

**IRON DEFICIENCY:
A Common Cause of Anemia During Childhood
A Guide for Parents**

The purpose of this document is to give you information about iron deficiency anemia during infancy, childhood, and adolescence. Iron deficiency anemia is a low blood count caused by having too little iron in your body. Here you will learn about the importance of iron in the red blood cell and in other parts of the body, the ways that a child can become iron deficient, the treatment of iron deficiency, and the importance of prevention and early diagnosis. This information should supplement what you learn from your physician and the brochure "Anemia: A Guide for Parents" (request a copy from us if you desire to have one).

What is Iron and How and Why is it Important in the Body?

Iron is a mineral that is abundant in the soil, rocks, and throughout the earth's crust. Iron is very important in the human body. It is a major component of hemoglobin, the protein that makes the blood red and which carries oxygen throughout the body. In iron deficiency the hemoglobin is low (i.e., the child has anemia). Moreover, since iron is present in the muscles, brain, liver, and other parts of the body, children with iron deficiency may suffer from other problems in addition to anemia.

How does Iron Get Into the Body?

Our bodies get iron from the food we eat. After being swallowed the iron passes through the stomach into the intestine, where it is absorbed into the bloodstream and taken to the bone marrow, where the red blood cells are made, and to other tissues. Some foods contain more iron than others (Table 1). Iron is most plentiful in meat and some vegetables

Table 1: Iron in Foods
<ul style="list-style-type: none">• Foods Rich in Iron: Meat, Fish, Beans, Spinach, Iron-Fortified Formula & Cereals• Foods Poor in Iron: Milk, Most Fruits & Vegetables

The amount of iron in a food that is absorbed by the intestine depends upon a number of factors, especially other foods that the child is eating.

What are the Causes of Iron Deficiency?

There are only four ways a person can become deficient in iron (Table 2). The most common cause in infants and young children is there not being enough iron in the food they eat, which is usually due to drinking too much whole cow's milk. Whole milk contains very little iron. A second cause is bleeding – the loss of blood (and the iron that is in blood) from the body. In young children this occurs most commonly as a result of nosebleeds or bleeding from the intestines (which often causes the stools to have bright red blood in them or to look black). Sometimes bleeding can occur from other sites. In teenage girls, loss of iron from heavy or prolonged menstrual periods is a common problem. A third but less common cause of iron deficiency is reduced absorption of iron from the intestines – that is, the intestines don't "pick up" enough iron and carry it into the bloodstream even though the child may be eating enough iron in his or her diet. This sometimes occurs in children with intestinal disorders. A fourth but very important cause of iron deficiency in babies is being born with not enough iron. This often occurs in premature and other low-birth-weight infants but also can result from hemorrhage at the time of birth.

Table 2: Causes of Iron Deficiency
<ul style="list-style-type: none">• Not enough iron in diet• Loss of blood from the body• Decreased iron absorption by the intestine• Decreased iron in the body at birth <p><i>Most causes of iron deficiency during childhood are due to one or more of these four causes</i></p>

What is the Association Between Cow’s Milk & Iron Deficiency?

By far the most common cause of iron deficiency in young children (typically between twelve months and three years of age) is drinking too much milk (i.e., homogenized whole, 2%, or skim milk purchased in the refrigerator section of the grocery store). Many parents believe that milk is a very good source of nutrition for their child. However, as some have said, “cow’s milk is great for little cows, but not necessarily for little people.” The preferred milk for babies is human breast milk or a packaged formula containing supplemental iron.

Drinking a lot of cow’s milk can cause iron deficiency for several reasons (Table 3). First, milk of any kind contains very little iron. Second, the small amount of iron in cow’s milk is poorly absorbed or taken up by the intestine. Third, the presence of milk in the stomach and intestines can actually prevent the absorption of iron from meat and other foods. A stomach full of milk may also result in the child losing his or her appetite for other more nutritious foods that contain more iron. Finally, there is a substance in whole cow’s milk that can injure the intestines and actually cause bleeding. This blood loss, which is related to the amount of milk that the child drinks, can further worsen the iron deficiency.

