CONDITION

Hemolytic disease of the newborn

Hemolytic disease of the newborn happens when antibodies from a pregnant parent destroy a baby's red blood cells.

WHAT IT IS
Immune destruction of fetal or newborn red blood cells

BODY SYSTEM
Blood and circulation

MAIN SYMPTOMS
Jaundice, paleness, sleepiness, poor feeding

WHAT CAUSES IT
Maternal antibodies against the baby's red blood cells

HOW IT IS DIAGNOSED
Maternal antibody screening, ultrasound monitoring, newborn blood tests

MAIN TREATMENT
Pregnancy monitoring, transfusion support, jaundice treatment

CAN IT BE CURED?
Yes - maternal antibodies eventually clear

IS IT AN EMERGENCY?
Sometimes - severe anemia, breathing trouble, or extreme sleepiness

LONG-TERM OUTLOOK
Most treated babies recover; severe cases can cause lasting effects

Overview

Hemolytic disease of the newborn is a condition in which antibodies from a pregnant parent attack the red blood cells of a fetus or newborn. It is also called hemolytic disease of the fetus and newborn, or HDFN.

Red blood cells carry oxygen around the body. When too many are destroyed, the baby can develop anemia, meaning too few healthy red blood cells. The breakdown of these cells also produces bilirubin, a yellow substance that can cause jaundice after birth.

The condition develops because the pregnant parent and baby have different red blood cell markers, called antigens. The parent's immune system may see one of the baby's markers as foreign and make antibodies against it. These antibodies can cross the placenta.

Some cases cause only mild jaundice or anemia. Others need treatment during pregnancy or soon after birth. Severe untreated anemia can affect the baby's heart and other organs. Very high bilirubin after birth can damage the brain, although monitoring and timely treatment greatly reduce this risk.

Symptoms

During pregnancy, the pregnant parent usually has no symptoms. Signs of the condition are found through blood tests and fetal monitoring.

A fetus with anemia may develop:

A severe buildup of fluid is called hydrops fetalis. It means anemia is placing major strain on the fetus's circulation.

After birth, symptoms may include:

Jaundice may appear within the first day after birth. Early jaundice needs prompt assessment because bilirubin can rise quickly when red blood cells are being destroyed.

Anemia can also appear or worsen several weeks after birth, even if the baby seemed well when leaving hospital. Possible signs include increasing paleness, tiring during feeds, poor weight gain, or unusual sleepiness.

- Faster blood flow through certain brain vessels
- An enlarged heart, liver, or spleen
- Extra fluid around organs or under the skin
- Reduced movement in some severe cases
- Yellow skin or eyes from jaundice
- Pale skin
- Sleepiness or difficulty waking for feeds
- Poor feeding
- Fast breathing or a fast heartbeat
- Weakness or reduced activity
- Swelling in severe cases

Causes and risk factors

Hemolytic disease of the newborn is caused by red blood cell antibodies made by the pregnant parent's immune system. This process is called alloimmunization or sensitization.

RhD is one important blood group antigen. If an RhD-negative person carries an RhD-positive fetus, exposure to fetal blood can lead to anti-D antibodies. Rh immune globulin, often called anti-D immunoglobulin, has made this cause much less common where preventive care is available.

Other red blood cell antibodies can also cause the condition. These include antibodies against Kell, Rhc, and other blood group antigens. The severity is not determined by the blood group name alone.

ABO incompatibility is another cause. It often occurs when the pregnant parent has type O blood and the baby has type A or B blood. ABO-related cases are usually less severe than significant Rh or Kell-related cases, but treatment may still be needed.

Exposure to a different blood group antigen may happen through:

The condition can affect a first pregnancy if antibodies already exist from a transfusion or earlier pregnancy event. ABO-related hemolysis can also occur in a first pregnancy.

Having RhD-negative blood does not mean a baby will develop this condition. Risk requires an antigen difference, exposure, and antibodies capable of crossing the placenta and destroying fetal cells.

