Iron

What is Iron?

Present in all cells of the human body, iron is a mineral that has several vital functions. As the major part of hemoglobin in red blood cells, it carries oxygen from the lungs to all parts of the body and facilitates oxygen use and storage in muscles. Every cell in the body needs iron to produce energy.

What is Iron Deficiency?

When a person has used up the iron stored in her body, she is said to be "iron deficient." Iron deficiency doesn't always result in anemia, but it may cause other health problems such as lethargy or a weakened immune system. Iron deficiency occurs when the diet does not include enough iron rich foods, if there is blood loss, or if there is an increased need for iron in the body, such as during adolescence and pregnancy.

When the body does not get enough iron, it cannot make enough red blood cells to adequately carry oxygen throughout the body. The condition of having too few red blood cells is called "anemia." A person with anemia may look pale and feel tired. Severe anemia can lead to an irregular or increased heart rate as the heart must pump more blood to make up for the lack of oxygen.

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Nutrition and Physical Activity
Guidelines for Adolescents

Inside this Section

Adolescent girls are at high risk for iron deficiency because they often have diets lacking iron and because they lose iron during menstruation.[1] Iron deficiency is the most common cause of anemia[2] so adequate intake of iron should be encouraged.

According to the 2010 Pediatric Nutrition Surveillance for California, approximately 14% of low-income adolescent girls and 13.1% of low-income boys have low hemoglobin or hematocrit, indicators of anemia. Racial/ethnic breakdowns of anemia indicate that among those 15-19 years of age, African-American girls (28.9%) and boys (26.0%) have the highest prevalence. Pacific Islander boys (17.9%) and girls (16.0%) have high prevalence of anemia indicators.[3]

More racial/ethnic breakdowns are available here.

Due to the high prevalence, it is important to address adequate iron intake with all adolescents.

Adolescent athletes with low body stores of iron may be at risk of anemia; intensive or excessive exercise can cause iron to be excreted through the gastrointestinal tract.

What are the Consequences of Iron Deficiency?

In the early stages of iron deficiency, a person may experience tiredness, decreased intellectual performance, reduced resistance to infection, and increased susceptibility to lead poisoning. Later stages may result in irritability, pallor, decreased tolerance for exercise, appetite loss, rapid heart action (tachycardia), enlargement of the heart (cardiomegaly), and risk for other nutrient deficiencies (see the *Vegetarian Teens* section).

In pregnancy, iron deficiency increases the risk of low birth weight and potentially pre-term delivery and perinatal mortality.[4]

During pregnancy and at other times, people who are iron-deficient may have intense cravings to eat non-human foods, such as dirt. This can be a symptom of iron deficiency and can pose a danger to one's health. A healthcare provider should be contacted if this behavior is suspected.

Adolescents need more iron due to increasing blood volume and muscle mass. See Table I-1 for recommended amounts.

How Much Iron is Enough?

Table I-1 Recommended Daily Dietary Reference Intakes for Iron (milligrams per day)

Age	Females	Males
9-13	8	8
14-18	15	11
19-30	18	8
Pregnancy 14-18 19-30	 27 27	
Lactation 14-18 19-30	 10 9	

Source: Institute of Medicine, Food and Nutrition Board, 2001[5]

The iron needs for adolescents are listed below:

What are Good Sources of Iron?

Lean red meat, fish, poultry and iron-fortified grains, such as WIC-approved cereals, are good sources of iron.

Legumes and dark green vegetables, such as kale, collard greens and spinach, are part of a healthy diet. They also have iron. It is easier for the body to use the iron in meat than the iron in plant foods. To help the body use iron from plant foods, vitamin-C-rich foods, such as citrus fruits/juices, or a small amount of meat should be eaten at the same meal.

Using cast-iron skillets for cooking can add iron to the food cooked.

Coffee, tea, soda, and excessive milk intake can reduce iron absorption and should be avoided, especially at mealtimes.

Note that iron absorption varies from person to person, which means that different people can eat the same foods but have different levels of iron in their bodies. Iron absorption often increases significantly when iron stores are low.

What about Iron Supplements?