Table 3: Why Taking More Than 16 to 20 Ounces of Cow’s Milk May Result in Iron Deficiency
<ul style="list-style-type: none">• Milk has very little iron• The small amount of iron in cow’s milk is not taken up by the intestine• Milk prevents iron in other foods from being absorbed by the intestine• Cow’s milk may lead to bleeding from the intestine

How Effective is Breast Feeding in Preventing Iron Deficiency?

Like cow’s milk, human milk from the breast also contains very little iron. The important difference is that the iron in human breast milk is taken up much better by the baby’s intestines, so iron deficiency is much less common when babies are breast-fed. However, mothers who exclusively breast feed their infants beyond six months of age must add some iron to their infant’s diet (such as iron drops, iron fortified cereals, or iron fortified formula) to prevent iron deficiency.

What About Packaged Infant Formulas?

If a mother is not going to breast feed, one of the packaged infant formulas made from cow’s milk (such as Similac or Enfamil) or soy protein (such as Isomil) should be used during the first years of life. All of the soy formulas, and most of the cow’s milk-based formulas, contain adequate iron. Thus, babies who take an iron-containing formula and who don’t drink cow’s milk before twelve months of age or large quantities of cow’s milk after that time rarely develop iron deficiency.

What are Some Other Good Sources of Iron for Infants & Young Children?

In addition to iron-fortified formulas, infant cereals are excellent sources of iron. Two one-half ounce servings daily provide adequate iron to prevent iron deficiency. Moreover, as indicated above, red meat such as beef and pork contain a lot of iron.

How Is Iron Deficiency Diagnosed?

Your doctor can diagnose iron deficiency anemia on the basis of signs and symptoms of anemia (pale skin, tiredness, listlessness, irritability, weakness, etc.) or because the child has a specific symptom of iron deficiency – pica. A child with pica eats things that are not food, including dirt, clay, paper, clothing items, hair, ice, etc. Pica results from deficiency of iron in the brain. Pica may lead to constipation and abdominal pain. It also causes lead poisoning if there is excessive lead in the substances that the child is eating. Usually pica disappears after beginning treatment with iron.

In addition to various symptoms, your doctor will often consider the possibility of iron deficiency on the basis of your child’s history (age, diet, excessive bleeding, etc.).

Too little iron in the body occurs weeks to months before anemia develops. Usually, however, iron deficiency is not identified until anemia develops. Anemia, or a reduced red blood cell count, is measured by the hemoglobin concentration. The normal hemoglobin concentration during infancy and childhood is 11.0 gm/dl or more. In mild iron deficiency anemia, the hemoglobin is between 9.0 and 11 gm/dl, but severely affected children have hemoglobin values lower than 6 gm/dl. The anemia can become very serious and potentially life-threatening if the hemoglobin is lower than 4 to 5 gm/dl.

Children with iron deficiency anemia nearly always have small red blood cells, as measured by the mean corpuscular volume or MCV test (part of the blood count). The normal MCV during childhood is greater than 70 fl. Children with iron deficiency typically have MCV values between 45 and 70 fl. Another abnormal part of the blood count in children with iron deficiency is the red cell distribution width or RDW. The normal value is 12 to 15%. Children with iron deficiency have elevated RDW values (usually between 17 and 30%).

In most cases, a blood count is the only test required to diagnose iron deficiency. However, in difficult or unusual circumstances, other tests may be performed. These include a serum ferritin measurement (which is usually low in iron deficiency), a measurement of serum iron (which is almost always low), and a test for total iron binding capacity (TIBC), which is usually elevated. If thalassemia, infections, or other disorders are suspected rather than or in addition to iron deficiency, more laboratory tests and x-rays may be performed.

How is Iron Deficiency Tested?

Treatment for iron deficiency treatment is usually quite easy and nearly always effective in raising the child's hemoglobin level and restoring him or her to improved health. There are two steps in treatment (Table 4).

First, the cause of the iron deficiency must be identified and corrected. This includes reducing the amount of whole cow's milk in the diet, improving nutrition, and identifying and eliminating excessive blood loss from the body. Initially your child may be unhappy at having less milk during the day or not having the trusty bottle of cow's milk at night. However, if you give water, juice, and nutritious foods instead, your child will quickly forget how dependent he or she was on cow's milk.

