Immunology Lab 2

ABO and Rh

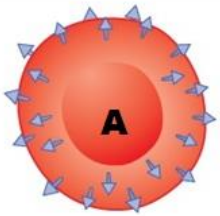
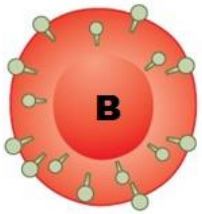
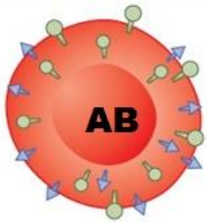
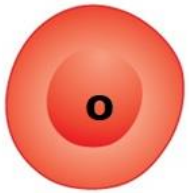
Blood Group Systems

Assis. Prof. Dr. Dara K. Mohammad

Discovery of the ABO system

- Red cell membranes have antigens (protein/glycoprotein) on their external surfaces.
- ABO discovery was first reported by **Karl Landsteiner** in 1900.
- Won Nobel Prize for medicine in 1910.
- The presence or absence of these antigens is used to classify blood groups (ABO & Rh).

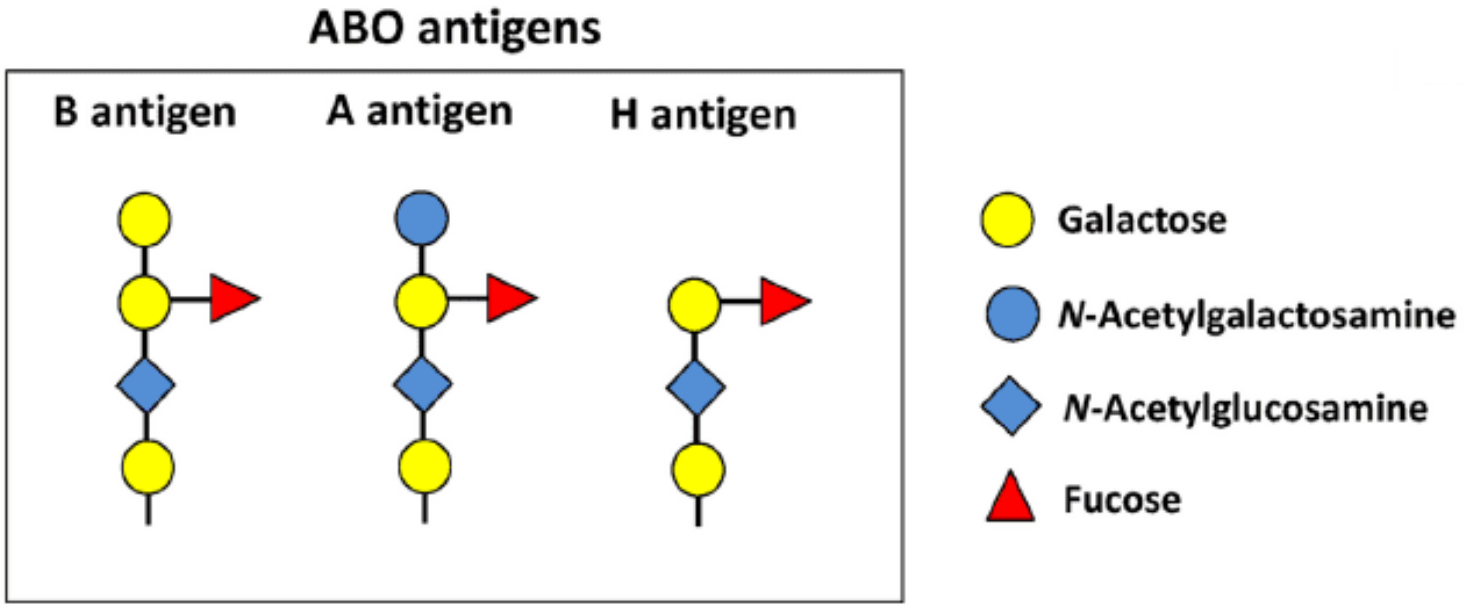
Landsteiner's rules for the ABO Blood Group

