

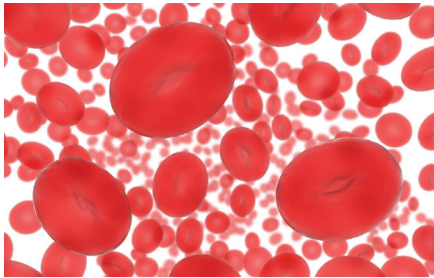
FOCUS ON IRON-DEFICIENCY ANEMIA AND ITS TREATMENT



What you need to know

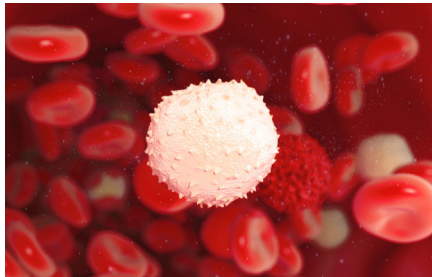
BLOOD AND ITS IMPORTANCE IN YOUR BODY

Blood circulates throughout your body, taking oxygen and nutrients to your tissues and carrying away waste products.¹ Blood also contains three important cell types: red blood cells, white blood cells, and platelets.¹



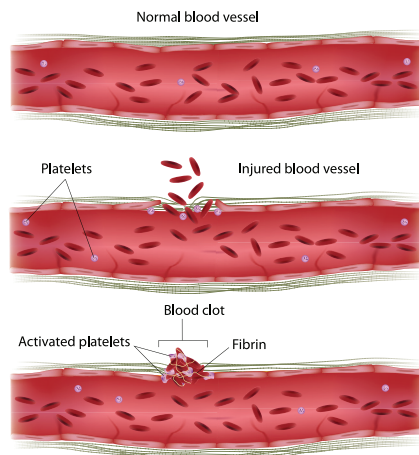
Red blood cells

Red blood cells contain a protein called hemoglobin.² Hemoglobin carries oxygen from your lungs to all your body tissues.² Your tissues need oxygen to produce energy.²



White blood cells

White blood cells fight infection.²



Platelets

Platelets help stop bleeding by clumping together and helping to seal blood vessels that have been damaged.²

ANEMIA

Anemia is a condition in which your body does not have enough hemoglobin (healthy red blood cells).³ Hemoglobin is important because it contains iron. The oxygen you breathe in attaches to the iron and is carried to the cells of your body. Anemia decreases how much oxygen your red blood cells can carry. Therefore, you may have symptoms of anemia.³

Symptoms of anemia

Early symptoms of anemia include the following:³

- Weakness or fatigue, especially with exercise
- Headaches
- Difficulty concentrating or thinking
- Irritability

Symptoms of more severe anemia include the following:³

- Shortness of breath
- Lightheadedness when standing up
- Pale skin colour
- Blue colour of whites of eyes
- Brittle nails
- Sore tongue

Other symptoms may also occur, depending on the cause of your anemia.³

Reasons to treat anemia

Treatment can relieve the symptoms of anemia.³



CAUSES OF ANEMIA

The body needs certain vitamins, minerals and nutrients to make enough red blood cells. Iron, Vitamin B12 and folic acid are three of the most important.³ The main causes of anemia are iron deficiency, vitamin B12 and/or folate deficiency, certain chronic diseases, and blood loss.³ Other causes of anemia include chronic inflammation⁴ and inherited disorders, such as thalassemia or sickle cell disease.³

Iron-deficiency anemia

Iron is necessary to make hemoglobin, the protein in red blood cells that carries oxygen.⁵ Low body iron can cause iron-deficiency anemia.⁵ The following situations may cause low iron:⁵

- Your body is losing more iron than you consume in your diet: for example, bleeding due to an ulcer
- Your diet is low in iron: for example, a strict vegetarian diet
- Your body does not absorb dietary iron well: for example, certain digestive diseases, such as inflammatory bowel disease

Good dietary sources of iron include meat, legumes, dark green leafy vegetables, dried fruit, and iron-fortified cereal.⁶



Vitamin B12 deficiency

Vitamin B12 is necessary to make red blood cells, and vitamin B12 deficiency can cause anemia.⁷ Vitamin B12 deficiency can occur in several circumstances:⁷

- A vegetarian diet
- Surgery to remove part of the stomach or small intestine
- Long-term use of antacids and other heartburn medications
- Medical conditions including chronic alcoholism, Crohn's disease, and celiac disease



Good dietary sources of vitamin B12 and folate include meat, dairy products, citrus fruit, legumes, dark green leafy vegetables, and fortified bread, cereal, and pasta.⁶

Anemia of chronic disease

Certain chronic diseases can affect the body's ability to make red blood cells.⁴ The anemia that results in this situation is called anemia of chronic disease.⁴ Conditions that can cause anemia of chronic disease include the following:

- Cancer⁴
- Chronic kidney disease⁴
- Human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS)⁴
- Chronic inflammation³

Some medications used to treat these conditions may also cause anemia. For example, chemotherapy medications containing platinum, which are used to treat cancer, may cause anemia.⁸