During pregnancy, some teens may need a supplement containing iron to reduce their risk of adverse birth outcomes. This should be discussed with the primary healthcare provider at prenatal visits.[4,6]

Do not recommend iron supplements unless a healthcare provider prescribes them. Consuming more iron than needed may be unhealthy. In fact, too much iron can be harmful or fatal. Just 10 iron pills can kill a child!

Screening

- Use the How Much Iron Am I Getting? handout to help the client determine how much iron she is getting from her diet. You can use the sheet to help her identify iron-rich foods.
- Has the client ever been told by her healthcare provider that she is anemic? If yes, what information and/or counseling was she given?

Interventions/Referrals

If you suspect your client might be anemic — because of symptoms or responses to the Risk Questionnaire — **refer her to a health care professional.**

Print handouts back-to-back to save paper.

- Use the How Much Iron Am I Getting? handout to teach what foods are good sources of iron.
- Use the Why Do I Need Iron? handout to discuss symptoms of iron deficiency. Clients with these symptoms should be encouraged to discuss them with her healthcare provider.
- Use the Iron Tips handout to discuss how iron intake can be increased.
- Use the Action Plan for Iron handout to assist the client in developing her plan to achieve the recommendation for optimal iron intake.

Follow-Up

Review the Action Plan for Iron handout with the client to determine if she achieved her goal(s) for behavior change.

If the client did not make any changes, talk with her about what prevented her from doing so. Review the importance of iron and see which (if any) are important to her. Validate her feelings. Work with her to identify strategies for removing any barriers.

If the client made changes but still falls short of the recommended intake, praise her for the changes that she made. Work with her to revise her action plan (change or add goals).

If the client has made changes and achieved the recommended intake, praise for the changes that she made. Help her consider a new action plan from another section in the Guidelines.

Web Links Referenced/Additional Resources

Title	Resource Type	URL
2010 Pediatric Nutrition Surveillance California: Anemia Indicators by Race/Ethnicity and Age	Document (PDF)	http://www.dhcs.ca.gov/services/chdp/Documents/PedNSS/2010/17C.pdf
Institute of Medicine Dietary Reference Intake tables	Document (PDF)	www.iom.edu/Activities/Nutrition/SummaryDRIs/~/media/Files/Activity Files/Nutrition/DRIs/5_Summary Table Tables 1-4.pdf
Nutrition Risk Screening section from the California Nutrition and Physical Activity Guidelines for Adolescents	Document (PDF)	www.cdph.ca.gov/HealthInfo/healthyliving/childfamily/Documents/MO-NUPA-02NutritionalRiskScreening.pdf
How Much Iron Am I Getting? handout	Document (PDF)	www.cdph.ca.gov/programs/NutiritionandPhysicalActivity/Documents/MO-NUPA-HowMuchIronAmIGetting.pdf
Why Do I Need Iron? handout	Document (PDF)	www.cdph.ca.gov/programs/NutiritionandPhysicalActivity/Documents/MO-NUPA-WhyDoINeedIron.pdf
Iron Tips handout	Document (PDF)	www.cdph.ca.gov/programs/NutiritionandPhysicalActivity/Documents/MO-NUPA-IronTips.pdf
Action Plan for Iron handout	Document (PDF)	www.cdph.ca.gov/programs/NutiritionandPhysicalActivity/Documents/MO-NUPA-IronActionPlan.pdf
Anemia Resources tailored for maternal, child and adolescent populations	Webpage	www.cdph.ca.gov/healthinfo/healthyliving/nutrition/Pages/AnemiaResources.aspx
Iron for Strong Blood handout from the California WIC Program – English version	Document (PDF)	www.cdph.ca.gov/programs/wicworks/Documents/NE/WIC-NE-EdMaterials-IronForStrongBlood.pdf
Iron for Strong Blood handout from the California WIC Program – Spanish version	Document (PDF)	www.cdph.ca.gov/programs/wicworks/Documents/NE/WIC-NE-EdMaterials-IronForStrongBloodSpanish.pdf