Blood group	Group A	Group B	Group AB	Group O
Red blood cells Type				
Antigens on surface of red blood cells	 A Antigen	 B Antigen	 AB Antigen	None
Antibodies in plasma	 Antibody B	 Antibody A	None	 Antibody A & B

- **Type AB: (Universal Recipient) Type O: (Universal Donor)**

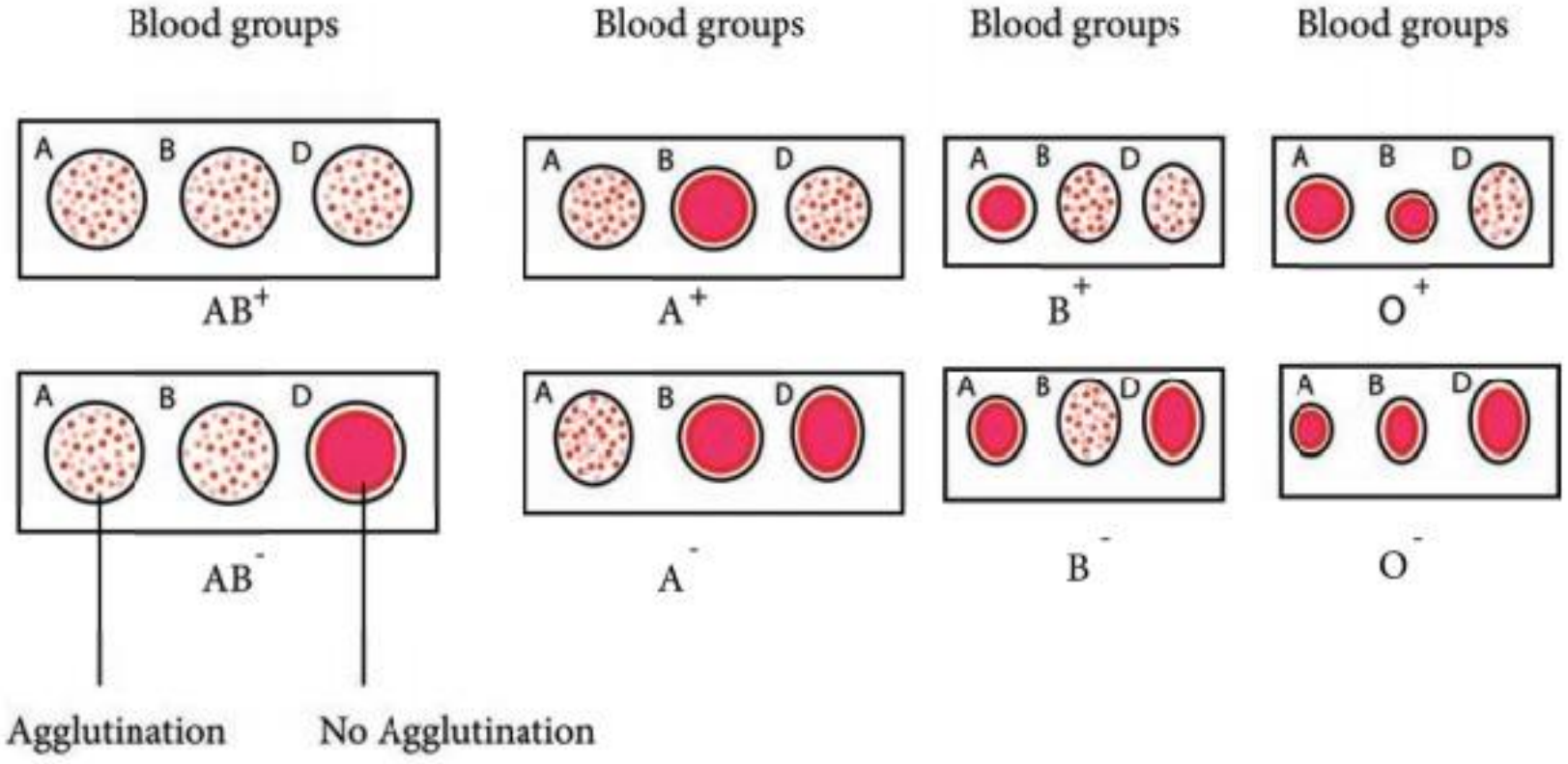
Characteristics of ABO antigens

- ABO antigens are **glycolipid** in nature.
- Oligosaccharides chain attached directly to lipids on red blood cell membrane.
- The production of A, B, and H antigens is controlled by the enzymatic actions of transferases.



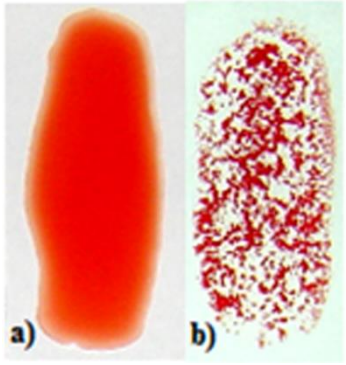
ABO-Rh blood typing kit

Blood group test



