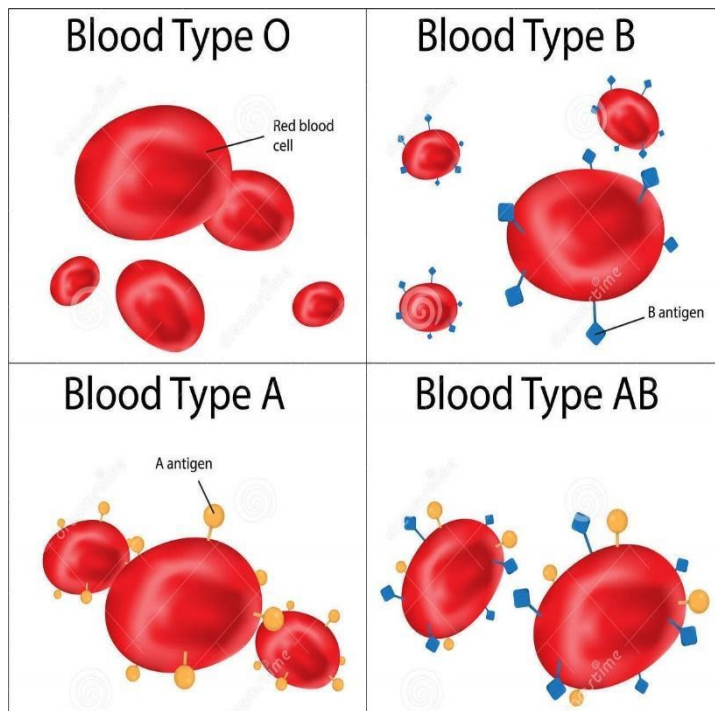


OBJECTIVE

To understand the basic concepts of blood grouping and classification of blood based on inherited differences in antigens on the surfaces of the red blood cell.



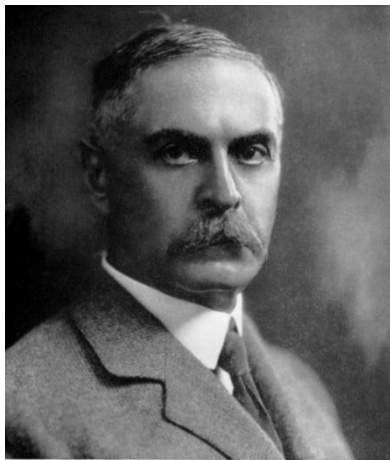
MATERIALS REQUIRED

- Monoclonal Antibodies (Anti-A, B and D)
- Clean glass slide
- Needles
- Alcohol swabs
- Sterile cotton balls

PROCEDURE

1. At first we cleaned the finger tip of the donor by alcohol, with the help of cotton.
2. Then we tightly pressed the finger tip of the donor and slightly taken out the blood with a needle.
3. We took three drops of the blood on a slide.
4. We had put three antibodies, i.e anti **A**, anti **B** and anti **D** Separately on three blood drops.
5. We then observed the coagulation taking place with the blood.
6. Based on the coagulation we identified the blood groups of the donor.

PRINCIPLE OF BLOOD GROUPING



K. Landsteiner

It was in 1901, that Austrian-American immunologist and pathologist **Karl Landsteiner** discovered human blood groups. Karl Landsteiner's work helps to determine blood groups and thus opened a way for blood transfusions which can be carried out safely. He was awarded the **Nobel Prize in Physiology or Medicine** in 1930 for this discovery.

He recognized three groups—A, B, and O—based on their reactions to each other. A fourth group, AB, was identified a year later by another research team. Other blood groups were identified later, such as, Diego, Lutheran, Duffy, and Kidd. The remaining blood group systems were rest described after antibodies were identified in patients.

Once reliable tests for Rhesus grouping had been established, transfusion reactions became rare! For this discovery Landsteiner was awarded the Nobel Prize in Physiology or Medicine in 1930.

