reduce the antibodies is given and the last resort is an exchange transfusion. An exchange transfusion is a little like kidney dialysis. Some blood is removed from the baby and then 'clean' blood is inserted back. These are very rarely needed these days.

These babies maybe in hospital for a few days or if they are premature a few weeks, but overall they do very well. Babies that have had a number of IUTs and are delivered at term generally do very well.

After discharge the baby will sometimes need regular blood tests to identify development of anaemia. This can happen a few weeks after birth and it is important to call you LMC if you are worried that the baby is not behaving normally as this maybe a sign of anaemia and may need urgent treatment.

Future Pregnancies

It is likely that in a future pregnancy the antibodies will re-appear. In some couples the father is a heterozygote. This means that he has two different genes for the red cell antigen that causes the problem. One will be the same as the mother and there is a 50:50 chance the baby will inherit this gene which will mean the baby is not susceptible to the antibodies as it is the same as the mother. In this case there is testing that can be done from the mothers blood once she is pregnant to determine the baby's blood group in some cases.

For more information please contact your local NZMFMN Unit

Auckland District Health Board
Te Toka Tumai

Auckland: 09 307 4949 ext 24951

Capital & Coast District Health Board
ŪPOKO KI TE URU HAUORA

Wellington: 04 806 0774

Canterbury District Health Board
Te Poari Hauora ō Waitaha

Christchurch: 03 364 4557

New Zealand Maternal Fetal Medicine Network
NZMFMN@adhb.govt.nz

(Complex version)

Haemolytic Disease of the fetus and Newborn (HDFN) (Rhesus Disease)

New Zealand Maternal Fetal Medicine Network

What is HDFN?

HDFN is a condition where antibodies designed to identify substances which do not belong to the mother (foreign material), cross the placenta and cause fetal anaemia. The effect of the antibodies can continue to affect the newborn baby also. We all have antibodies as part of our immune system. They are very specific to different antigens (the foreign material identified as not belonging) and can be made in the immune system very quickly when needed if there is a blueprint for them.

The most common antibodies that cause a problem are Anti D (aka Rhesus), Anti Kell, Anti c.

In the case of HDFN the antibodies are very good at identifying antigens on red blood cells. They are small enough to cross over the placenta and into the baby's circulation. If the baby's red cells are different to the mother's the antibodies may attach to the cells and identify them as being foreign material. The baby's own immune system then receives the signal to say they are foreign and destroys the red cells. The baby then becomes anaemic.

Red blood cells carry oxygen to the tissue of the cells. When the baby becomes anaemic it can tolerate this for a while, but if it becomes very severe the heart muscles suffer and the baby can go into heart failure and die. This is a very rare event these days, but much of this is due to medical advances and thirty years ago many women lost babies due to HDFN and limited medical assessments and therapies being available.

What causes HDFN?

The developing baby will be a mix of the mother and father genetically. This is true of the red blood cells too. The baby is fairly well isolated from the mother in an immunological sense by being inside the womb and membranes, but we know that throughout pregnancy small amounts of placental cells slough off into the maternal circulation. In certain blood groups if the baby is different to the mother, due to inheritance from the father, these small amounts of cells can lead to an immune response.

In the first pregnancy the amount of response the mother's immune system can develop is fairly limited as the blueprint for the antibodies is still being developed. Most babies don't have any problems if it is the mother's first pregnancy. However in the next pregnancy when the cells appear in the mother's circulation again, the immune system is ready with the blueprint and the antibodies are produced and are very accurate.

How is it diagnosed?

During pregnancy there are a number of routine blood tests taken. One of these is looking for red cell antibodies. If an antibody is identified and it is linked with HDFN (not all red cell antibodies are) then the woman will have the levels monitored with monthly blood tests. If the antibody levels (measured as a titre) reach a certain threshold the mother will be referred to see a local expert. This maybe at a secondary unit with an Obstetrician with skills to monitor the pregnancy, or one of the Fetal Medicine Units.

Ongoing Treatment and Management

Once the woman is referred to the Fetal Medicine Unit regular scans will be arranged which aim to identify babies who are becoming anaemic. The assessment is looking at the blood flow to the baby's brain (looking at the Middle Cerebral Artery (MCA)). When a baby is anaemic this blood flow speeds up to allow a good amount of oxygen to the brain.

When a woman is referred to a Fetal Medicine Unit there is around a 2-5% chance her baby will be identified as anaemic on ultrasound at some point in the pregnancy. Once this threshold is reached an invasive test called a Fetal Blood Sample (FBS) will be considered. This procedure is similar to an amniocentesis, where a needle is inserted into a vessel in the umbilical cord or the baby using ultrasound to guide the needle. The procedure is more difficult though and only done by a few qualified Doctors in New Zealand.

When an FBS is performed the chances are high that the baby will be anaemic as the MCA is a very good surrogate for an actual blood test. For this reason donated fresh blood is always available to allow a transfusion of blood (in utero transfusion (IUT)) to be given to the baby at the same time as the needle is in position for the FBS. Blood tests are also taken to check the baby's blood group.

FBS carries a risk of pregnancy loss and complications and so is not done unless the team are sure it is indicated. Occasionally the baby is not anaemic and the MCA was erroneous. If the baby is anaemic, the red cells given are the same as the mother so they are not destroyed by the antibodies. Usually the IUT needs to be repeated at 2 – 3 weekly intervals as the baby gets bigger and needs more blood.

Towards the end of pregnancy the MCA is not so good at predicting anaemia and usually the advice is to deliver the baby at 37 weeks or earlier if there are concerns regardless of whether IUT has been required. This is due to concerns that the baby may become anaemic and sick quite quickly, but not get recognised.

These babies do not need a caesarean section and the mode of delivery will be decided on other factors.

Neonatal Course

After birth the baby will be under the care of a paediatrician or maybe in the Neonatal Intensive Care Unit (NICU). This will depend on the gestation at which the baby is delivering and condition after birth. If this is likely to be the case you Doctors can advise you and arrange for you to meet with a neonatologist.

These babies are sometimes born with jaundice as a result of build-up of a by-product called bilirubin which is produced when red cells are destroyed. Before birth the bilirubin is cleared by the mother across the placenta. After birth the baby's liver needs to destroy the bilirubin. If the levels get too high the bilirubin can lead to brain damage. Treatment options include having the baby under special lights (phototherapy) and on a 'bili bed'. Sometimes an injection to