BLOOD GROUP

- Blood grouping is based on type of antigen present on the red blood cells.
- There are more than 300 blood group systems but ABO and Rh(Rhesus) are of importance from clinical point of view.
- Other blood group systems are MNS , Lutheran , Kell , Lewis , Duffy , Kidd etc.

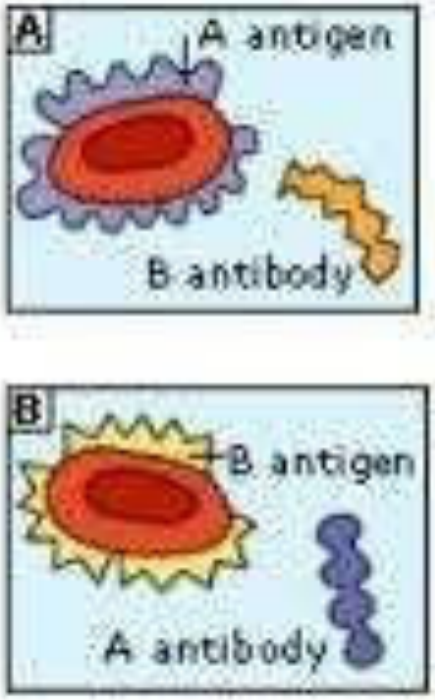
ABO SYSTEM

- Discovered by Karl Landsteiner in 1900.
- The red cells contain different types of Antigen(Agglutinogen) while plasma contains antibody(Agglutinins)
- Genes that control the system are present on chromosome 9

LANDSTEINER'S LAW

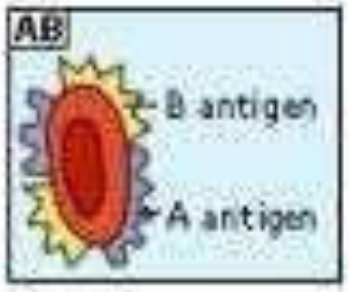
If an antigen(Ag) is present on a patient's RBC, the corresponding antibody(Ab) should not be present in patient's plasma under normal condition

ABO blood grouping system

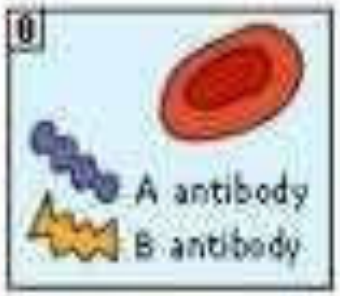


Blood group A
If you belong to the blood group A, you have A antigens on the surface of your RBCs and B antibodies in your blood plasma.

Blood group B
If you belong to the blood group B, you have B antigens on the surface of your RBCs and A antibodies in your blood plasma.



Blood group AB
If you belong to the blood group AB, you have both A and B antigens on the surface of your RBCs and no A or B antibodies at all in your blood plasma.



Blood group O
If you belong to the blood group O, you have neither A or B antigens on the surface of your RBCs but you have both A and B antibodies in your blood plasma.

Major ABO Blood Group

ABO Group	Antigen Present	Antigen Missing	Antibody Present
A	A	B	Anti-B
B	B	A	Anti-A
O	None	A and B	Anti-A&B
AB	A and B	None	None

Methods of blood grouping:

1) Slide method

2) Tube method

Tube method – better method
but takes longer

Sample in tube with antiserum --- incubate it --- centrifuge it ---examine it macroscopically and microscopically for agglutination.

SLIDE METHOD

REQUIREMENTS:

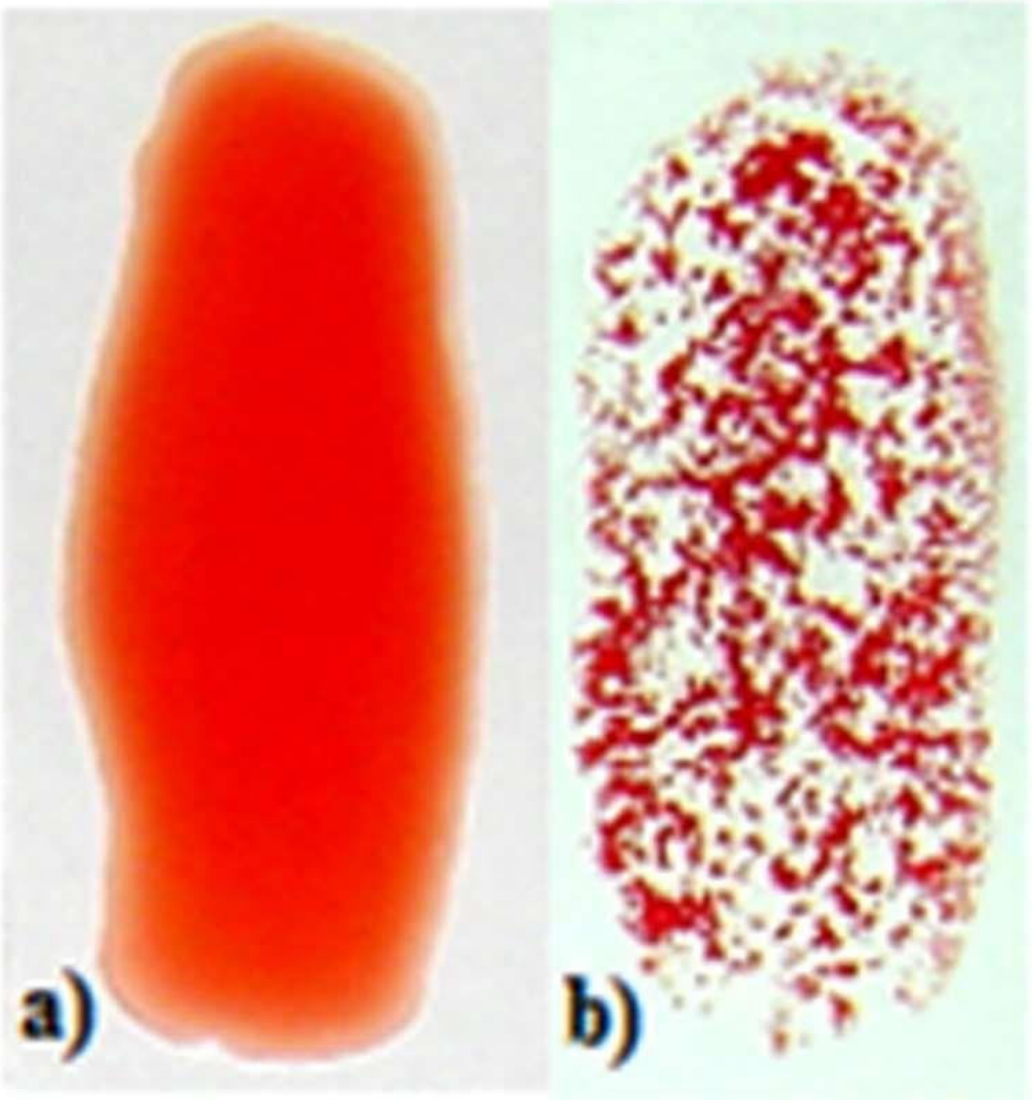
1)3 slides
2)Antisera A , B
3) Blood samples

PROCEDURE:

1) Take 2 clean slides and mark them 1, 2 .
2) Put one drop of antisera A on slide 1 , one drop of antisera B on slide 2.
3) Add one drop of blood to each and mix well with stick
4) Wait for 5 min and observe.

OBSERVATION:

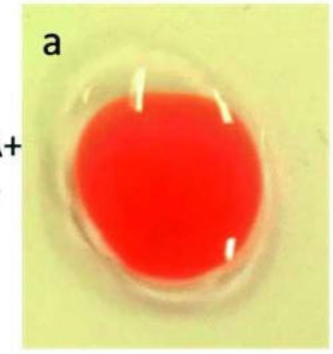
- If any agglutination occurs it is visible with naked eyes as dark reddish clumps of different sizes.
- If agglutination is minimal it can be confirmed by examining it under microscope.

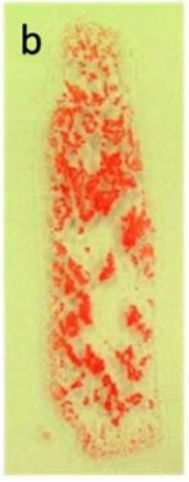


INTERPRETATION:

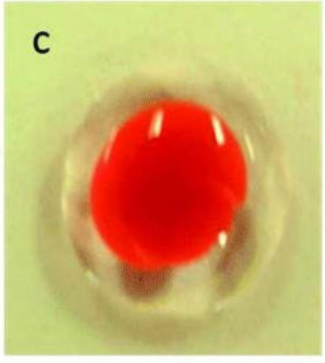
1) Agglutination with antisera A not with antisera B – group A
2) Agglutination with antisera B not with antisera A – group B.
3) Agglutination with both antisera A and B – group AB
4) No agglutination in any slide – group O

Blood sample A+ interacted with antibody-A





Blood sample A+ interacted with antibody B



Universal donor – blood group O as no Ag so no agglutination.

Universal recepient – blood group AB as both A and B Ags present so agglutination occurs in both as no Abs present in serum.

Rh TYPING

HISTORY:

- 1939 – Levine and Stetson defined D antigen(Rh factor)

- 1949 – Landsteiner and Weiner discovered anti Rh (named after Rhesus monkey)

Rh TYPING

- Rh blood group system is second in significance after ABO system.
- Genes that control the system are present on chromosome 1
- Consists of over 50 related Ags.
- Important genes are D,C,E,c,e.

- All Rh antigen are controlled by 2 genes –
- RHD gene– determines expression of D
- RHCE – encodes for C,c and E,e.

- RhD is a strong antigen (immunogenic) and other antigen are less antigenic than D and are of less clinical significance.

- Therefore , in practice Rh negative and Rh positive depends on presence of D antigen on the surface of red cells which is detected by strong anti-D serum.