When blood-cell antigens bind with their matching antibodies results in AGGLUTINATION!

- Causes a clumping of factors.
- Looks like a thickening of blood.



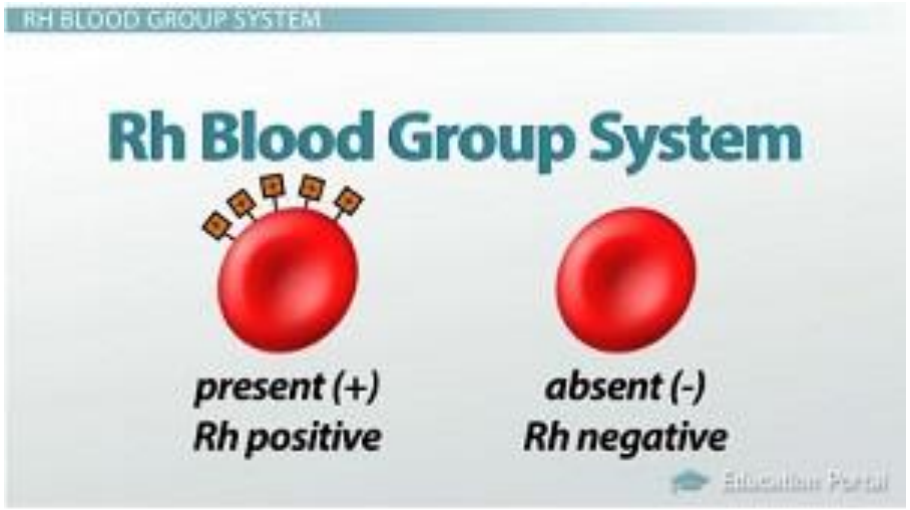
The procedure of Blood Typing:

1. Place a drop of anti-A, anti-B, and anti-D on each circle of the blood group plate.
2. At the side of each drop (anti-A, anti-B, and anti-D), quickly place a drop of blood to be tested.
3. With the end of a wooden stick, mix the blood with (anti-A, anti-B, and anti-D).
4. Continue mixing by tilting the slide back and forth for one minute (1 min.). Then the positive result will be easily seen by the presence of a granular appearance ("beaded" appearance) consisting of large clumps of RBCs.

