Blood Types

Blood types are determined by the presence or absence of certain factors on the red blood cell. Human blood can be divided into four **Major Groups:** A, B, AB, and O. Each factor has a specific antigen called an isoantigen that forms antibodies. Type A blood has A antigens, B has B antigens and AB has both A and B antigens. Type O has a silent antigen and therefore recognizes both A and B factors as foreign.

Blood Group	%Occurrence	Isoantigen on RBC	Isoantibodies is serum
O	46%		silent Anti-A and Anti-B(universal donor
A	41%		A Anti-B
B	9%		B Anti-A
AB	4%		A & B none (universal recipient)

ABO incompatibility is more common but less severe than other blood incompatibilities. It occurs only in newborns whose blood type contains the A or B antigen. The theory is that severe cases are not usually seen because the baby is spontaneously miscarried early in pregnancy. Women who have a history of repeated miscarriage after the first trimester may have a minor factor sensitization or incompatibility problem. The infants at risk are:

Group A or B infant of Group O mother (more common if problem occurs)
Group B or AB infant of Group A mother (less common for problems)
Group A or AB infant of Group B mother (less common for problems)

Unlike Rh incompatibility, treatment is never warranted during pregnancy. After the birth, the newborn is carefully assessed from development of hyperbilirubinemia.

Minor Factors

There are other blood factors known as minor factors. With the minor factors, when a foreign factor is introduced, antigens on the red blood cells form antibodies against the foreign factor. When incompatible blood mixing occurs between the pregnant mother and her baby, this can lead to destruction of the babies red blood cells. Sensitization is only possible if the mother does not have the minor factor that the baby has. (Thus her blood forms antibodies against it.)

There are many minor factors. **Rh(Rhesus) factors** are the most reactive. They are a group of related antigens that usually occur together, Cc Dd Ee. C, D and E are dominant; c, d and e are recessive. Those who are Rh positive carry the D antigen. If the D antigen is not present the person is Rh negative. About 15% of the white population and 10% of the black population is Rh negative. About 85% of the white population and 90 % of the black population is Rh positive.

If both parents are Rh negative then the baby will be Rh negative and there will be no problem. If the father is Rh positive and the mother is Rh negative there is potential for problems in pregnancy. The risk is highest for ABO compatible, Rh+ male children. When Rh+ blood enters the system of an Rh- person, antigens on the red blood cells form antibodies

against the Rh+ factors. This is called sensitization. This can occur in the following ways for the Rh- mother who is carrying a Rh+ baby:

- Through a wrong type of transfusion
- As a by-product of abortion or miscarriage past 8 weeks
- Through placental leakage during pregnancy
- Slight abruptions during pregnancy
- After the birth when the placenta detaches.

There is normally no mixing of fetal and maternal blood during pregnancy. When the placenta begins to separate the risk of blood mixing increases. In many cases between 0.5 and 5 ml of fetal blood enters the maternal circulation and causes the production of Rh antibodies in the mothers blood.

Often the first encounter will not result in an actual antibody formation but a second encounter will have a strong antibody reaction. The Anti Rh antibodies remain in the blood of the Rh- mother. During a future pregnancy, they can cross the placenta and enter an Rh+ baby's system. Approximately 13% of all Rh- mothers will become sensitized with their first baby if they do not receive Rho(D) immunoglobulin. Once sensitization occurs, all future Rh+ babies are at risk for blood cell destruction.

The baby's response to maternal sensitization can range from no reaction to death. As the red cells are destroyed, bilirubin is released. It is then processed by the liver. The continuing red blood cell destruction and rise in bilirubin levels may lead to brain damage, anemia, hypoxia, and heart failure. Fluids fill the lungs, peritoneum and pericardium causing generalized edema. This condition is known as hydrops and is the last stage of erythroblastosis fetalis.

Sensitization can become progressively worse with successive pregnancies. A woman who has had a previously severely affected baby is 90% to 100% likely to have another severely affected baby. The destruction of fetal red blood cells (hemolysis) causing anemia in the fetus is proportional to the extent of maternal sensitization. Serial amniocenteses are used to evaluate blood cell destruction. If the results are too high, intrauterine exchange tranfusion may be suggested.

Babies with mild problems may be jaundiced but may not require extensive treatment. Treatment will depend on the clinical appearance, hemoglobin and bilirubin levels at birth. Immediately after the baby is born, a sample of blood from the umbilical cord is taken to determine the baby's blood type, hemoglobin and bilirubin levels, and a direct Coombs' test is done to detect present or absence of maternal antibodies of fetal red cells.

RhoGam

Administration of Rh immune globulin to the pregnant woman at 28 weeks has decreased the incidence of primary immunization 0.07% (7 in 10,000). It has become routine since the 1980's to prophylactically administer RhoGAM at that time. However, with such a small percentage of benefit the risks must be weighed. RhoGam is a blood product and although

studies waiver, there is the small possibility of blood-related illness being transferred. There is no information on how will the immunoglobin affect the immature fetal immune system. Gamma globulin can compromise the immune system of children for up to four months. RhoGam is a form of gamma globulin. If the baby is female and Rh- there is a theoretical risk that the baby will develop antibodies, which has implications for her reproductive future in the event she carries a Rh+ child.

The following tests are used to detect sensitization:

- Indirect Coombs' tests: done on the mother's blood to measure the number of Rh+ antibodies.
- Direct Coomb's test: done on the infants blood to detect antibody coated Rh+ red blood cells.

The administration of 300 micrograms of Rho(D) immune globulin is usually sufficient to prevent maternal sensitization if given within 72 hours of childbirth. Clinical studies showed that the incidence of Rh immunization as a result of pregnancy was reduced from 13% to between 1% and 2% when RhoGAM was given within 72 hours of childbirth. It promotes lysis of fetal Rh+ red blood cells circulating in the mother's blood, before the mother forms her own antibodies against them.

It is also administered after all miscarraiges or abortions past 8 weeks gestation, at any stage of gestation with threatened miscarriage, after amniocentesis, chorionic villi sampling, and percutaneous umbilical blood sampling, or after abdominal trauma to the mother because of the risk of sensitization in these situations. It is administered to any woman after childbirth who meets the following criteria:

- The mother is Rh negative with no Rh antibodies (Indirect Coomb's test is negative).
- The infant must be Rh positive.
- The results of direct Coomb's test on the cord blood is negative.

The dose is administered to the mother intramuscularly, never intravenously or to the infant.

Because Rho(D) immunoglobulin is a blood derivitive, mild problems similar to that of blood transfusions may occur. Symptoms might include heat at the injection site, bleeding from wounds, low grade fever, flushing of the face, or constricting pain in the chest. Although symptoms probably will be mild, if any of these occur it is important to tell your midwife or doctor right away.

A strong healthy placenta can help prevent sensitization. By strengthening the placenta the risk of premature separation is minimized. A good healthy diet will help strengthen the placenta.

Daily dietary suggestions include: citrus fruit and juice 3 times a day, and 1000 mg. of Vitamin C, 1 teaspoon powdered magnesium in water, fresh garlic or garlic oil capsules, spirulina or

kelp. Fluoridated water and toothpaste should be eliminated because fluoride interferes with the main protein used in the attachment of the placenta.

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