Blood Groups and Blood Transfusion

2 stage

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BLOOD GROUPS

Determined by:
Antigens (glycoprotein) on the surface RBC

The chief blood groups are:

- **A-B-O System**
- **Rh (Rhesus) System**

Rhesus (Rh) Blood Group

Determined by:

- Presence or absence of the Rhesus antigen (D) on the surface of RBC

  - Presence of D (individual is Rh+ve)
  - Absence of D (individual is Rh–ve)

- Types of Rhesus antigens (Rh factors): D,d, C,c, E, e
  Clinically most important is D

The ABO system:

- Depends on whether the red cells contain one, both or neither of the two blood antigens A and B.

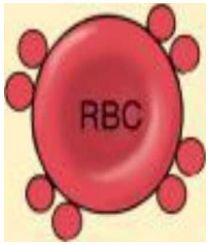
- Four main ABO groups:

A, B, AB, O

The ABO Blood groups

A	A	Anti-B
B	B	Anti-A
AB	A & B	-
O	-	Anti A+B

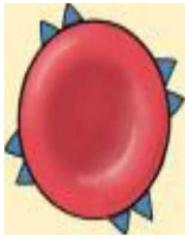
TYPE A



Surface antigen A

Anti-B antibodies

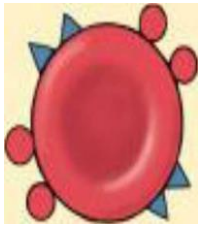
TYPE B



Surface antigen B

Anti-A antibodies

TYPE AB



Surface antigens A and B

Neither anti-A nor anti-B antibodies

TYPED

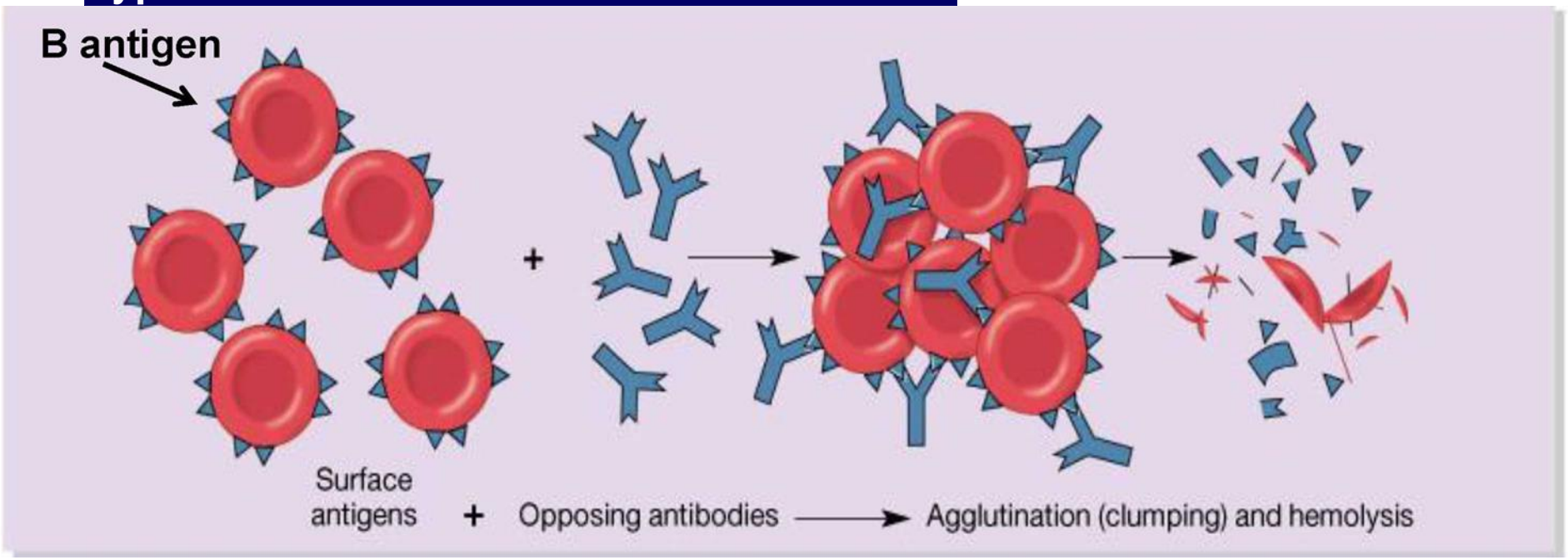
0

Neither A nor B surface antigens

YW

Anti-A and anti-B antibodies

Type B Anti B


B antigen
Surface antigens
+
Opposing antibodies
Agglutination (clumping) and hemolysis

The ABO system- cont.

