to 50 mg of elemental iron required. There may be a vast difference in cost for various iron preparations, but there is little if any therapeutic benefit to the more expensive forms.

If ferrous sulfate causes sufficient gastric irritation to be intolerable, ferrous succinate, lactate, fumerate, glycine sulfate, glutamate and gluconate are absorbed almost as well as the sulfate form, but none are clearly superior. Ferric iron salts, however, are less well absorbed.

Although ascorbic acid increases absorption of iron, preparations that combine iron with vitamin C, molybdenum, copper, cobalt, folic acid and vitamin B_{12} are more expensive and may have some other disadvantages. Enteric-coated and timed-release iron preparations should be avoided, because they release the iron in the area of the small intestine with a lower rate of absorption, or may pass through the intestine too quickly to be absorbed at all.

Liquid iron preparations are available for children and the dosage requirement is generally half the adult dose for weights from 30 to 80 pounds of body weight and full adult dose over 80 pounds. Liquid iron sulfate should be sipped through a straw to prevent staining of the teeth. It is essential to take iron supplements for a minimum of six to 12 months to provide for the replenishment of the body iron stores that are diminished in the presence of anemia. In the case of chronic blood loss, continuous iron supplementation may be necessary.

Iron dextran (Imferon) injections are rarely required and should be reserved for those persons who are unable to tolerate or absorb oral tablets. Those conditions that may require the intramuscular or intravenous routes for giving iron include: malabsorption disorders such as ulcerative colitis, Crohn's disease, colostomy or ileostomy patients or those rare persons whose iron stores are so severely depleted that large amounts of iron must be administered urgently. Rarely, large doses of injected iron dextran have been reported to cause formation of a sarcoma, a form of malignant tumor. Therefore, injectable iron should be reserved for those persons whose need is absolute.

Toxicity

In normal persons, the possibility of iron toxicity from food sources is remote. In the past there were reports of poisoning from home brews made in iron vessels. However, there are approximately 2,000 cases of iron poisoning in the United States each year from supplements. Most of these occur accidently in children. Three grams of ferrous sulfate, or about nine tablets, can cause death in a two-year-old child.

Primary hemochromatosis is an inherited metabolic disorder in which excessive iron accumulates in the tissues, causing cirrhosis of the liver, congestive heart failure and bronze pigmentation of the skin. Less commonly, there are several acquired forms, one of which can occur from excessive blood transfusions (see HEMOCHROMATOSIS).

Iron supplements cause a grayish-black stool that should be distinguished from the black, tarlike stool that occurs from a bleeding ulcer.

ironweed A flowering perennial, *Veronica fasciculata,* of the Compositae family, found on prairies, riverbanks and roadsides in the eastern, southern and some western parts of the United States, whose bitter root and leaves are used in Native American medicine as treatment for various gynecological problems, chills and bilious fever, scrofula, dyspepsia and syphilis.

isoniazid Antimicrobial drug used in the treatment of tuberculosis. However, peripheral neuritis is a common adverse affect that can be prevented by taking pyridoxine (vitamin B_6).

ivy American (woodbine, Virginia creeper, wild wood vine) A flowering, fruit-bearing vine, *Vitis quinquefolia,* of the Vitaceae (grape) family, considered in Native American and homeopathic medicine to be a tonic, expectorant and astringent. The bark and twigs are prepared as a syrup, which is prescribed for scrofula, dropsy, cholera, hoarseness, hydrocele and lung diseases.

ixora Evergreen trees or shrubs, both cultivated and wild, of the Rubiaceae family, such as *Ixora chinensis,* named after a Malabar (from the Malabar Coast, a region of southwest India) god and used by Chinese practitioners to treat rheumatism, pain, abscesses and contusions.