References

1. Centers for Disease Control and Prevention. Iron and Iron Deficiency. *Nutrition for Everyone* 2011; http://www.cdc.gov/nutrition/everyone/basics/vitamins/iron.html, 2012.
2. Iron deficiency anemia. *Medline Plus* 2012; http://www.nlm.nih.gov/medlineplus/ency/article/000584.htm.
3. Pediatric Nutrition Surveillance - California. Table 17C: Anemia Indicators by Race/Ethnicity and Age. 2010. http://www.dhcs.ca.gov/services/chdp/Documents/PedNSS/2010/17C.pdf.
4. Kaiser L, Allen LH. Position of the American Dietetic Association: nutrition and lifestyle for a healthy pregnancy outcome. *J Am Diet Assoc.* Mar 2008;108(3):553-561.
5. Institute of Medicine (U.S.). Panel on Micronutrients. DRI : dietary reference intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc : a report of the Panel on Micronutrients ... and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine. Washington, D.C.: National Academy Press; 2001: http://www.nap.edu/openbook.php?isbn=0309072794.
6. Office of Dietary Supplements, National Institutes of Health. Iron. 2007; http://ods.od.nih.gov/factsheets/iron/.

How Much Iron Am I Getting?

In the list below, foods with the most iron per serving are at the top. The foods at the bottom of the list have less iron. But, they are still good iron sources.

Tip: Your body uses the iron in meat foods better than the iron in non-meat foods. Help your body use iron by eating some meat or a food that has vitamin C at the same time as a food that has iron. For example, eat tomatoes with beans or cereal with strawberries.

Amount of Iron in Some Good Iron Foods

Iron Food	Serving Size	Approximate Iron Contents (mg)	My Serving Size/Day	My Iron Intake (mg)
Clams, canned, drained	3 oz.	24		
WIC-approved cereals, dry	50g (about 2 oz.)	At least 14		
Oysters, cooked	3 oz.	10		
Organ meats: liver/giblets	3 oz.	5-10		
Fortified instant cereals, cooked	1 packet	5-8		
Cowpeas (blackeye peas), cooked	1 cup	4		
Beans, cooked (pinto, kidney, garbanzo, lima, navy, white)	1/2 cup	2-4		
Chili with meat and beans	1 cup	3		
Lentils, cooked	1/2 cup	3		
Tofu, firm	1/2 cup	3		
Spinach, cooked, drained	1/2 cup	3		
Ground beef, 15% fat, cooked	3 oz.	2		
Prune juice	3/4 cup	2		
Rice/pasta, cooked	1 cup	1-2		
Chicken, turkey	3 oz.	1		
Tuna, canned in water	3 oz.	1		
Salmon, cooked	3 oz.	1		
Corn or flour tortillas	1 tortilla	1		
Bread, enriched	1 slice	1		
Dried fruit (apricots, apples, plums)	About 10 pieces	1		
Peanut butter	2 Tbsp.	1		
Egg	1	1		

Enter total here →

Iron Recommendations

Age	9-13 Years	14-18 Years	19-30 Years
Females	8 mg	15 mg	18 mg
If pregnant		27 mg	27 mg
If breastfeeding		10 mg	9 mg
Males	8 mg	11 mg	8 mg

Amount of iron I need for my age and pregnancy or breastfeeding status ____ mg

Amount of iron I am getting now — ____ mg

How much more iron I need each day ____ mg

My Action Plan for Iron

Name: _____

Check the box for each step you are doing now to eat enough iron. Check the boxes for the steps you plan to take. Write down other ways you plan to improve your iron intake.

Things that I can do to get enough iron every day	Am Doing	Steps I Will Take
• Add one serving of vegetables such as broccoli or romaine lettuce to my diet most days of the week.	☐	☐
• Try a breakfast cereal that has been approved for WIC. These cereals have iron added to them. • To find cereals approved for WIC, visit www.cdph.ca.gov/programs/wicworks/Pages/WIC-AuthorizedFoodListWAFL.aspx. • Tip: Look for the WIC logo in the cereal aisle at the store. Some stores label foods approved for WIC.	☐	☐
• Eat an orange or another citrus fruit with my iron-rich foods.	☐	☐
• Try a fruit or vegetable from the iron-rich food list that I have never tried before.	☐	☐
• Add one serving of black beans, pinto beans, garbanzo beans or lentils to my diet most days of the week.	☐	☐
• My ideas for improving my iron intake: _____	☐	☐
_____	☐	☐

Signature: _____ Date: _____

Photo credit for cereal photo: Debora Cartagena, Centers for Disease Control and Prevention

Iron Tips

1 Eat foods that are good sources of iron every day.

- Just eating a little meat with other foods can increase the iron your body can get from foods. For example, try putting a small amount of meat into your cooked beans. Meat is an "iron helper" -- it helps your body use the iron from other foods.
- If you are a vegetarian, eat beans often.
- When preparing dry beans, soak beans for several hours in cold water before you cook them. Pour off the water and use new water to cook the beans. Your body will take in more iron this way.