The Rh System

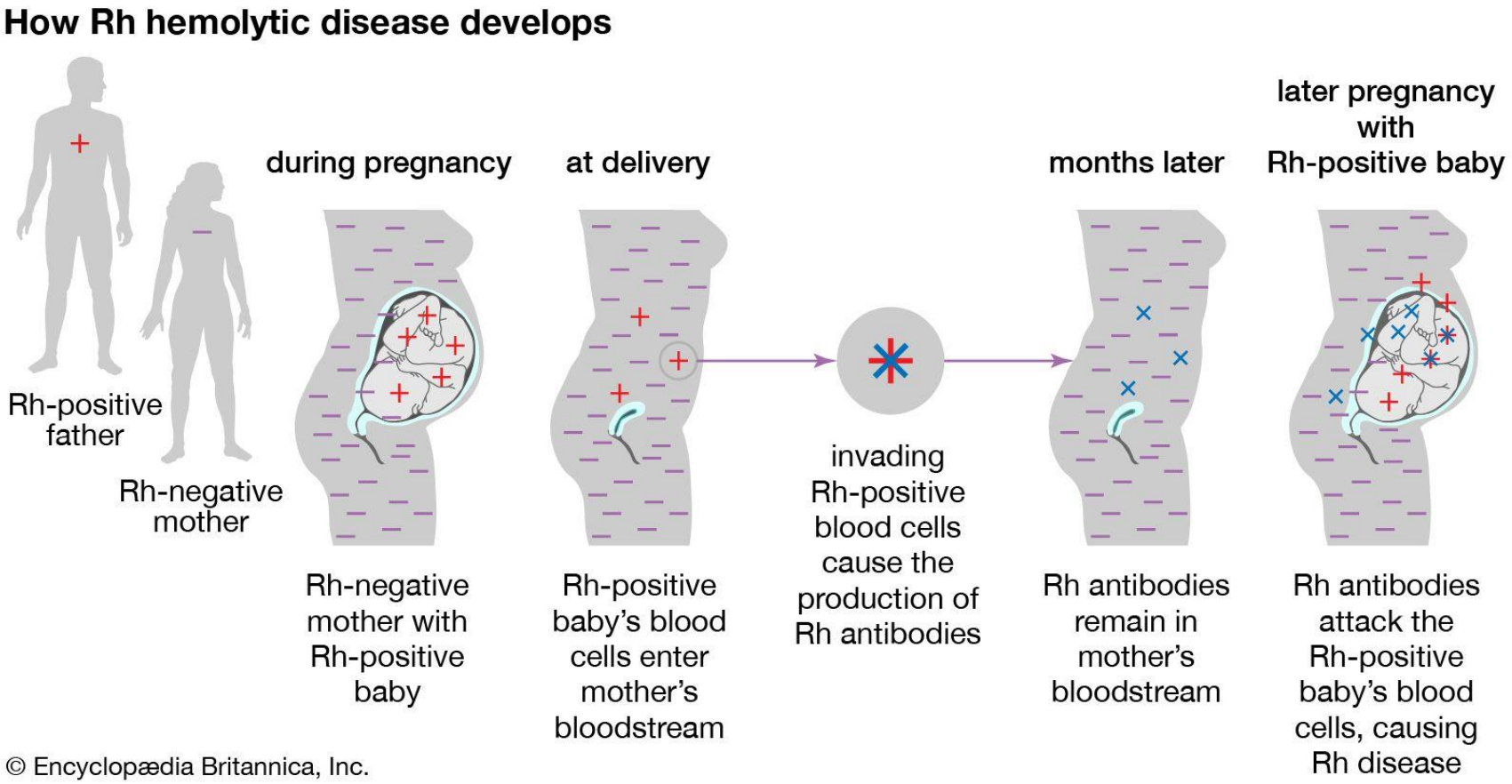
The second most important blood group in humans is the Rhesus (Rh) system. Landsteiner and Wiener discovered the Rh blood group in 1940. They found that when they injected rabbits with Rhesus monkey blood; the rabbits produced antibodies against the Rhesus red cells.

