

**“Rh Disease.” Kelly Moore, April 20, 2007**

### **What Is Rh Disease?**

“Rh Disease” refers to a condition in which blood incompatibility between a mother and a fetus results in an attack of the fetal red blood cells by the mother’s immune system (3). It is addressed with several other names, such as Erythroblastosis fetalis in the fetus and Hemolytic Disease of the Newborn in the baby which simply concern the destruction of the infant’s red blood cells (2). The variance in the blood is due to different proteins that a particular individual has on the red blood cells.

Red blood cells are all responsible for the transport of oxygen throughout the body, and there exist different groups of proteins which can be characteristic of an individual’s red blood cells. In 1900, the A, B, and O blood types were determined by Karl Landsteiner by the presence or absence of the proteins A and B on the surface of the red blood cells. The protein A attached to the red blood cell constitutes blood type A, and similarly the protein B attached to the surface will give blood type B. In addition, the presence of both proteins A and B can produce a blood type of AB, and the absence of both proteins will give blood type O. Blood types are important because the proteins produce antigens which stimulate the production of specific antibodies which will attack a foreign substance in the body. Possessing the antigen will inhibit the production of that particular antibody. Therefore, a person with blood type A will have the A antigen and produce the B antibody, and a person with blood type B will have the B antigen and produce the A antibody. If these two blood types mixed, they would attack one another, resulting in destruction of the red blood cells. Blood type AB is unique because it has

both antigens and neither A nor B antibodies. Blood type O is the opposite because it contains both A and B antibodies due to the absence of the A and B antigens (1, 3).

The Rh Disease is caused by a different protein group located on the red blood cell surface, called the Rh factor. The presence of the Rh factor constitutes an “Rh positive” person, whereas the absence of the Rh factor indicates an “Rh negative” person. If a mother who is Rh negative has a baby who is Rh positive, the immune system of the mother will be able to form antibodies for the Rh positive red blood cells and destroy them. However, this will only occur when the two different blood types combine. This is a serious event that could lead to anemia, jaundice, organ enlargement, or even death in the newborn (5).

### **How Does One Get Rh Disease?**

Whether or not a person has the Rh factor is genetically determined. The only condition in which Rh Disease is possible to occur is when the mother is Rh negative and the baby is Rh positive. This is because it is the only circumstance where the blood of the mother is exposed to a foreign substance, the Rh factor protein, and responds by making antibodies. The Rh factor is a dominantly inherited autosomal trait. Thus, one must receive a recessive allele from both parents to be Rh negative, or recessive for the Rh factor. If this occurs in the mother, and the father is Rh positive, then the baby will either have a 50% chance or a 100% chance of having the Rh protein, depending on whether the father is homozygous dominant or recessive for the Rh factor. Since the majority of the population is Rh positive, any woman who is declared Rh negative is assumed to have a child that is Rh positive (3).

A key fact to the Rh Disease is that the mother's immune system only produces antibodies when her blood crosses the baby's blood. Crossover of the blood generally only occurs during the delivery when the placenta detaches. However, instances such as an accident, amniocentesis, a prior miscarriage, abortion, or ectopic pregnancy can allow the blending of the two different red blood cells as well. If the mother's immune system is exposed to the Rh factor, then it begins to produce long-term Rh antibodies. At this point, the mother is considered "Rh sensitized." The first Rh positive baby born to an Rh negative mother is typically unharmed. It is the rest of the pregnancies of the Rh sensitized mother that show the effects of Rh Disease (4).

### **How Is Rh Disease Diagnosed?**

Diagnosis of Rh Disease is very easy due to the advancements in prenatal care. The primary diagnosis begins with the identification of an Rh negative mother. This is done with a series of standard blood tests that identify blood types using antibody testing. Then, both parents are tested, and their genetic history is studied to determine the chance of obtaining an Rh positive child. The woman will then be tested for the presence of Rh positive antibodies within her blood. During pregnancy, symptoms of Rh Disease can be detected by viewing organ enlargement of the fetus during an ultrasound, measuring bilirubin, a byproduct of dead red blood cells, in an amniocentesis, or by checking for antibodies, bilirubin, or anemia in the fetal blood taken from the fetal umbilical cord (5).

### **How Is Rh Disease Treated?**

Unfortunately, if Rh Disease has not been prevented, there is not much that can be done to assist the pregnancy. The pregnancy will be highly monitored to determine the severity of the Rh Disease. This is done by similar techniques used in diagnosis, such as

amniocentesis, ultrasound, and blood samples. If conditions of the fetus are too dangerous, an intrauterine blood transfusion can be performed to introduce red blood cells into the circulation of the fetus. This is a very dangerous procedure in which fresh blood cells are introduced through the umbilical vein. This procedure can be repeated several times throughout the pregnancy as needed, but it has high risks. If the effects of Rh Disease are too damaging, an early delivery might be enforced. The fetus has to be at least thirty-two weeks old in order to survive the induced labor (5).

### **What Is the Prognosis of Rh Disease?**

The prognosis for Rh Disease is generally poor for the baby, while no complications will surface for the mother. The destruction of the fetal red blood cells is referred to as Hemolytic Disease of the Newborn, or HDN. It can consist of hydrops, which is the buildup of fluid in the body, anemia, or jaundice. As the fetus loses its red blood cells, it attempts to produce a large amount of red blood cells in a short period of time. In most cases, the liver cannot maintain these conditions, which results in its enlargement. This can lead to fluid accumulation in the heart, lungs, and belly of the fetus. Many times, this can result in hydrops fetalis, or stillborns. In addition, the destruction of red blood cells produces a byproduct called bilirubin. Bilirubin is a yellow substance that causes jaundice where the baby appears yellow. Any accumulation of bilirubin in the brain can lead to deafness and mental retardation (2). Rh Disease will often produce anemic babies as well due to their low levels of red blood cells (4).

### **How Can Rh Disease Be Prevented?**

Fortunately, most cases of Rh Disease are prevented today because prenatal care currently tests all women who plan on having a baby. Rh-negative women are identified

and tested for antibodies early. Women who are not yet sensitized are given an Rh immunoglobulin drug which is both necessary and effective for preventing Rh Disease consequences. The drug used is called RhoGAM, and it is injected directly into the woman's muscle at least twice for every pregnancy. RhoGAM works to confuse the woman's immune system into believing the Rh antibodies have already been made so that her body will not produce more. One injection will block Rh sensitization for twelve weeks. The first shot is given when the mother is at twelve weeks, and the second one is given within seventy-two hours following delivery. In addition, the woman will be given an injection for any instance that occurs in which there is a possibility that the mother and fetal blood crossed (2).

## References

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