People with anemia of chronic disease may also have low body iron.⁴

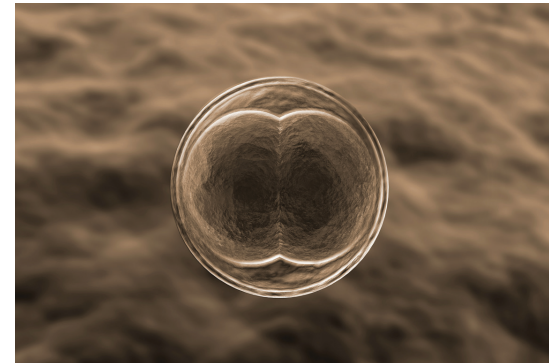
PRODUCTION OF RED BLOOD CELLS

Red blood cells are made in the bone marrow, the spongy tissue inside long bones. Through this highly controlled process, healthy people release about 2.4 million red blood cells into the blood every second.⁹

Two main processes must take place for healthy red blood cell production:

1. *Cell division:*

In the bone marrow, specialized cells divide to produce immature red blood cells.¹⁰ Decreased blood oxygen increases the number of red blood cells produced through the release of a hormone called erythropoietin.¹⁰



2. *Hemoglobin production:*

As immature red blood cells develop into more mature cells, they begin to fill with hemoglobin.¹⁰ If not enough iron is available, mature red cells contain less hemoglobin and have less oxygen-carrying capacity.³

TREATMENT OF ANEMIA

The first step in treating anemia is treating the cause, which may include vitamin and mineral supplements, such as iron, vitamin B12, folic acid, and others, or blood transfusion.³ In some cases, your doctor may prescribe erythropoiesis-stimulating agents, which help your body make more red blood cells.³

Note: The focus of this educational piece is iron-deficiency anemia. Detailed treatment of other causes of anemia is not discussed here.

Oral iron

Oral iron supplements may be prescribed for people with iron-deficiency anemia to increase body iron.⁵ Eating iron-rich foods⁵ and foods high in vitamin C⁶ is also important.

Available oral iron preparations are the following:¹¹

- Ferrous fumarate
- Ferrous gluconate
- Ferrous sulfate
- Polysaccharide iron

Injectable iron

Iron injections are used to treat iron-deficiency anemia in patients with chronic kidney disease.⁵ Iron may be injected into a vein in the arm or into a large muscle.^{12,13} Available injectable iron preparations are the following:

- Ferumoxytol injection¹⁴
- Iron sucrose injection USP¹⁵
- Sodium ferric gluconate complex in sucrose injection¹⁶
- Iron dextran injection USP^{12,13}

SUMMARY

Anemia is linked to a decreased number of healthy red blood cells and decreased hemoglobin.³

Low hemoglobin means the amount of oxygen reaching your tissues is decreased.³

Anemia may cause symptoms, such as fatigue, headache, and shortness of breath.³

Available oral iron preparations are ferrous fumarate, ferrous gluconate, ferrous sulfate, and polysaccharide iron.¹¹

Available injectable iron preparations are ferumoxytol, iron sucrose, ferric gluconate, and iron dextran.^{12–16}

Please consult your doctor for important information regarding potential side effects and risks associated with these medications.

References:

1. The Merck Manual Home Health Handbook. *Overview of Blood*. Available at http://www.merckmanuals.com/home/blood_disorders/biology_of_blood/overview_of_blood.html. Accessed July 14, 2012.
2. The Merck Manual Home Health Handbook. *Components of Blood*. Available at http://www.merckmanuals.com/home/blood_disorders/biology_of_blood/components_of_blood.html. Accessed July 14, 2012.
3. PubMed Health: A.D.A.M. Medical Encyclopedia. *Anemia*. Available at <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001586/>. Accessed July 14, 2012.
4. PubMed Health: A.D.A.M. Medical Encyclopedia. *Anemia of chronic disease*. Available at <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001591/>. Accessed July 14, 2012.
5. PubMed Health: A.D.A.M. Medical Encyclopedia. *Iron deficiency anemia*. Available at <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001610/>. Accessed July 14, 2012.
6. Anemia. Mayo Clinic. Available at <http://www.mayoclinic.com/health/anemia/DS00321/METHOD=print>. Accessed July 14, 2012.
7. PubMed Health: A.D.A.M. Medical Encyclopedia. *Anemia – B12 deficiency*. Available at <http://www.nlm.nih.gov/medlineplus/ency/article/000574.htm>. Accessed September 10, 2012.
8. American Cancer Society. *Anemia in People with Cancer*. Available at <http://www.cancer.org/Treatment/TreatmentsandSideEffects/PhysicalSideEffects/Anemia/anemia-in-people-with-cancer>. Accessed July 14, 2012.
9. Blood. Texas Heart Institute. Heart Information Center. Available at <http://www.texasheartinstitute.org/HIC/anatomy/blood.cfm>. Accessed November 16, 2012.
10. Life cycle of the erythrocyte. Available at http://faculty.ucc.edu/biology-potter/life_cycle_of_the_erythrocyte.htm. Accessed December 11, 2012.
11. Advisory Committee. Iron deficiency: Investigation and management. Available at http://www.bcguidelines.ca/pdf/iron_deficiency.pdf. Accessed December 11, 2012.
12. Infufer[®] Product Monograph. Sandoz Canada Inc. July 29, 2005.
13. Dexiron[™] Product Monograph. Luitpold Pharmaceuticals Inc. May 31, 1996.
14. Feraheme Product Monograph. Takeda Canada Inc; Mississauga, ON. December 7, 2011.
15. Venofer[®] Product Monograph. Genpharm Inc; Toronto, ON. December 8, 2006.
16. Ferriecil[®] Product Monograph. sanofi-aventis Canada Inc; Laval, QC. November 6, 2009.