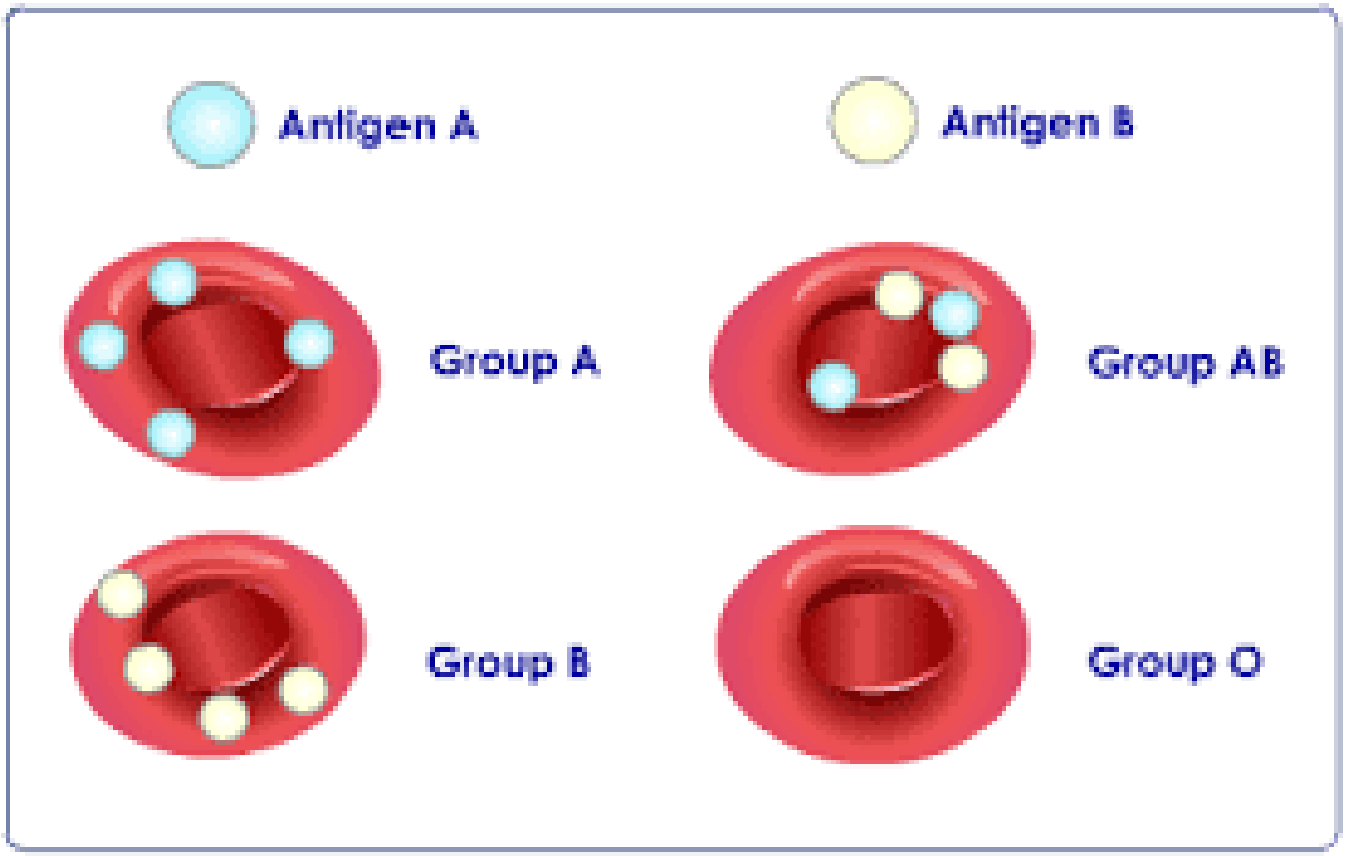
BLOOD GROUPS

There is an erythrocyte agglutination event based on antigen-antibody relationships.

Antibodies are present in serum.

- In blood, the serum is the component that is neither a blood cell (serum does not contain white or red blood cells) nor a clotting factor; it is the blood plasma not including the fibrinogens.

Antigens are present in erythrocytes.



- The importance of blood groups arises especially in blood transfusions and pregnancy. While there is no reaction in blood transfusions within the same group, agglutination and hemolysis events are seen in erythrocytes in different groups.

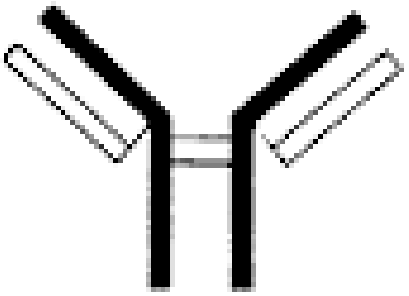
- The presence of antibodies in the blood was determined by agglutination.

