

Blood group

As we know there is : classic blood group , minor blood group ,Rh-blood group.

The classical blood group ABO: A antigen or B antigen express on the surface of RBC or both expressed or neither .

Now we go to the blood type of ABO blood group "phenotypically":

1-Type A: has A antigen and anti B antibody (also called beta antibody)

2-Type B: has B antigen and anti A antibody (also called Alpha antibody)

3-Type AB: has A and B antigen and no antibody

4-Type O: has no antigen but both type of antibody (anti A and anti B)

These antibodies are sometimes called agglutinin.

These antibodies are not present in the plasma of the newborn they occur after 7 to 8 month and it occur naturally maybe under the effect of antigen of food in meat or special type of bacteria.

But only rarely, they don't occur at all during the life of that individual unless the individual exposed to the RBC's of the opposite individual who have different type of blood.

-These antigens (called agglutininogen) are present in surface of RBC but also present in other tissues: salivary glands, pancreas, kidneys, liver, lungs, testes, semen and amniotic fluid.

-There are hundreds of antigen present in surface of RBC beside the classical but only 15 of them have been identified.

-There are many blood systems two of major important (ABO and Rh- blood group).

-the most important antigen in minor blood group are : MM,MN, NN, PP, Pp, KELL, LEWIS, LUTHERAN ..etc.

the first three sometimes ,produce problems in the human being that these antigens may produce antibodies which results in agglutination between the RBC and the newly produced antibodies.

Now ,A,B,O,AB is the phenotype what about the genotype ???

A= AA or AO

B=BB or BO

AB= AB

O= NO ANTIGEN recessive

Rh blood group : by accident they found on RBC the Rh antigen or they call it D antigen .

-in Europeans, 85% of individuals' RBC have the D antigens but no antibodies in their plasma: these are called Rh or D positive.

- the remaining 15%: neither antigen or antibody is present, these are called Rh or D-negative .

-there are at least three sets of alternative antigens in the Rh group system: D or d(actualy there is no d just D antigen but the doctor said there is D and d -.-) , C or c and E or e and D is the most strong antigen therefore most important clinically .

-we said the antibody not present in newborn in early life they increase gradually within 6 month reach the higher concentration between 8and 10 years .

- from table in slide this is the distribution of blood group in us
White A 41%, B 10%, AB 4%, O 45%, Rh-positive 85%, Rh-negative 15% .

This table from 1945 -.- but the distribution almost the same as no change in it the difference only in Black, Chinese and Indian.

-the Rh is positive 90% in black ,99% in Chinese , 100% in Indian , 97% in Jordanian.

Now the importance of Rh group is when a man of Rh-positive marries a woman with Rh-negative blood type, their baby will be Rh-positive.

The probability of Rh marriage

DD male x female dd.

- Dd, Dd, Dd, Dd (offspring)
- in this case, all the babies are positive.

Dd male x female dd

- Dd,Dd,dd,dd (offspring)
- 50% chance of Rh +ve and 50% chance of Rh -ve.
- so an Rh-positive father with an Rh-negative mother may not always produce Rh-positive babies.

The antibody will pass from mother to fetus, agglutination occurs and hemolysis may occur in the fetal blood and will cause death.

There are three condition in which woman develop antibodies:-

- 1- if she had blood transfusion premarital from an Rh+ person if she get married of Rh positive and the child is Rh positive any passage of RBC from the child cause more and more antibody.
- 2- if leakage during pregnancy; sometimes there is placental hemorrhage ,if the passage of the RBC from fetus to mother occur at early stage then there is problem , but in late stage (after the 6th month) maybe the child is not on that dangerous .
- 3-durig delivery, some blood is secreted back to maternal blood in this case, the second baby will be in danger.

in these one of the following hemolytic diseases will occur:-

1-erythroblastosis fetalis (mild disease): small amount of RBC leak into mother circulation some mother develop antibody against D ag . These ab pass to fetal blood and cause mild hemolysis of the RBC of the fetus.

In this case we can save the fetus by giving him, Rh-ve blood ,but not from mother cause she has ab against the D ag .

2-leterus graves neonatorum (moderate disease) : The infant is born at term, with jaundice, or becomes so within 24 hours. Mental retardation may occur involving the basal ganglia in which the bile pigments deposited.

3- **hydrops fetalis** (severe disease) This depends on the amount of antibodies that pass into the fetal blood. Infant may die in uterus or may develop severe anemia, jaundice and edema and dies within a few hour.

Nowadays there is usually no problem .It can be prevented by giving an Rh- mother human gamma globulin against Rh+ RBC's within 72 hours after she has delivered an Rh+ infant. These antibodies bind to an antigenic sites on Rh+ RBC that may have entered the mother's blood during delivery and prevents them from inducing antibody synthesis by the mother .

Blood transfusion

- O is general donor who donates to everyone including its own kind, receives only from its own kinds .
- AB is called the general/ universal recipient who receives from anyone and its own kind .
- Ideal : from the same blood group (like A and B).

Is O always general donor or AB always general receipt ?

There is agglutination occur always when we transfer blood from O to any type of blood or when AB person receive blood from any type of blood but it consider minor because of dilution.

- one bag (one unit of blood) contain 420 ml .
- maximum we can give 4 bags, after 4 bags there will be serious problem so there is no general donor or general receipt.
- more the bags ,more the agglutination.

You may be wondering whether ABO incompatibilities are also a cause of hemolytic disease of the newborn for example , a woman with Type O blood has natural antibodies to both A and B antigens. If her fetus is type A or B in theory it should cause a problem .fortunately , it doesn't because A and B antigens are not strongly expressed in fetal RBC's and partly because natural antibodies are of the IgM type which doesn't cross the placenta.