- Anti-A & Anti-B are:
  naturally occurring antibodies.
- Not present at birth, appear 2-8/12
- Triggered by A & B antigens in food and bacteria

Rhesus (Rh) Blood Group

Anti-D antibody (agglutinin):

-Is not naturally-occurring

-Can be acquired by:

i-Transfusion of Rh-ve individual with Rh+ve blood

ii-Rh-ve pregnancy with Rh+ve fetus

Inheritance of blood groups

Blood group	Genotype
A	AA, OA
B	BB, OB
O	OO
AB	AB

Relative frequencies of the different blood types:

O	47%
A	41%
B	9%
AB	3%

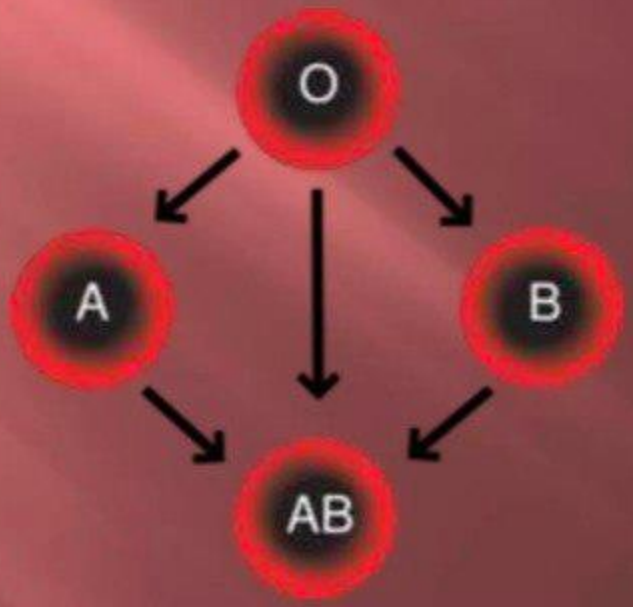
Importance of blood groups

1. Blood Transfusion.

2. Rh incompatibilty between mother and fetus

Blood transfusion

Blood grouping and cross matching



Blood transfusion

Definition

Blood transfusion is the transfusion of the whole blood or its component such as blood cells or plasma from one person to another person.

Blood transfusion involves two procedure that is –

- ***Collection of blood from donor***

And

- ***Administration of blood to the recipient.***

Blood transfusion

Type of blood transfusion

- Allogenic blood transfusion (someone else blood)
- Autogenic blood transfusion (own blood)
- Exchange blood transfusion

Blood transfusion

Purposes

- To restore the blood volume when there is sudden loss of blood due to hemorrhage.
- To raise the Hb level in cases of severe anemia
- To treat deficiencies of plasma protein, clotting factors or hemophilic globulin etc.
- To provide antibodies to those persons who are sick and having lowered immunity.
- To replace the blood with hemolytic agents with fresh blood
- To improve the leukocyte count in blood as in agranulocytosis.
- To combat infection in leucopenia

Blood transfusion

Components of blood (for transfusion)

- Each unit of blood is tested for evidence of hepatitis-b, hepatitis-c, human immuno deficiency virus I&II and syphilis.
- The blood is then processed into sub-components. These are-

- ✓ Whole blood
- ✓ Packed cell volume
- ✓ Fresh frozen plasma
- ✓ Platelets
- ✓ Cryoprecipitate

Agglutination in transfusion reaction

- If a patient of blood group A transfused with blood group B

- The anti-B in plasma will agglutinate the transfused group B cells:

Outcome:

- The clumped cells plug small blood vessels (kidney shut down)
- Sometimes immediate hemolysis

Blood transfusion

Components of blood (for transfusion)

Fresh frozen plasma

- Fresh frozen plasma is rich in coagulation factors.
- It is separated from whole blood and stored at-40 to -50 degrees centigrade with a 2year shelf-life.
- It is the first line therapy in the treatment of coagulopathic haemorrhage

Blood transfusion

Components of blood (for transfusion)

Whole blood

- Whole blood is unseparated blood containing an anticoagulant – preservative solution.
- One unit of whole blood contains-
  - 450 ml of donor blood.
  - 50 ml of anticoagulant-preservative solution.
  - Hemoglobin approx.12g/ml & haematocrit 35%-45%.
  - No functional platelets.