THE IMPORTANCE OF ANTIBODIES

Antibodies are part of the circulating plasma proteins known as immunoglobulins, which are classified by molecular size and weight and by several other biochemical properties. Most blood group antibodies are found either on

Blood Type	Antigens Present	Antibodies in Serum
<i>AB+</i>	<i>ABH, Rh D</i>	<i>None</i>
AB-	ABH	Rh D
<i>A+</i>	<i>AH, Rh D</i>	<i>B</i>
A-	AH	B, Rh D
<i>B+</i>	<i>BH, Rh D</i>	<i>A</i>
B-	BH	A, Rh D
<i>O+</i>	<i>H, Rh D</i>	<i>AB</i>
O-	H	AB, Rh D
<i>Bombay</i>	<i>None</i>	<i>ABH, Rh D</i>

immunoglobulin **G** or immunoglobulin **M** molecules, but occasionally the immunoglobulin **A** class may exhibit blood group specificity. Naturally occurring antibodies are the result of immunization by substances in nature that have structures similar to human blood groups. These antibodies are present in an individual despite the fact that there has been no

previous exposure to the corresponding red cell antigens—for example, anti-A in the plasma of people of blood group B and anti-B in the plasma of people of blood group A.

THE IMPORTANCE OF ANTIGENS

The red cells of an individual contain antigens on their surfaces that correspond to their blood group and antibodies in the serum that identify and combine with the antigen sites on the surfaces of red cells of another type.

Individual blood group antigens vary in their antigenic potential; for example, some of the antigens belonging to the Rh and ABO systems are strongly immunogenic (i.e., capable of inducing antibody formation), whereas the antigens of the Kidd and Duffy blood group systems are much weaker immunogens.

The blood group antigens are not restricted solely to red cells or even to hematopoietic tissues. The antigens of the ABO system are widely distributed throughout the tissues and have been unequivocally identified on platelets and white cells and in skin, the epithelial cells of the gastrointestinal tract, the kidney, the urinary tract, and the lining of the blood vessels. Evidence for the presence of the antigens of other blood group systems on cells other than red cells is less well substantiated.

Among the red cell antigens, only those of the ABO system are regarded as tissue antigens and therefore need to be considered in organ transplantation.

CHEMISTRY OF THE BLOOD GROUP SUBSTANCES

The exact chemical structure of some blood groups has been identified, as have the gene products (i.e., those molecules synthesized as a result of an inherited genetic code on a gene of a chromosome) that assist in synthesizing the antigens on the red cell surface that determine the blood type. Blood group antigens are present on glycolipid and glycoprotein molecules of the red cell membrane. The carbohydrate chains of the membrane glycolipids are oriented toward the external surface of the red cell membrane and carry antigens of the ABO, Ii, and P systems.

ABO BLOOD GROUPING SYSTEM:

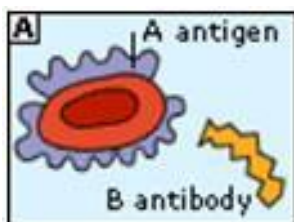
ABO grouping is based on the presence or absence of two surface antigens on the **RBC** namely **A&B**. Similarly, the plasma of different individuals contain two natural antibodies. The distribution of antigens & antibodies in the four groups of blood, **A,B,AB&O** .

Blood Type	Antigens on rbcs	<i>Antibodies</i> in blood
A	A	B'
B	B	A'
AB	A , B	-
O	-	A' , B'

From the above mentioned table it is evident that group **O** blood can be donated to persons with any other blood group and hence **O** group individuals are called 'UNIVERSAL DONORS'. Persons with **AB** group can accept blood from persons with **AB** as well as the other groups of blood. Therefore, such persons are called 'UNIVERSAL RECIPIENTS'.

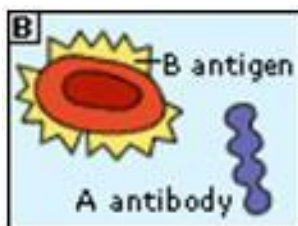
According to the ABO blood group system there are four different kinds of blood groups: **A**, **B**, **AB** and **O**.

Blood group A



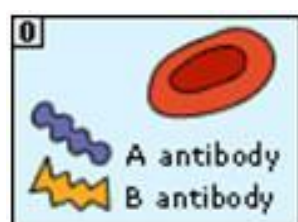
If you are having blood group **A**, you have **A** antigen on the surface of your red blood cells and **B** antibodies in your blood plasma .

Blood group B

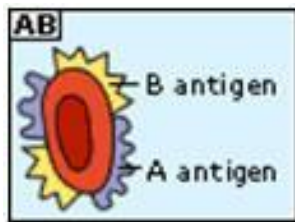


If you are having blood group **B**, you have **B** antigen on the surface of your red blood cells and **A** antibodies in your blood plasma.

