

# Blood Groups

1. Major blood group system - Based on agglutinogens on cell membrane, present widely and causes severe transfusion reaction.
  - ABO
  - Rh system
2. Minor blood group system - Based on agglutinogens but present in few populations and causes mild transfusion reaction.
  - MNS
  - P
3. Familial blood group system - found in few families
  - KELL, DUFFY, BOMBAY LEWIS etc..

Q Define Landsteiner's Law. Explain ABO blood grouping system.

Landsteiner's Law states that:

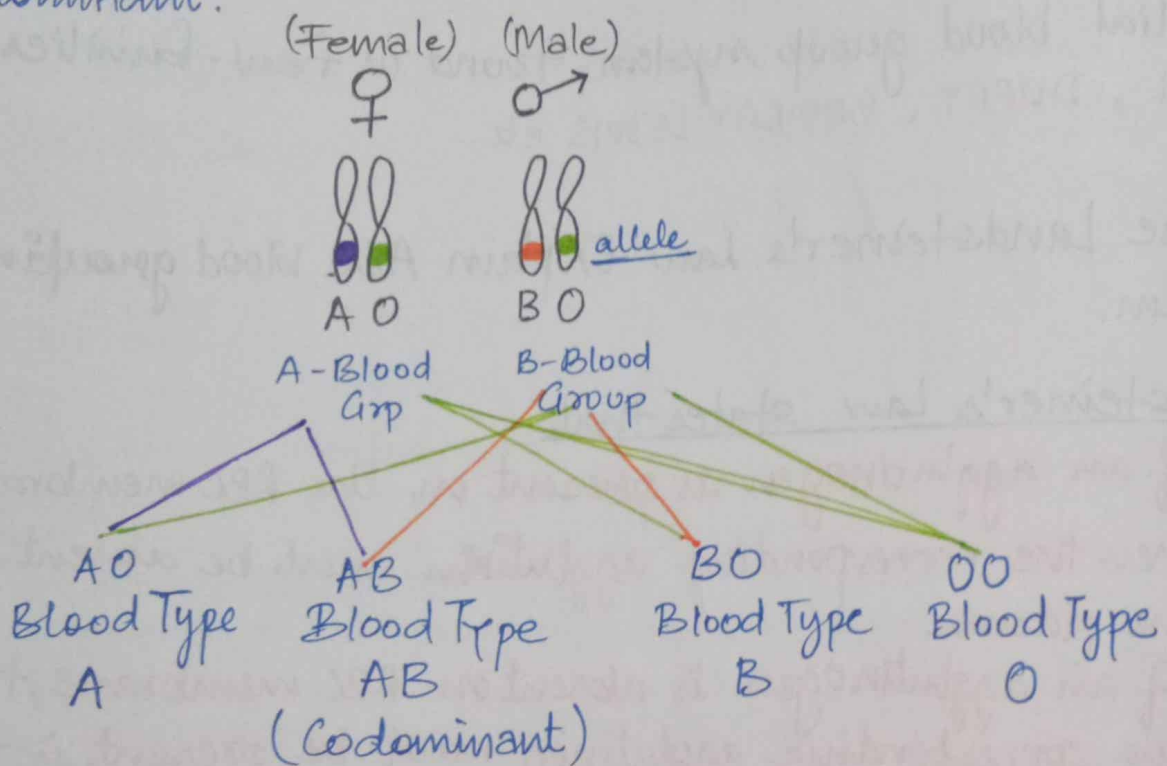
- (i) If an agglutinogen is present on the RBC membrane, then the corresponding agglutinin must be absent in the plasma.
- (ii) If an agglutinogen is absent on RBC membrane, then the corresponding agglutinin must be present in the plasma.

- (1<sup>st</sup> determine by ABO Blood grouping System - Karl Landsteiner)
- The individuals are divided into four major blood groups depending on presence or absence in their RBC's membrane of the blood group specific substance called A, B and O.
- A and B are group-specific substances called antigen (agglutinogen) i.e present of suitable antibody (agglutinin)

Antigen (agglutinogen) present on RBC	Blood Group	distributi <sup>n</sup> in India
A	A	21%
B	B	39%
Both A and B	AB	9%
Neither A nor B	O	31%

### Inheritance of Classical 'ABO' Blood Groups

- The agglutinogen A and B are inherited as Mendelian dominant.



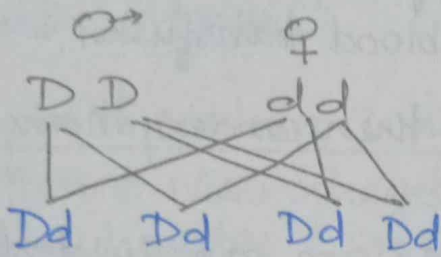
### Rhesus (Rh) Blood Group

- Discover by **Landsteiner & Wiener**.
- Rh antigens - called Rh as they were first discovered in RBC of ~~ret~~ rhesus monkey.
- 3-types of Rh antigen C, D, E
- D is commonest and cause severe transfusion reaction.
- Rh antigens are integral membrane proteins and not in other tissues.

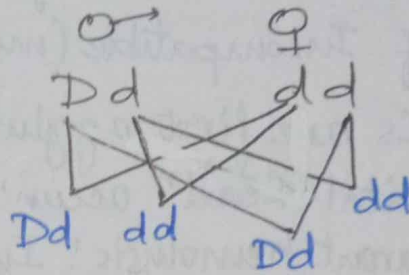


- No natural antibodies like ABO systems.
- Rh antibodies are produced when Rh-ve individual is transfused with Rh +ve blood.
- These are IgG type and crosses placenta.

### Inheritance of Rh Blood Groups



100% RH+ children



50% RH+ children

### Haemolytic Disease or Erythroblastosis foetalis

It is incompatibility of Rh blood groups b/w foetus and mother.

#### Mechanism

- Entrance of Rh +ve fetal RBC into Rh -ve mother's circulation during first pregnancy.
- This lead to production of Rh antibodies in mother's body.
- During delievery of 2<sup>nd</sup> child the antibody IgG produces which is smaller and can pass through placenta.
- It attack foetal RBC which cause severe anaemia, jaundice and even death of new body.
- It is called haemolytic disease of Newborn" or "Erythroblastosis foetalis".
- In Such Condit<sup>n</sup> foetal start to release immature RBC i.e Erythroblast.

@surgeon911

## Prevention

Injecting single dose of Rh antibodies (anti-D) to mother soon after birth child.

So active antibody will not be formed by mother.

Q What are the hazards of Blood Transfusion?

1. Effects of Incompatible (mismatched) blood transfusion.

The RBCs are first agglutinated and then undergo hemolysis. The clinical React<sup>n</sup> occur!

(i) Inapparent hemolysis! Injected RBCs are rapidly destroyed, the recipient's blood returning within a week or less to its pre-transfusion state.

(ii) Post-Transfusion jaundice! Haemolysed RBCs cause increased release of haemoglobin which get metabolised to bilirubin producing "hemolytic jaundice".

2. Mechanical overloading of circulation produces hypervolaemia, specially in patients with cardiac damage.

3. Pyrogenic reaction like fever with chills and rigors.

4. Allergic reactions eg rash, anaphylactic shock, etc..

5. Transmission of diseases like malaria, syphilis, AIDS, jaundice (viral hepatitis) etc..

6. Chemical risks. as stored blood cells lose  $K^+$  to external-plasma,  $\therefore$  after excessive transfusion death occur due to hyperkalemia.