Blood transfusion

Components of blood (for transfusion)

Packed Red Cells

- Packed red cells are cells that are spun down and concentrated.
- One unit of packed red cells is approx. 330 ml and has a haematocrit of 50-70%.
- They are stored in a SAG-M (saline-adenine-glucose-mannitol) solution to increase their shelf life to 5weeks at 2-6degrees centigrade.

Transfusion reactions
(Incompatible Blood transfusion)

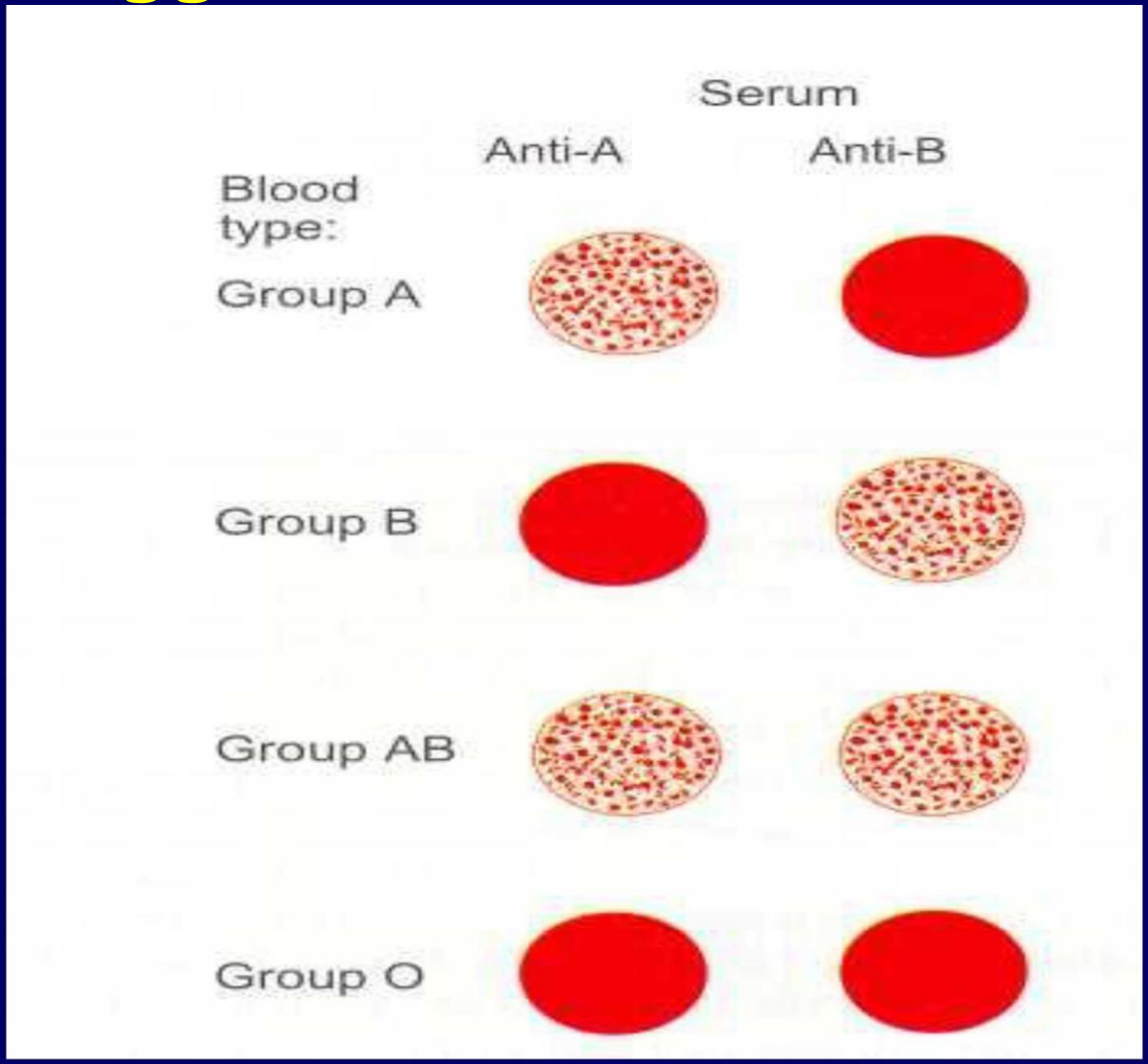
- If a person with blood group B transfused with blood of group A
- The anti-A in plasma of recipient blood group B will agglutinate the transfused cell (A)
- The clumped cells plug small blood vessels
- Sometimes causes immediate hemolysis