Blood group O



Blood group AB



ABO Blood Groups				
Antigen (on RBC)	Antigen A	Antigen B	Antigens A + B	Neither A or B
Antibody (in plasma)	Anti-B Antibody	Anti-A Antibody	Neither Antibody	Both Antibodies
Blood Type	Type A Cannot have B or AB blood Can have A or O blood	Type B Cannot have A or AB blood Can have B or O blood	Type AB Can have any type of blood Is the universal recipient	Type O Can only have O blood Is the universal donor

RH GROUPING:

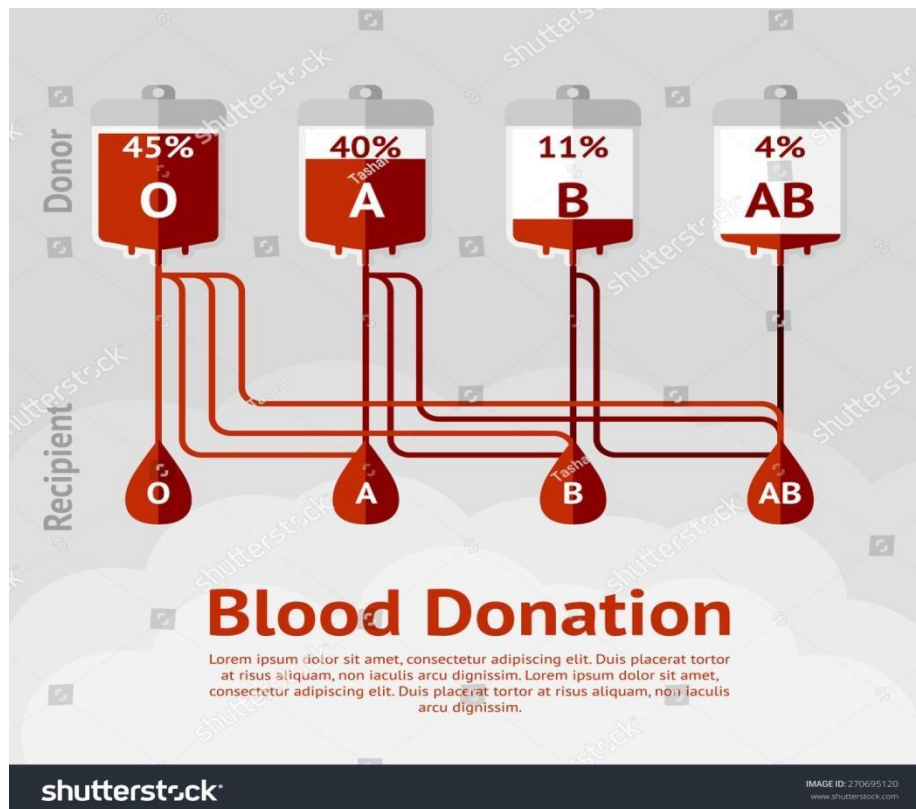
Another antigen, the RH antigen similar to one present in Rhesus Monkeys, is also observed on the surface of RBC's of majority of humans. Such individuals are called RH Positive and those in whom this antigen is absent are called RH Negative. An RH negative person, if exposed to RH Positive blood, will form specific antibodies against the RH antigens. Therefore, RH group should also be matched before transfusions.

Factor Rh		
Blood Type (genotype)	Rh (+)	Rh (-)
Red Blood Cell Surface Proteins (phenotype)	 Rh AGLUTINÓGENO	 NO AGLUTINÓGENO