The other aspect of treatment is iron therapy. Iron deficiency cannot be treated with a high-iron diet (such as plenty of meat) or vitamins supplemented with iron. Much larger quantities of iron are necessary, such as those found in liquid iron medications or pills. The type and amount of iron prescribed will vary depending upon the age of the child and severity of the iron deficiency anemia.

Table 4: Treatment of Iron Deficiency
<ul style="list-style-type: none">• Correct the cause (poor diet, excessive bleeding, etc.)• Iron therapy with ferrous sulfate or occasionally with other medications such as Niferex or ICAR <p>Types of ferrous sulfate medication:</p> <ul style="list-style-type: none">• Drops (25 mg of iron per cc)• Suspension (18 mg of iron per 5 cc)• Elixir (44 mg of iron per 5 cc)• Pills (65 mg of iron per 325 mg tablet)

Many different kinds of iron can be given. Although some iron medicines can be purchased without a prescription, others require a doctor's prescription. The most common type of iron medicine is ferrous sulfate. It is the least expensive and is usually quite effective. More costly but sometimes preferred (since it may be easier on the stomach) is an iron-sugar mixture called Niferex. Another iron preparation, ICAR, is sometimes prescribed because it is grape flavored and tastes better than the

alternatives, but it often seems not to be effective. On rare occasions it is necessary to give iron by injection into the vein. However, this form of iron therapy can be expensive and cause side effects.

Iron medication is taken from one to three times a day, as specified by your physician. In severe cases a blood count may be checked one week or so after treatment begins. By this time the child's symptoms (irritability, pica, etc.) have usually improved. Within a week there is usually a rise in the child's hemoglobin value and reticulocyte count, a test that measures the production of new red blood cells by the bone marrow. Whether or not the blood count is checked after a week or two, a blood count is typically performed about six weeks after starting iron therapy. By this time the anemia should be almost fully corrected. However, the treatment does not end there. An additional two or four months of iron treatment (sometimes at a lower dose) is required to be sure there is enough iron in all parts of the body. Usually another blood count is performed at the end of or shortly following therapy to be certain that all is well.

What are the Side Effects of Iron Therapy?

Many children who take iron have no side effects. However, it is common for liquid iron medicines to temporarily stain the teeth and cause the stools to become dark. These are not serious problems. The teeth staining disappears after the iron is discontinued. Some children receiving iron therapy have mild stomach aches and occasional constipation. If this is a problem, please consult your doctor so that the dose or preparation can be changed. Most iron medicines don't taste very good, so you will have to be creative in "hiding" the iron medicine in juice and other of your child's favorite foods.

It is critical that the iron medicine be kept in a safe place so that your young child does not take the iron all at once. This can be extremely dangerous. Some children die each year as a result of iron overdose.

How Can Iron Deficiency be Prevented?

It is much better to prevent iron deficiency than to treat it after it occurs. Iron deficiency can be prevented by breast feeding for the first six months of life (followed by some type of iron supplementation if breast feeding is continued), use of an iron-fortified formula for the first year of life, avoidance of too much (greater than 16 to 20 ounces a day) whole cow's milk at any age, and a healthy nutritious diet that contains many iron containing foods. Individuals at high risk of iron deficiency – such as premature infants, children whose diets are inadequate, teenage girls with heavy menstrual periods, etc. – should be checked for iron deficiency and if necessary receive iron supplements.

Can Iron Deficiency be Harmful?

The lack of iron in the red blood cells, brain, and other parts of the body can be harmful. Iron deficiency may result in abnormal behavior, lethargy, irritability, and even brain damage. However, most or even all of these problems disappear after correction of iron deficiency.

Conclusion

We hope that this information has been helpful to parents, grandparents, and others who care for a child with iron deficiency as well as to students, residents, and primary care physicians. If you have questions or comments, please contact one of the physicians or hematology nurses at the Center for Cancer and Blood Disorders at (214) 456-2382.

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