Isoantigen (alloantigen) & Iso-antibodies (alloantibodies)

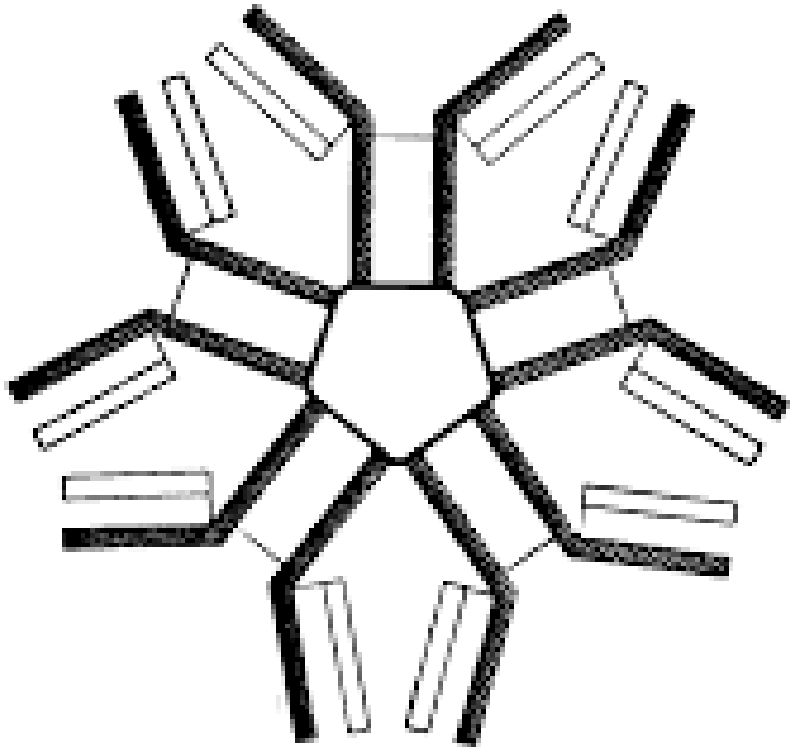
- **Isoantigens** are those substances which have antigenic properties and are contained in some individuals of a given species, antibodies against isoantigen are also called **isoantibodies**.
- Isoaglutinins are naturally found in the ABO system.

- The major antibodies in blood groups are IgG and IgM.

IgG



IgM



- **IgG** reacts well at 37 ° C, passes through placenta, is heat resistant.
- **IgM** is the full agglutinating antibody. It reacts well at 4-20 ° C, can not pass through placenta and is heat sensitive.

Zeta potential

- Surfaces of the erythrocytes, bacteria are loaded (-) in salty water suspensions and they repel each other. This electrostatic repulsion force is called Zeta Potential.
- (+) Charged ions surround it like a cloud.

✓ Because **IgM** is large volume, it exceed the zeta potential. It can be combined with erythrocytes and agglutinated.

✓Rh antibodies in the form of **IgG** can be combined with Rh (+) erythrocytes ancak but because they are often small in volume, they do not exceed the zeta potential and agglutinate with erythrocytes.

- In this case, the presence of antibody can be displayed in three ways.

1. **Zeta potential** was removed by centrifugation and may agglutination.
2. Anisotropic agent is added and erythrocytes can be precipitated in clusters in the presence of compleman. **(coagglutination)**
3. Erythrocytes can agglutinate with antiglobulin addition. **(Coombs Test)**

Coombs test

- **The Coombs test is used to detect block antibodies.**
- Coombs serum containing human antiglobulin is used as reagent.

- Blocan antibody: IgG without Fc part is called incomplete-blocking-antibody.
- Antigen-antibody binding occurs in the presence of blockan antibody but agglutination can not be observed under laboratory conditions.
- Antiglobulin: An antibody that combines with globulin to cause clustering

- There are two types of coombs test
- 1- Direct coombs test
- 2- Indirect coombs test

Direct coombs test

- By examining the erythrocytes of suspected newborn children with erythroblastosis,
- pasted through the mother and covered with erythrocytes
- but can not agglutinate because of the mechanism
- **to detect the presence of anti-Rh antibodies.**

Direct coombs test

- Erytroblastosis fetalis
- Blood transfusions
- Autoimmune hemolytic anemia
- Viral diseases
- Lead poisoning

Indirect coombs test

- It is reveal anti-Rh antibodies formed in the serum of pregnancy to a Rh-positive child, Rh-negative mother.

- Antibody(Anti-Rh antibody) is sought in the patient's serum using O Rh + erythrocytes as a reagent.

