

## Blood groups - Rhesus factor

The RhD (Rhesus) factor is a protein that is either present or absent on the surface of a person's red blood cells. Haemolytic disease of the newborn (HDN) can occur if there is RhD incompatibility between a mother and her unborn child. The incompatibility can happen if an Rh-negative mother and an Rh-positive father conceive an Rh-positive baby. A woman who is Rh-positive will not be affected by having a baby with an Rh-negative man. HDN is also known as 'Rhesus disease', Rh (D) disease or RhD HDN.

In severe cases of HDN, the fetus may die without medical treatment. HDN is now uncommon in developed countries, due to routine 'anti-D' vaccination given to the Rh-negative mother after the birth of her first child.

### Blood groups explained

The genes you inherit from your mother and father determine your blood group. Blood is described by the type (A, B, AB or O) and RhD (previously known as the 'Rhesus factor'). The RhD is a protein that is either present or absent on the surface of your red blood cells. In medical shorthand, this is indicated by a plus sign (+) or a minus sign (-). For example, the blood type O+ means that the blood is type O and each blood cell has RhD.

A blood group is identified by a collection of molecules (antigens) located on the surface of each red blood cell. The antigens, including RhD, help the body to distinguish its own blood from the blood of another person.

### Genetics and blood groups

About 85 per cent of people are RhD-positive. The remaining 15 per cent are RhD-negative.

The RhD-negative gene is recessive, while the RhD-positive gene is dominant. This means that there is a greater than or equal to 50 per cent chance that an RhD-negative mother will conceive an RhD-positive baby if the father is RhD-positive.

Genetic testing of the father can help to predict the chance of conceiving another Rh-positive baby. Genes come in pairs. If the father has one Rh-positive gene and one Rh-negative gene, each child has a fifty-fifty chance of being Rh-positive. However, if the father has two Rh-positive genes, all children conceived by the couple will be Rh-positive.

### RhD factor and immune response

A person who is RhD-negative (whose blood cells do not have RhD) may have an immune reaction if RhD-positive blood cells enter their bloodstream. This can happen during a miscarriage, an abortion or childbirth. This is because blood from an RhD-positive baby may enter the bloodstream of an RhD-negative mother.

The mother's body considers the RhD-positive cells a threat and mounts an immune system response. Her immune system makes antibodies (called anti-D antibodies) against the RhD-positive blood cells. If the mother conceives another RhD-positive baby, her anti-D antibodies will attack her unborn baby's red blood cells. This complication of pregnancy is called haemolytic disease of the newborn (HDN) or 'Rh (D) disease'.

A pregnancy affected by the RhD factor should be closely monitored. In some cases, medical treatment may include one or more blood transfusions for the unborn baby.

### HDN affects the second baby

HDN rarely affects the first pregnancy. However, HDN can affect any later RhD-positive fetuses.

In severe cases, the unborn baby's blood cannot carry oxygen, because of destruction of the red blood cells, and the baby dies of heart failure. This explains why fetuses affected by HDN may be miscarried or stillborn.

## Babies with HDN can survive

If the baby survives, it may be born with anaemia and jaundice. Jaundice causes a yellowish tinge to the skin and eyes, due to an excess of the chemical called bilirubin. The baby's liver makes bilirubin as it breaks down the damaged or destroyed red blood cells. High levels of bilirubin can be toxic.

However, some RhD-positive babies born to RhD-negative mothers are either healthy or have mild anaemia that is easily treated.

## Prevention of HDN

Prevention is the best form of treatment. A vaccine against HDN has been available for about 40 years. The vaccine helps to prevent the mother's immune system from making anti-D antibodies and offers protection for future pregnancies against RhD disease. Studies show that about 99 per cent of RhD-negative mothers do not make anti-D antibodies after receiving the vaccination.

Since vaccination was first introduced, the death rate from HDN in developed countries has dropped significantly. The vaccine, which contains anti-D immunoglobulin, is given as an injection to the RhD-negative mother during pregnancy and after she gives birth to an Rh-positive baby.

RhD-negative women should also be vaccinated if there has been any possibility of fetal blood entering their bloodstream. For example after:

- Miscarriage
- Abortion
- Amniocentesis
- Abdominal trauma during pregnancy
- Manipulation of a breech presentation during delivery.

A mother who is Rh-positive does not need the vaccine because her pregnancies carry no risk of Rh incompatibility.

## Treatment of HDN

Treatment is complex, and the preferred medical treatment for a baby born with HDN is blood transfusion. The baby's damaged blood is regularly replaced in small amounts with compatible donor blood. The blood exchange continues until the baby's blood has been completely replaced with healthy donor blood. The transfusion also removes maternal anti-D antibodies, which prevents damage to the baby's new red blood cells.

## Test before your next pregnancy

If you're an Rh-negative mother and you've given birth to an Rh-positive child, you should see your doctor before conceiving again, even if you have been vaccinated. A blood test can detect the level of anti-D antibodies in your blood.

## Where to get help

- Your doctor
- Obstetrician
- Royal Women's Hospital Tel. (03) 8345 2000

## Things to remember

- The Rh factor is a protein that is either present or absent on the surface of a person's red blood cells.

- HDN or 'Rhesus disease' can occur if there is Rh incompatibility between a mother and her unborn child.
- Vaccination of the Rh-negative mother during pregnancy or shortly after giving birth to her Rh-positive baby helps to protect future pregnancies against HDN.

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Australian Centre for Blood Diseases

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