- A previous pregnancy, including miscarriage or ectopic pregnancy
- Bleeding during pregnancy
- Abdominal injury
- Procedures such as amniocentesis
- Birth
- A previous blood transfusion

Diagnosis

Screening begins with blood group and red blood cell antibody tests during pregnancy. If a clinically important antibody is found, further testing identifies the antibody and measures its level or activity.

Testing may also determine whether the fetus carries the matching antigen. This can sometimes be assessed using the other biological parent's blood or fetal DNA circulating in the pregnant parent's blood. The available test depends on the antigen and local services.

A pregnancy at risk may be monitored using Doppler ultrasound. This measures blood flow in the fetus's middle cerebral artery, a blood vessel in the brain. Faster-than-expected flow can suggest moderate or severe anemia. Ultrasound also checks for fluid buildup and other signs of strain.

If results suggest serious anemia, specialists may directly test fetal blood through the umbilical cord. This is an invasive procedure and is generally used when the result will guide treatment.

After birth, tests may include:

The direct antiglobulin test looks for antibodies attached to the baby's red blood cells. A positive result supports an immune cause, but the full diagnosis depends on the antibody history, examination, bilirubin pattern, and other blood results.

- The baby's blood group
- Hemoglobin or hematocrit to measure anemia
- Bilirubin levels
- A reticulocyte count to assess new red blood cell production
- A direct antiglobulin test, also called a direct Coombs test

Treatment and management

Treatment depends on the antibody involved, the degree of anemia, how quickly bilirubin is rising, and whether the baby is still in the uterus or has been born.

During pregnancy, care may include repeated antibody tests, ultrasound examinations, and Doppler monitoring. Pregnancies at higher risk are usually managed with input from maternal-fetal medicine and blood transfusion specialists.

A fetus with significant anemia may need an intrauterine transfusion. Specially selected donor red blood cells are given through the umbilical cord. More than one transfusion may be needed before birth. The timing of delivery is planned around the fetus's condition, gestational age, monitoring results, and access to specialist care.

After birth, the baby's bilirubin and red blood cell levels are checked closely. Treatment may include:

Intravenous immunoglobulin, or IVIG, may be considered in selected cases of antibody-related hemolysis when bilirubin continues to rise despite intensive phototherapy. Its use is based on the clinical situation because benefit is not certain in every case.

Treatment does not remove all maternal antibodies immediately. These antibodies fade over

time, so follow-up blood tests may be needed after discharge.

- Phototherapy: Special blue light helps the body remove bilirubin
- Red blood cell transfusion: Donor cells treat significant anemia
- Exchange transfusion: Small amounts of the baby's blood are replaced with donor blood to lower bilirubin and remove antibody-coated cells
- Supportive care: Feeding support, fluids, oxygen, or breathing support when needed

Complications

Possible complications are related mainly to severe anemia, high bilirubin, or both.

Severe fetal anemia can make the heart work harder to deliver oxygen. This may lead to heart failure and hydrops fetalis. In the most serious cases, pregnancy loss or stillbirth can occur.

After birth, rapidly rising bilirubin can enter brain tissue. Early effects are called acute bilirubin encephalopathy. Without prompt treatment, permanent injury called kernicterus can develop. It may cause hearing loss, movement difficulties, abnormal muscle tone, or developmental disability.

Other possible complications include:

Most babies who receive timely care do not develop these severe outcomes.

- Anemia that continues or returns during the first weeks or months
- A need for additional transfusions
- Feeding difficulties or slow weight gain
- Complications related to premature birth
- Rare complications from fetal or newborn transfusion procedures

Prevention

Not every case can be prevented. There is no diet, activity, or lifestyle change that prevents blood group antibodies.

Rh immune globulin can prevent anti-D sensitization in an RhD-negative person who has not already made anti-D antibodies. It may be given during pregnancy, after the birth of an RhD-positive baby, and after events that could mix fetal and maternal blood. Exact timing follows local maternity protocols.