- Rh refers to the presence or absence of the D antigen on the surface of RBCs.
- Rh antigens are transmembrane proteins with loops exposed at the surface of red blood cells



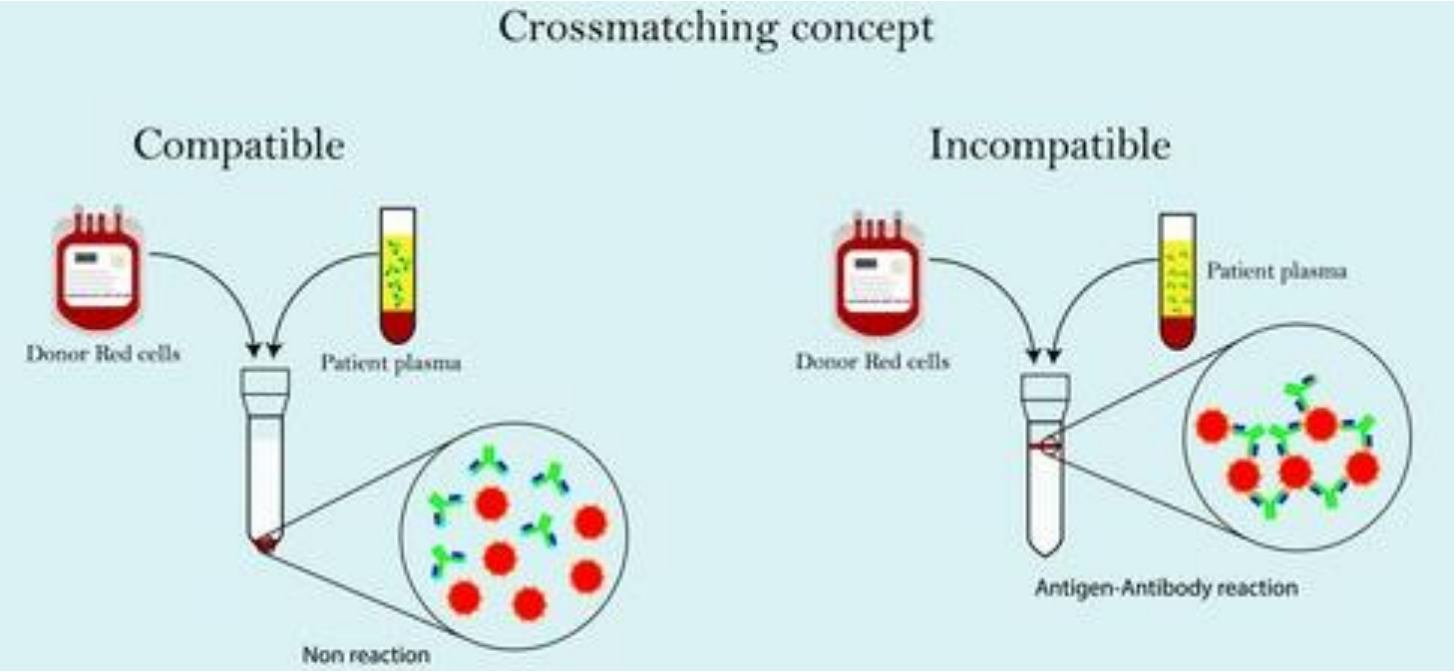
Hemolytic Disease of the Newborn (HDN)

- The Rh blood group system is the major cause of Hemolytic Disease of the Newborn (**HDN**).
- A fetus who is Rh^+ and whose mother is Rh^- is at high risk for this disorder, because the mother will produce antibodies against the fetal antigen.



Cross-matching (compatibility testing or pre-transfusion testing)

- Cross-matching is an antigen-antibody reaction.
- A crossmatch test is carried out to ensure that there are no antibodies present in the patient's serum (recipient) that will react with donor cells when transfused.
- It involves mixing a sample of the recipient's serum with a sample of the donor’s RBCs and checking if the mixture *agglutinates* ,or forms clumps.



The procedure of Cross Matching (CM) test

1. Collect the blood from donor .
2. Collect the serum from recipient in Gel tube then allow for clotting, centrifuge and separate the serum.
3. **Mix 0.1 ml (1 drop) of 3-5% suspension of donor cells with 0.25 ml (2 drops) of recipient serum.**
4. Incubate for 30 min. at room temperature.
5. Centrifuge at 1500 rpm for 3 min.
6. Observe for the presence or absent of agglutination and record the result.