

# Blood groups and blood transfusion

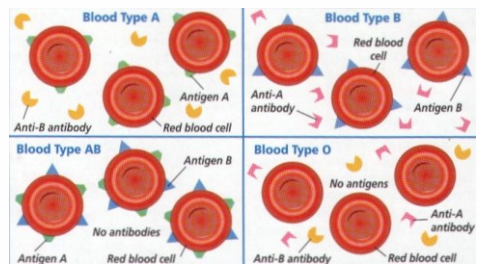
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- Agglutinogen- refer to Ag present on RBCs membrane.
- Agglutinins- refers to antibodies against the agglutinogens. Present in plasma

## Blood grouping system

- ABO blood grouping system
- Rh blood grouping system
- MNS
- P
- KELL, DUFFY, LUTHRAN, LEWIS and Others
- Landsteiner's law

## ABO grouping (types)



- A and B antigens also present in tissues like salivary glands, pancreas, liver, lungs and testis and also in body fluids as saliva, semen and amniotic fluid.
- Anti -A and Anti-B Agglutinins- IgM type , can not cross placenta.
- Alpha- 2 types- alpha 1 and alpha proper
- Alpha and beta agglutinins acts best at low temprature , so called cold antibodies.

## Determination of blood groups

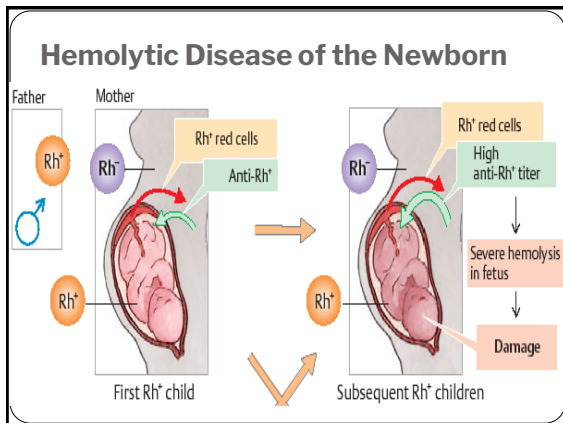
Anti-A	Anti-B	Anti-D	Control	Blood Type
●	●	●	●	O-pos
●	●	○	●	O-neg
●	○	●	●	A-pos
●	○	○	●	A-neg
○	●	●	●	B-pos
○	●	○	●	B-neg
●	●	○	●	AB-pos
●	●	○	○	AB-neg
○	○	○	○	Not valid

## Rh blood grouping

- Rh antigen- when RBCs of rhesus monkey injected into rabbit , ab's were formed against these RBCs. When such serum was tested against human RBCs, agglutination occurred in 85 % cases. i.e. Rh Ag-Rh +ve,
- Three types C,D,E -
- Rh antibody- no natural ab's
- Produced when-?
- Ig type- can cross placenta
- Warm antibodies

## Manifestations of HDN

- **Erthroblastosis fetalis-**
- Erythroblastosis-appearance of large number of erythroblasts in circulating blood as hemopoietic tissue attempt to replace damaged RBCs.
- Anaemia- due to excessive hemolysis-severe anaemia
- **Icterus gravis neonatorum-**
- Jaundice-
- Liver spleen- enlarged
- **Kernicterus-**neurological syndrome, excessive bilirubin crosses BBB and damage Basal ganglia produce motor activity disturbances.
- **Hydrops fetalis-** fetus is grossly oedematous. Ehen hemolysis is very severe, IUD or just after birth.



## Hemolytic Disease of the Newborn

- Hemolytic disease of the newborn – Rh<sup>+</sup> antibodies of a sensitized Rh<sup>-</sup> mother cross the placenta and attack and destroy the RBCs of an Rh<sup>+</sup> baby
- Rh<sup>-</sup> mother becomes sensitized when Rh<sup>+</sup> blood (from a previous pregnancy of an Rh<sup>+</sup> baby or a Rh<sup>+</sup> transfusion) causes her body to synthesis Rh<sup>+</sup> antibodies
- The drug RhoGAM can prevent the Rh<sup>-</sup> mother from becoming sensitized
- Treatment of hemolytic disease of the newborn involves pre-birth transfusions and exchange transfusions after birth

## Hydrops fetalis



## Prevention and treatment of HDN

- Single dose of anti- D within 72 hours of birth-will destroy Rh+ve RBCs of fetus in maternal circulation
- Replacement of blood with Rh -ve blood.

## Uses of blood grouping

- In blood transfusion
- Preventing HDN
- Paternity disputes
- Medico legal cases
- Knowing susceptibility of diseases

ABO genotype in the offspring	ABO alleles inherited from the mother		
	A	B	O
ABO alleles inherited from the father	A	AB	A
	B	AB	B
	O	A	O

## Blood transfusion

- **Indications-**
  - Blood loss
  - Quick restoration of Hb- severe anaemia
  - Exchange transfusion- HDN
  - Blood d'ses- hemophilia, aplastic anaemia, pupura, leukemia
  - Acute poisoning- CO poisoning
  - **Donor and recipients-** who donates and who receives blood is
- **Criteria for donor-**
  - Age, lactating pregnant, screened for AIDS , hepatitis, malaria, syphilis, Hb, PCV normal range
- **Universal donor-** group o . Theoretically RBC s not agglutinated as no Ag. practically not valid bcoz presence of Rh and Other.
- **Universal recipient-** AB group- no Ab.

### ● Precautions

- Absolute indication
- Cross matching
- Rh +ve blood never to Rh -ve person
- Always screen donor blood
- Blood bag check-for name, group
- At slow rate transfuse-
- Proper aseptic measures
- Carefully watch condition of recipients

## Blood storage

- For better long term storage :

- Citrate is used in combination with Dextrose in the following forms:
  - Acid citrate dextrose (ACD)
  - &
  - Citrate phosphate Dextrose Adenine (CPD-A)

- Dextrose acts by:

- Liberating Lactic acid and increasing the pH , helps in the survival of RBCs.
- Provides a substrate for metabolism

- Under such conditions can be stored for 14 days.

## Hazards of BT

- **Mismatched transfusion reaction-**
  - Agglutination
  - Tissue ischemia
  - Haemolysis- haemoglobinemia
  - Hemolytic jaundice
  - Renal vasoconstriction-by haemolysed RBCs
  - Circulatory shock- by toxic substances and RBCs
  - Haemoglobinuria-extra free HB leaks and produce
  - Renal tubular damage

## Hazards of BT

- Circulatory overload-rapid transfusion in cardiac d'ses pts
- Infection transmission
- Pyrogenic reaction-
- Allergic reaction
- Hyperkalemia
- Hypocalcemia
- Reduced tissue oxygenation
- Haemosiderosis
- Thrombophlebitis
- Air embolism

## Plasma Volume Expanders

- When shock is imminent from low blood volume, volume must be replaced
- Plasma or plasma expanders can be administered
- Plasma expanders
  - Have osmotic properties that directly increase fluid volume
  - Are used when plasma is not available
  - Examples: purified human serum albumin, plasminite, and dextran
- Isotonic saline can also be used to replace lost blood volume