Transfusion reaction

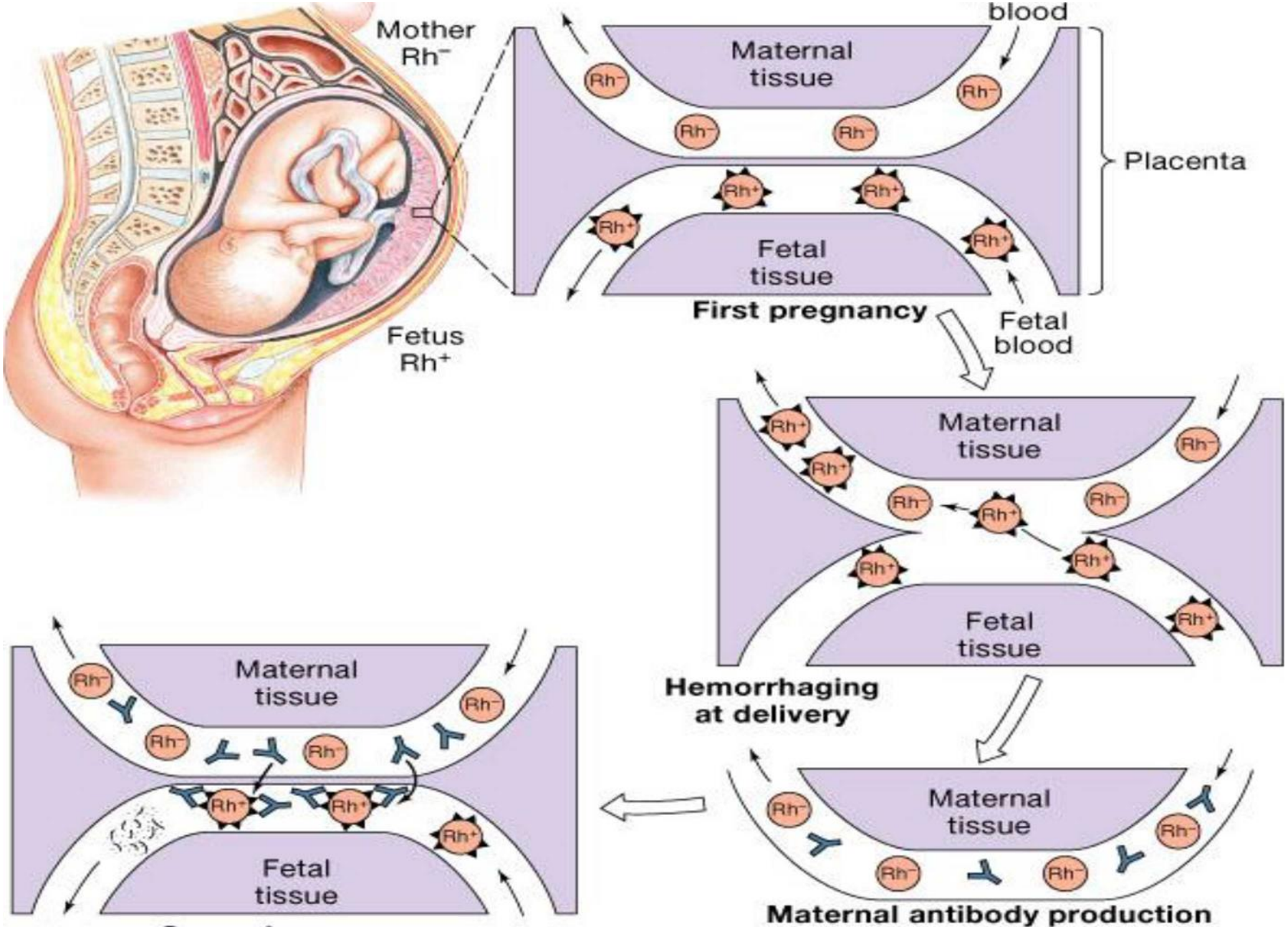
Complications of blood transfusion

1. Immune reaction: Incompatible blood transfusion leading to immediate or delayed reaction, fever, hemolysis, allergic reaction
2. Transmission of infection; malaria, syphilis, viral hepatitis & Aids
3. Iron overload

Agglutination Reaction



Rh incompatibilty between mother and fetus


Mother
Rh⁻
Fetus
Rh⁺
blood
Maternal tissue
Fetal tissue
Placenta
First pregnancy
Fetal blood
Hemorrhaging at delivery
Maternal antibody production