



# SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 35

DEPARTMENT OF BIOMEDICAL ENGINEERING



Blood types are determined by the presence or absence of specific antigens on the surface of red blood cells. The main blood group systems include the ABO system and the Rh system.

## **1. ABO Blood Group System:**

### **Blood Types:**

Type A: Individuals have A antigens on the surface of their red blood cells and anti-B antibodies in their plasma.

Type B: Individuals have B antigens on the surface of their red blood cells and anti-A antibodies in their plasma.

Type AB: Individuals have both A and B antigens on the surface of their red blood cells but no anti-A or anti-B antibodies in their plasma.

Type O: Individuals have no A or B antigens on the surface of their red blood cells but have both anti-A and anti-B antibodies in their plasma.

### **Function:**

The ABO blood group system is crucial for blood transfusions and organ transplants. It ensures compatibility between the donor's blood and the recipient's blood to avoid immune reactions.

The presence or absence of A and B antigens is genetically determined, and it is inherited from parents.

## **2. Rh Blood Group System:**

### **Rh Factor:**

Individuals can be Rh-positive (+) or Rh-negative (-) based on the presence or absence of the Rh factor (D antigen) on the surface of red blood cells.

Rh-positive individuals have the Rh factor, while Rh-negative individuals do not.

### **Function:**

The Rh factor is particularly important during pregnancy. If an Rh-negative mother is carrying an Rh-positive baby, there is a risk of Rh incompatibility.



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In Rh-negative mothers, exposure to Rh-positive blood (usually during childbirth) can lead to the development of Rh antibodies. In subsequent pregnancies with Rh-positive babies, these antibodies can cross the placenta and attack the baby's red blood cells, causing hemolytic disease of the newborn (HDN).

### **3. Blood Transfusions:**

#### **Compatibility:**

Blood transfusions must be compatible in terms of both ABO and Rh systems to prevent adverse reactions.

For example, a person with blood type A positive can receive blood from a donor with type A positive or type O positive but not from a donor with type B or AB blood.

#### **Universal Donors and Recipients:**

Universal Donor: Type O negative individuals are considered universal donors for red blood cells because their blood lacks A, B, and Rh antigens, minimizing the risk of adverse reactions.

Universal Recipient: Type AB positive individuals are considered universal recipients because they can receive blood from donors of any ABO and Rh type.

### **4. Immune Response and Antibodies:**

#### **Antibodies:**

Individuals naturally produce antibodies against blood group antigens they lack. For example, a person with blood type A will have anti-B antibodies in their plasma.

#### **Immune Reactions:**

Exposure to incompatible blood can lead to immune reactions, including agglutination (clumping) of red blood cells and the release of toxins, causing hemolysis.