- Occasionally, Anti - D,C,E,c,e may develop in case of pregnancy or transfusion.

- Rh positive

There is presence of D antigen.

These individuals constitute 80% of population.

Rh negative:

There is absence of D antigen.These individuals constitute 17% of population.

Cc and Ee antigen:

These are weak antigens and therefore risk of sensitisation is less than that of D antigen.

Rh antibody:

- Unlike ABO system there is no naturally occuring antibodies against Rh antigens in Rh negative individuals.

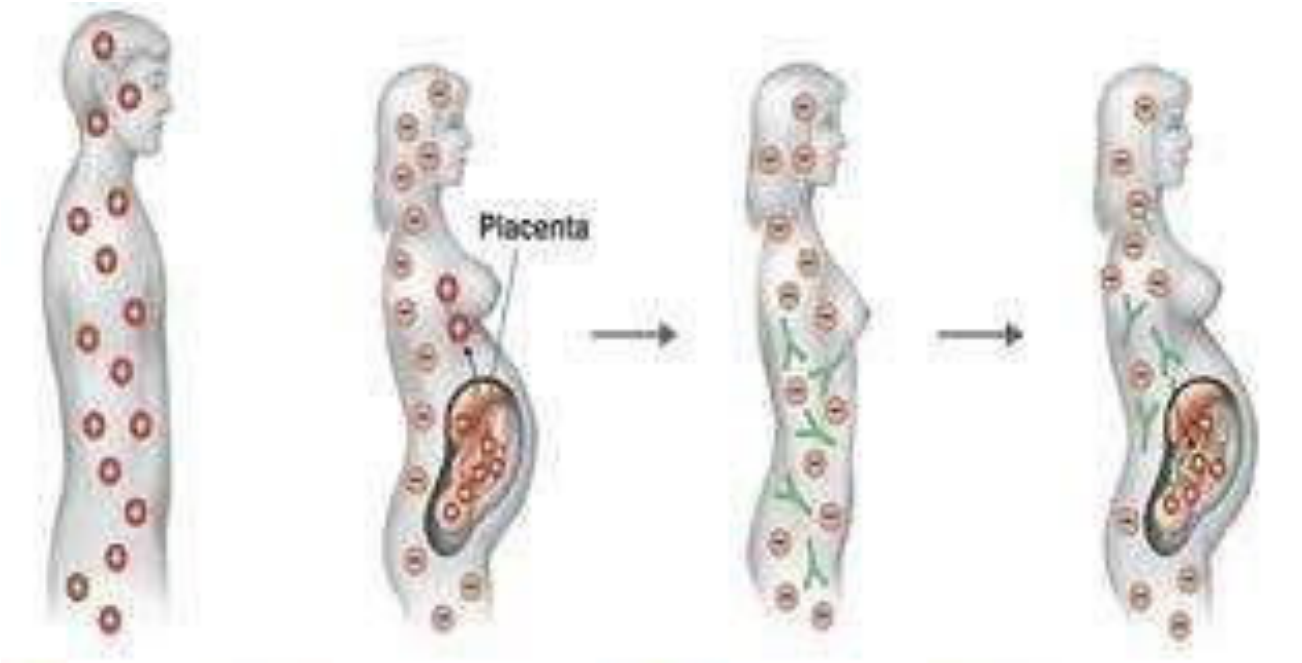
Immune Abs:

- Rh Abs develop against Rh Ag after exposure to Rh Ags following transfusion or pregnancy.
- But can be detected by enzyme treatment or coomb test(antiglobulin test)

SIGNIFICANCE:

- Rh incompartibility results in haemolytic tranfusion reaction.
- Haemolytic disease of newborn.

ERYTHROBLASTOSIS FETALIS



TECHNIQUES:

1) slide method

2) Tube method

SLIDE METHOD:

- Place one drop of anti D on slide.
- Add one drop of blood and mix well with stick
- Wait for 5 min and observe.

RESULT:

- Agglutination indicates Rh positive blood samples.

IMPORTANCE OF BLOOD GROUPING AND Rh TYPING:

- In blood transfusion
- Haemolytic disease of newborn.
- Paternity dispute
- Medicolegal issues
- Immunology,genetics,anthropology
- Susceptibility to various disease(blood group O – peptic ulcer Blood group A – gastric ulcer)

CROSS MATCHING

- Also known as compatibility testing.
- It is the most important test before a blood transfusion is given.
- The primary purpose of cross matching is to detect ABO incompatibilities between donor and recipient.
- This is carried out to prevent transfusion reactions by detecting Abs in recipient's serum.

- Two main functions of cross matching test:

  1)It is a confirm ABO compatibility between donor and recipient.

  2)It may detect presence of irregular Ab in patient's serum that will react with donor RBCs.

- Cross matching test can be
  1) major
  2) minor

MAJOR CROSS MATCH TEST:

Mixing the patient's plasma with donor RBCs.

MINOR CROSS MATCH TEST:

- mixing the donor's plasma with patient's RBCs.

SCREENING TESTS BEFORE BT:

- Malaria
- Syphilis
- HBV
- HCV
- HIV