ABO Blood Group System

- For the first time in 1901, Dr. Karl Landsteiner identified 3 factors in each person's blood serum agglutinating erythrocytes of other people and named them A, B, C. The group called Landsteiner's C is named after the group of 0. Also a different group was identified as AB. All of these are now called ABO blood groups.

- Basis of blood-group is based on the A, B, and H antigens in erythrocytes.
- These antigens are in the glycoprotein structure and are present in body fluids such as sperm, milk, saliva, gastric juice, and sweat in tissue cells other than erythrocytes.
- **These antigens are not found in the tissues of the central nervous system, bone, cartilage and epithelial tissue.**

Oh:Bombay Kan Grubu

- Individuals with the rare Bombay phenotype (hh) do not express H antigen, the antigen which is present in blood group O.
- As a result, they cannot make A antigen or B antigen on their red blood cells, whatever alleles they may have of the A and B blood-group genes, because A antigen and B antigen are made from H antigen.
- For this reason people who have Bombay phenotype can donate red blood cells to any member of the ABO blood group system (unless some other blood factor gene, such as Rhesus, is incompatible), but they cannot receive blood from any member of the ABO blood group system (which always contains one or more of A and B and H antigens), but only from other people who have Bombay phenotype.

Rh System

- It is the second most important blood group system, after ABO.
- The rhesus blood type named after the rhesus monkey was first discovered in 1937. This serum that led to the discovery was produced by immunizing rabbits with red blood cells from a rhesus monkey. Antigens in erythrocytes are called Rh antigen (D antigen).

Hr Factors

- In 1941, it has been shown that a child with erythroblastosis brought to the world, Rh (+) woman's serum be able to agglutinate Rh (-) person erythroytes.
- This factor is called the Hr factor, which means that it is opposed to Rh.
- Hr factors are present in the absence of Rh factors in erythrocytes

Other blood group systems

- Duffy, MNS, Lutheran, Kell, P, Lewis, KIDD, Diego, Cartwright, Xg, Scannia, Dombrock, Colton, Knops, OK, Gerbich, RAPH

Blood Transfusion

- Blood transfusion is the transfer of blood from one person to the venus of another. However, in this process, the recipient and donor blood groups have to match each other.
- In the ABO system, the serum of each group contains isoaglutinins which are not compatible with the antigens in their erythrocytes. **It is impotant that there is no antibody against the erythrocytes of the recipient in the donor blood.**

- Persons with group O blood have no A or B antigens on their red cells. However, since group O blood has A and B antibodies, can only take blood from group O so are **universal donors**.
- Persons with group AB blood have neither A nor B antibody and thus are **universal recipients**.

- Cross-matching should be performed before blood transfusion.

- **Cross-Matching:** It is the method of searching for antibodies in recipients and donors from the same blood group. The recipient's serum is compared with the donor's erythrocytes followed by Coombs serum **(large cross-matching)**

- Only the comparison of the blood of the recipient and the donor on the lame is **small cross-matching.** It is examined in terms of agglutination.

TRANSFUSION DISEASES

- *Brucellosis*
- *Salmonella cholera suis*
- *Yersinia enterocolitica*
- *Borrelia recurrentis*
- *Treponema pallidum*
- *Plasmodium falciparum, P. vivax, P. ovale, P. malariae*
- *Toxoplasma gondii*
- *Leichmania donovani*
- *Aspergillus and Penisillium sp.*
- *Hepatitis A,B,C,D viruses*
- *HIV*
- *EBV*
- *Herpes virus*

- **DONATION CRITERIA**
- For your health and well-being, you must:
- Be between 16 and 60 years old
- Weigh at least 45 kg
- Have a haemoglobin level of at least 12.5 g/dl
- Generally be in good health
- Not have had any symptoms of infection for at least 1 week e.g. sore throat, cough, runny nose, diarrhea
- Not have had a fever in the last 3 weeks
- In addition to the above requirements, apheresis donors should also:
- Weigh more than 50 kg
- Be at least 18 years old
- Not be more than 50 years old (for new apheresis donors only)
- Have had donated blood at least once before
- Have arm veins of a suitable size

Erythroblastosis fetalis (haemolytic disease of newborns-Rh disease):