2 Eat vitamin-C foods with iron-rich foods to help your body use iron better.

- Eat foods rich in vitamin C together with iron-rich foods. Vitamin-C foods are "iron-helpers" too. For example, eat an orange or strawberries with your breakfast cereal or have some salsa on your taco.
- Cook vitamin-C foods and iron-rich foods together. For example, cook your beans with tomatoes or chilies.
- For more examples of Vitamin-C and iron-rich foods, see *Iron Tips—Take Two*.

3 Coffee, tea and sodas may block iron from getting into your body.

- If you drink coffee or tea (including decaffeinated), drink them between meals.

4 Cook foods in cast-iron skillets, pots or pans to add extra iron to your food.

5 Follow your medical provider's recommendation about multivitamins or prenatal vitamins. They have extra iron that you may need.

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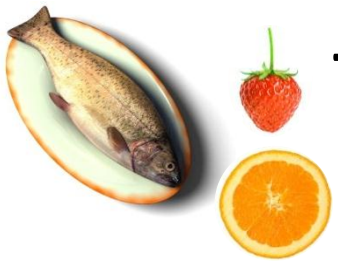
Iron Tips—Take Two!

Iron Helpers:

Foods rich in vitamin C or meats



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Foods rich in iron

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Your body uses ***more*** iron!

Foods rich in vitamin C

Vegetables

- Tomato
- Broccoli
- Cauliflower
- Bell pepper
- Chili peppers
- Cabbage

Fruits

- Oranges
- Cantaloupe
- Grapefruit
- Strawberry
- Kiwi
- Mango
- Papaya

Juices

- Orange
- Grapefruit
- Tomato
- Lemon/lime

Foods rich in iron

Meats

- Organ meats (liver, giblets); no more than once a week
- Beef
- Duck
- Lamb
- Shrimp
- Fish
- Shell fish, such as clams and oysters

Non-Meats

- WIC-approved cereals
- Fortified instant cereals
- Soybeans
- Pumpkin/squash seeds
- Dry beans, cooked
- Lentils
- Spinach
- Dark green leafy vegetables, such as collard and spinach
- Eggs
- Bread/tortillas
- Rice/pasta
- Tomato paste
- Prune juice
- Dried fruit

Read food labels!

Iron is added to many foods. Look for food labels that say "enriched" or "fortified." Some foods that may have extra iron are bread, rice, tortillas, cereals, and pasta.

Vitamin C is added to some foods because we need to have it every day. Look for labels that say "added vitamin C." Juices are a good example of a vitamin C enriched product. Check the label to see if each serving has 50% or more of the vitamin C that you need. Juice is high in natural sugar. **Limit juice intake to ½-1 cup per day.**

! Avoid buying "fruit drinks" and other sweetened drinks that are high in sugar. Look for labels that say "100% juice."

Limit juice intake to ½-1 cup per day.

Photo credit for cereal photo: Debora Cartagena, Centers for Disease Control and Prevention

Why Do I Need Iron?

Iron is a mineral found in some foods. If you do not eat enough foods high in iron each day, you may:

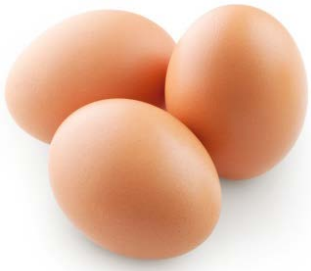
- Look pale, feel tired, and act cranky
- Not feel like eating
- Have headaches and get sick more easily
- Have trouble learning and do poorly in school or work

If you are pregnant, your baby could be born too small or too soon.

Look at the pictures below for examples of foods with iron.

Fish, chicken or other lean meats

Cooked dry beans



Egg yolks

Fortified cereals, such as WIC cereal

Dark green leafy vegetables

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