Rh immune globulin does not treat existing anti-D antibodies. It also does not prevent hemolysis caused by ABO incompatibility or antibodies against other red blood cell antigens.

Careful matching of blood used for transfusions can reduce the chance of developing some antibodies. Routine prenatal antibody screening remains important because it identifies pregnancies that need added monitoring, including cases that could not have been prevented.

Living with it and what to expect

The antibody attack does not continue indefinitely. Maternal antibodies gradually disappear from the baby's circulation, usually over the first weeks to months. However, anemia can persist or appear after jaundice has improved.

After discharge, follow-up may include checks of hemoglobin, bilirubin, feeding, weight gain, skin color, and activity. Some babies need only routine newborn care. Others need repeated blood tests or another transfusion.

Most babies treated for mild or moderate anemia and jaundice recover without long-term effects. Babies who had severe fetal anemia, hydrops, very high bilirubin, premature birth, or prolonged intensive care may need closer developmental, hearing, or neurological follow-up.

Previous intrauterine transfusions can temporarily affect how the baby's bone marrow makes new red blood cells. This is one reason later anemia may occur even after the original antibody-related destruction is slowing down.

The condition itself does not usually remain active throughout childhood. Lasting health needs are more likely to come from complications rather than continued antibody attack.

For the sensitized parent, antibodies may remain in the blood for life. A future fetus carrying the same red blood cell antigen may be affected, sometimes earlier or more severely. Early prenatal care and antibody testing are therefore important in later pregnancies.

When to get medical help

Keep all planned follow-up appointments, even if the baby appears well. Contact the baby's healthcare team promptly if jaundice is increasing, feeding is becoming harder, the baby looks paler, or the baby is sleepier than usual. These symptoms may require a same-day bilirubin or blood count check.

Seek urgent medical assessment if a newborn:

Call emergency services if the baby has pauses in breathing, blue or gray skin, a seizure,

marked limpness, severe arching of the body, or cannot be woken. These signs need immediate care.

During an at-risk pregnancy, contact the maternity unit urgently for reduced fetal movement, bleeding, significant abdominal injury, or any other symptom covered by the pregnancy care plan.

- Develops jaundice during the first 24 hours after birth
- Is difficult to wake or cannot stay awake for feeds
- Feeds much less than usual
- Has fewer wet diapers than expected
- Becomes increasingly pale or yellow
- Breathes quickly or appears to struggle with breathing

Common questions

Is hemolytic disease of the newborn the same as jaundice?

No. Jaundice is a symptom caused by bilirubin buildup. Hemolytic disease of the newborn is one possible cause of jaundice. Many newborns develop jaundice for other reasons and do not have immune destruction of red blood cells.

Can it happen with a first baby?

Yes. Antibodies may already be present because of a previous miscarriage, ectopic pregnancy, pregnancy procedure, or blood transfusion. ABO-related hemolysis can also affect a first pregnancy. Rh-related sensitization more often affects a later pregnancy, but not always.

Does being Rh-negative mean my baby will have it?

No. The fetus would need to carry the RhD antigen, and the pregnant parent would need to make anti-D antibodies. Preventive Rh immune globulin greatly lowers the chance of anti-D sensitization when it is appropriate.

How long does the condition last?

Maternal antibodies usually fade from the baby's blood over weeks to months. Jaundice often improves sooner, while anemia may continue or appear later. The follow-up period is based on blood test results and the baby's progress.

Will every affected baby need a blood transfusion?

No. Mild cases may need monitoring or phototherapy only. Transfusion is used when anemia is

significant or when bilirubin cannot be controlled adequately with less invasive treatment.

Can it happen again in another pregnancy?

Yes, if a future fetus carries the red blood cell antigen targeted by the parent's antibodies. The risk is assessed early with antibody testing and, when available, fetal antigen testing. Previous records should be shared with the maternity team.

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