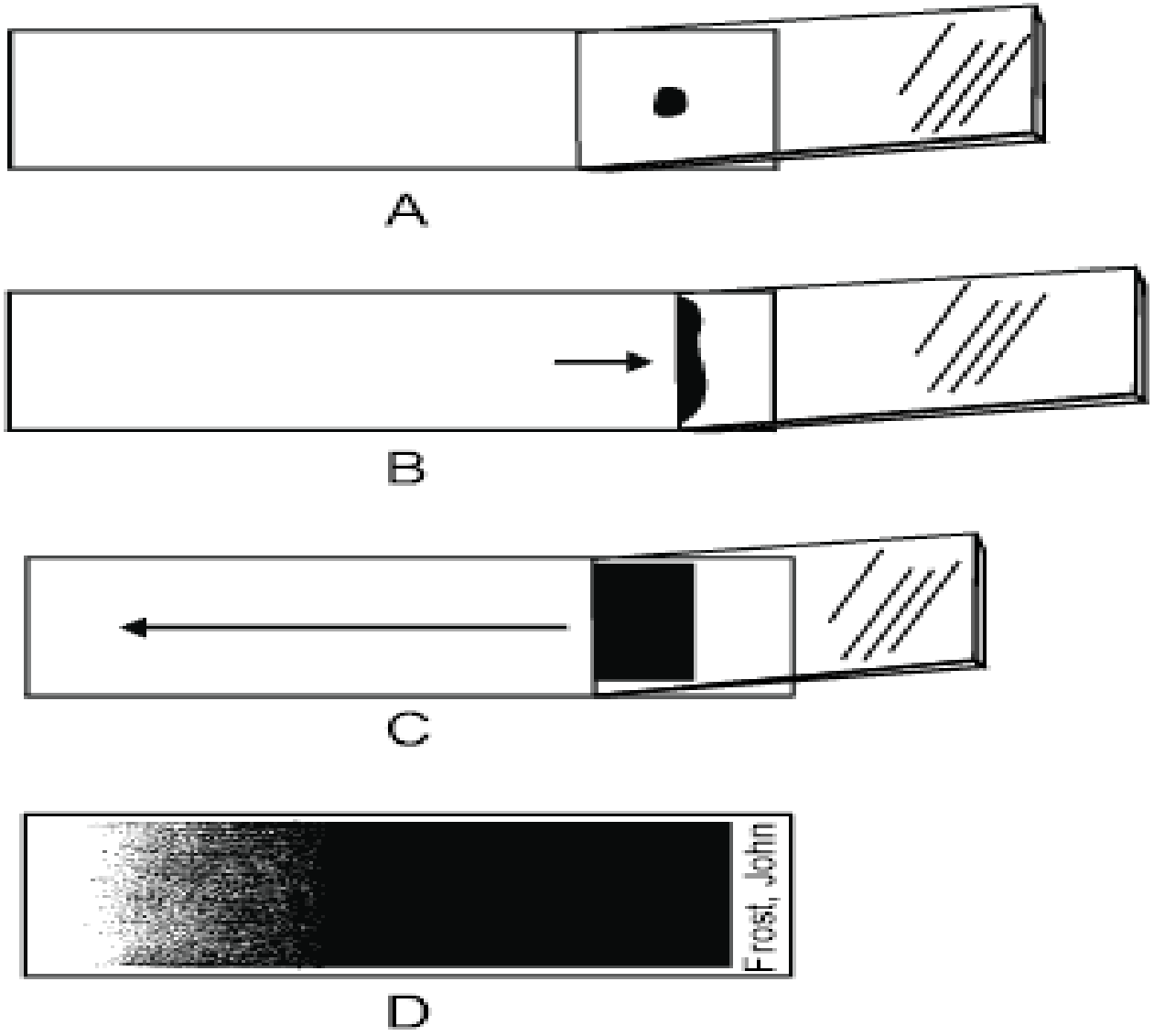
- It is a disease seen in the children who have Rh incompatibility among parents.
- A homozygous Rh (-) mother and a heterozygous Rh (+) father's child will 50% likely Rh (+) and this disease will be seen.

- Rh antigens present in the child's erythrocytes pass to the mother with the placenta and anti-Rh antibodies are formed against them.
- These antibodies also pass through the placenta to the child, causing the destruction of the red blood cells and the appearance of the disease.
- Immediately after birth, erythrocytes are blocked by giving anti-D gamma globulin to the mother.

DETERMINING BLOOD GROUPS

1. Hemaglutination
   - A) Lam agglutination,
   - B) Tube agglutination,
   - C) Gel centrifugation
   - D) Microplate
2. RIA
3. EIA
4. PCR

methods are used.


A
B
C
Frost, John
D

WRIGHT STAINING

- The preparation is initially **fixated in the alcohol tank for 2-3 min.** Dry in the air.
- Add 8 drops Wright stain. Wait 3-5 min.
- Add 8 drops buffered water and wait completed in 10 minutes.
- Washed with water, dried and examined with the immersion

Determination of blood groups

Anti-A	Anti-B	Anti-D	Sonuç
●	○	●	A Rh (+)
●	○	○	A Rh (–)
○	●	●	B Rh (+)
○	●	○	B Rh (–)
●	●	●	ABRh (+)
●	●	○	AB Rh (–)
○	○	●	0 Rh (+)
○	○	○	0 Rh (–)

● Çökelme var. ○ Çökelme yok.