

### Quick Facts

- Fetal anemia occurs when the number of red blood cells (RBCs) falls below normal levels in a developing fetus. Severe fetal anemia can increase the risk of serious complications, but treatments can be given to prevent these problems.
- The most common cause of fetal anemia is incompatibility between the mother's and fetus's red blood cells. Other causes include infections and genetic disorders.
- Fetal anemia is diagnosed by taking a blood sample from the umbilical cord. Ultrasound may be used to confirm the diagnosis and monitor the fetus's health throughout the pregnancy.
- Severe cases of fetal anemia can be treated with a blood transfusion.
- If you are pregnant and there is a risk of fetal anemia, you may receive special care and monitoring to prevent complications.

Fetal **anemia** occurs when the number of **red blood cells (RBCs)** falls below normal levels before delivery. RBCs carry **oxygen** to the fetal organs. If the level of RBCs is too low, the fetus may not get enough oxygen. Severe fetal anemia is rare. But when it does occur, there is an increased risk of serious problems, such as heart failure and abnormal fluid buildup in multiple body areas. Treatments can be given to prevent these complications.

### What causes fetal anemia?

A common cause of fetal anemia in the United States is RBC **alloimmunization**. This condition occurs when the RBCs of the mother and those of the fetus are incompatible. Specifically, if fetal RBCs cross into the maternal bloodstream, the mother's immune system recognizes these cells as foreign and produces **anti-bodies** against them. These antibodies remain in the mother's bloodstream even after pregnancy. In a later pregnancy with a fetus whose RBCs are incompatible with the mother's RBCs, the antibodies can cross the placenta and target the fetal RBCs.

This leads to the destruction of fetal red blood cells, a condition known as **hemolytic disease of the fetus and newborn (HDFN)**.

Fetal anemia can also be caused by **parvovirus** infection. Also known as "fifth disease," parvovirus is a common childhood viral infection that causes a rash on the face, trunk, arms, and legs. In a fetus, the virus can attack developing RBCs in the bone marrow. The result can be severe anemia, especially if the infection occurs before 20 weeks of pregnancy. Other infections, including **cytomegalovirus (CMV)**, coxsackie virus, and syphilis, can also cause fetal anemia.

Fetal anemia may occur in certain genetic and metabolic disorders. Some twin pregnancies that share a **placenta** are also at risk of fetal anemia.

### How is fetal anemia diagnosed?

A diagnosis of fetal anemia can be made only by sampling blood from the **umbilical cord**. This procedure, called **cordocentesis**, is performed at specialized centers. There is a small risk of pregnancy loss and early delivery. **Stillbirth** is reported in 1–2% of pregnancies following cordocentesis, which can be related to the procedure or to the underlying anemia in the fetus.

To make the diagnosis of anemia in a fetus, doctors may use **ultrasound** to check the blood flow in one of the arteries in the fetal brain (called the middle cerebral artery or MCA). One of the fetal responses to anemia is to speed up the blood flow to the brain. This test is used to screen for fetal anemia in several conditions, including RBC alloimmunization and parvovirus. Measurement of MCA blood flow using ultrasound is performed by ultrasonographers, maternal-fetal medicine physicians, or others with special training in the proper technique.

### Can anemia in a fetus be treated?

In severe cases of fetal anemia, blood can be given to the fetus. This is called an **intrauterine transfusion**. This treatment is done by specialists at centers with expertise in this type of therapy. Your healthcare professional will discuss the risks and benefits of intrauterine

transfusion with you before the procedure so that you can make an informed decision.

### What treatment will I receive if there is a risk of fetal anemia?

Treatment varies depending on the suspected cause of the disease. If RBC alloimmunization is suspected, a key step is finding out the blood type of the father to determine whether the fetus is at risk. If that is not possible, the fetal blood type can be determined using amniocentesis or, in some cases, by testing a sample of your blood using **cell-free DNA** technology. If you have antibodies against the fetus's blood, you will be tested several times during pregnancy to measure your antibody levels. If antibody levels are too high, you may have additional tests such as extra ultrasound exams to evaluate blood flow in the fetal brain or a fetal blood test to check the fetus's health.

If you've had a prior pregnancy complicated by fetal anemia due to maternal antibodies, antibody levels are not helpful in the current pregnancy. Ultrasound or direct testing of fetal RBC levels may be done to find the cause of the fetal anemia.

If you were exposed to parvovirus, your healthcare professional will test to see if you had parvovirus infection in the past and are now immune. But if you haven't had it in the past, and a current infection is confirmed, you may need close monitoring with ultrasound during your pregnancy to check for signs of fetal anemia.

## Glossary

**Alloimmunization:** A condition in which a pregnant person's immune system makes antibodies against proteins on the surface of fetal blood cells. This can happen when the mother's and the fetus's blood cells are not compatible.

**Anemia:** A condition caused by a decreased number of red blood cells.

**Antibodies:** Proteins made by the immune system in response to a foreign substance, such as a virus.

**Cell-free DNA:** Small pieces of DNA (genetic material) from the placenta that circulate in the blood of a pregnant person.

**Cordocentesis:** A procedure in which a sample of fetal blood is taken from the umbilical cord.

**Cytomegalovirus (CMV):** A virus that can be passed from a pregnant person to the developing fetus. Babies born with CMV can have problems such as jaundice, anemia, an enlarged liver and spleen, and a skin rash. Babies without symptoms at birth can develop deafness, cognitive difficulties, eye problems, and seizures.

**Hemolytic disease of the fetus and newborn (HDFN):** A condition where a fetus's or newborn's blood cells break down at a faster rate than normal, causing anemia and other complications.

**Intrauterine transfusion:** A procedure in which donor blood is given to the fetus before birth.

**Oxygen:** The gas the human body uses to convert food into energy.

**Parvovirus:** A virus that usually causes mild or no symptoms. Parvovirus infection during pregnancy can be passed to the developing fetus and may cause severe fetal anemia.

**Placenta:** A special organ that develops during pregnancy. It allows the transfer of nutrients, antibodies, and oxygen to the fetus. It also makes hormones that sustain the pregnancy.

**Red blood cells (RBCs):** The cells that carry oxygen in the body.

**Stillbirth:** Death of a fetus prior to delivery.

**Ultrasound:** Use of sound waves to create images of internal organs or the fetus during pregnancy.

**Umbilical cord:** The structure linking the growing fetus to the placenta; it contains blood vessels that bring oxygen and nutrients to the fetus and remove waste products.

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