# Blood Groups

Lecture-9

- Human **blood** is not the same—people belong to different **blood** groups, depending upon the surface markers found on the red **blood** cell.
- The cells that make up the body's tissues and organs are covered with surface markers, or **antigens**.

- An antigen is any substance to which the immune system can respond.
- For example, components of the bacterial cell wall can trigger severe and immediate attacks by neutrophils.
- **Antigens** that are found on the body's own cells are known as "self-**antigens**", and the immune system does not normally attack these.

- The membrane of each red **blood** cell contains millions of **antigens** that are ignored by the immune system.
- However, when patients receive **blood** transfusions, their immune **systems** will attack any donor red **blood** cells that contain **antigens** that differ from their self-**antigens**.

# Red blood cell antigens can be sugars or proteins

- **Blood group antigens** are either sugars or proteins, and they are attached to various components in the red **blood** cell membrane.
- **Antigens** of the ABO **blood group** are sugars.
- The **antigens** of the Rh **blood group** are proteins. A person's DNA holds the information for producing the protein **antigens**.
- The RhD gene encodes the D antigen, which is a large protein on the red **blood** cell membrane.
- Some people have a version of the gene that does not produce D antigen, and therefore the RhD protein is absent from their red **blood** cells.

# Red blood cell antigens determine your blood group

- The **antigens** expressed on the red **blood** cell determine an individual's **blood group**.
- The main two **blood** groups are called ABO (with **blood** types A, B, AB, and O) and Rh (with Rh D-positive or Rh D negative **blood** types).

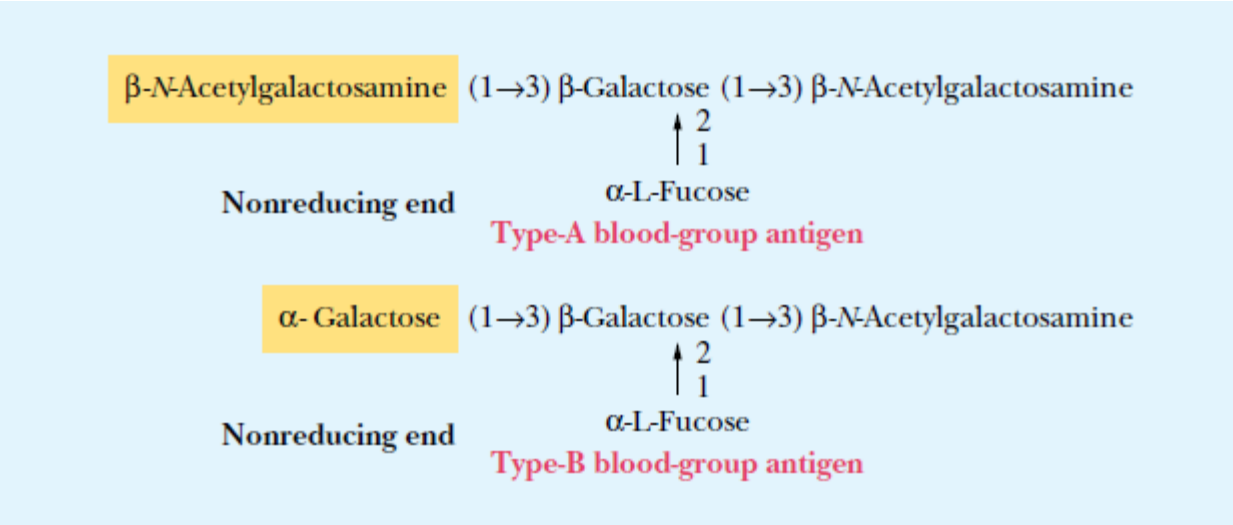
# The ABO blood group

- The ABO **blood group antigens** remain of prime importance in transfusion medicine—they are the most immunogenic of all the **blood group antigens**.
- Karl Landsteiner.

- The four basic ABO phenotypes are O, A, B, and AB.

| Blood Group | Antigens present on RBC | Antibodies in the serum | Genotype(s) |
|---|---|---|---|
| A | A antigen | Anti-B | AA or AO |
| B | B antigen | Anti-A | BB or BO |
| AB | A antigen And B antigen | None | AB |
| O | None | Anti A and Anti B | OO |

# The structures of the blood-group antigenic determinants



# Clinical significance of ABO antibodies

- The routine practice of **blood** typing and cross matching **blood** products should prevent adverse transfusion reactions caused by ABO antibodies.

| Transfusion Relationships | | | |
|---|---|---|---|
| Blood Type | Makes Antibodies Against | Can Receive From | Can Donate To |
| O | A, B | O | O, A, B, AB |
| A | B | O, A | A, AB |
| B | A | O, B | B, AB |
| AB | None | O, A, B, AB | AB |

# Hemolytic disease of the newborn

- HDN caused by ABO antibodies occurs almost exclusively in infants of **blood group** A or B who are born to **group**O mothers.
- This is because the anti-A and anti-B formed in **group** O individuals tend to be of the IgG type (and therefore can cross the placenta), whereas the anti-A and anti-B found in the serum of **group** B and A individuals, respectively, tends to be of the IgM type.

# THE RH BLOOD GROUP

- The Rh blood group is due to substance known as Rh factor which is an integral membrane protein of erythrocytes.
- The significance of the Rh **blood group** is related to the fact that the Rh **antigens** are highly immunogenic.
- Individuals having Rh factor are known are Rh positive individuals. The Rh factor passes from father to child.
- Some individuals (about 9% of whites) lacks this proteins and they are known as Rh negative individuals. They may produce anti Rh antibodies if they are exposed to Rh positive blood. So they must be transfused with Rh negative blood.
- Determination of Rh blood groups is important in the case of woman who may become pregnant. If infant is Rh positive and mother is Rh negative abortion due to production of antibodies may occurs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