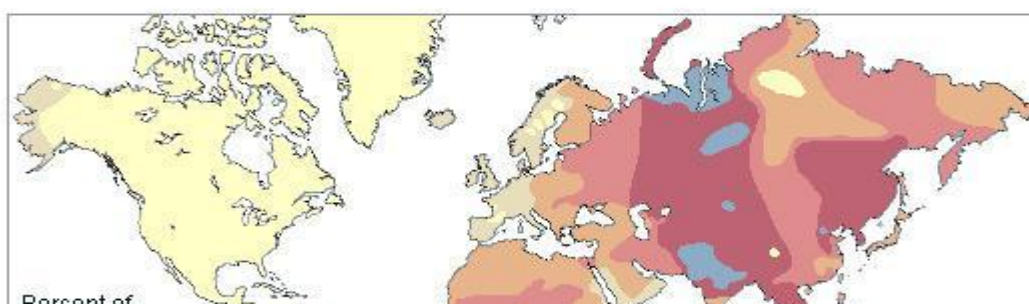
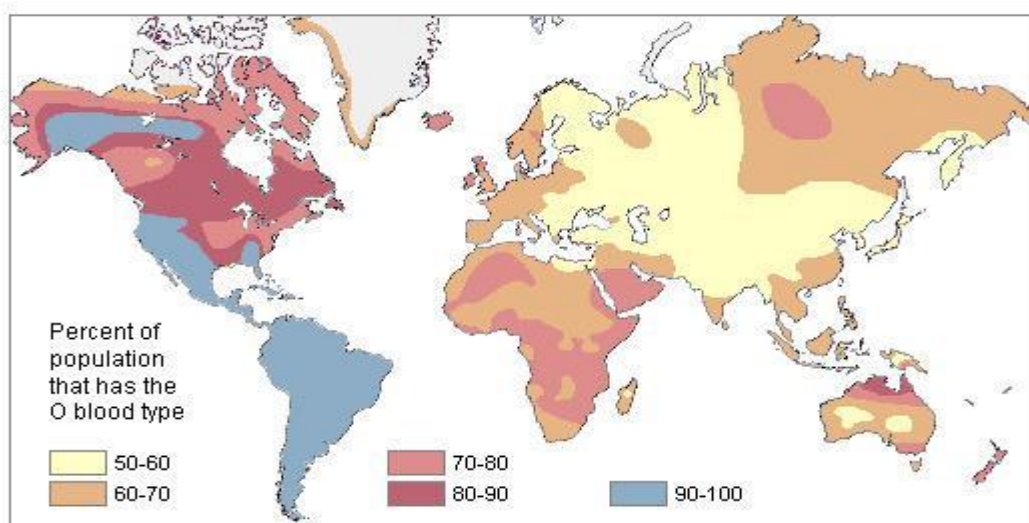


BLOOD DONATION SCHEME

Recipient ^[1]	Donor ^[1]							
	O-	O+	A-	A+	B-	B+	AB-	AB+
O-	✓							
O+	✓	✓						
A-	✓		✓					
A+	✓	✓	✓	✓				
B-	✓				✓			
B+	✓	✓			✓	✓		
AB-	✓		✓		✓		✓	
AB+	✓	✓	✓	✓	✓	✓	✓	✓

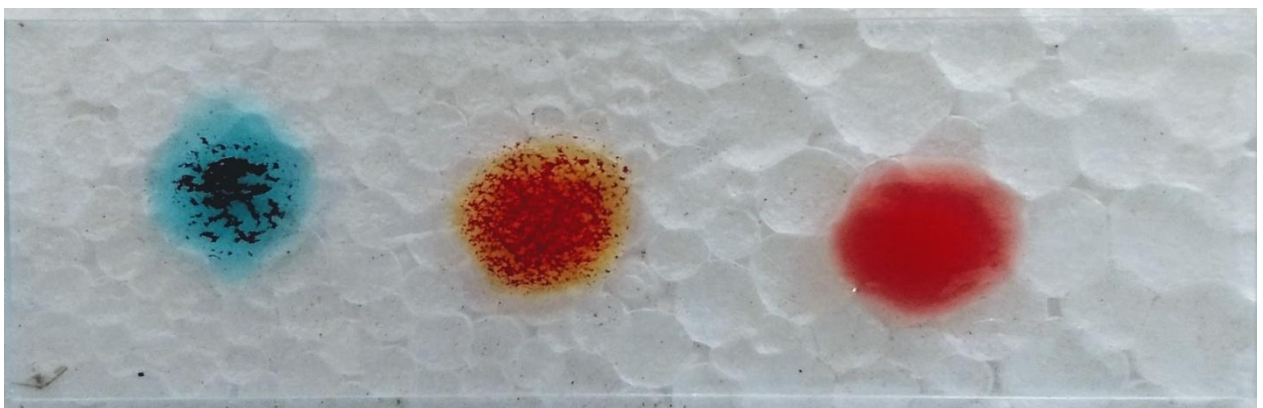


BLOOD GROUPS AND POPULATION:

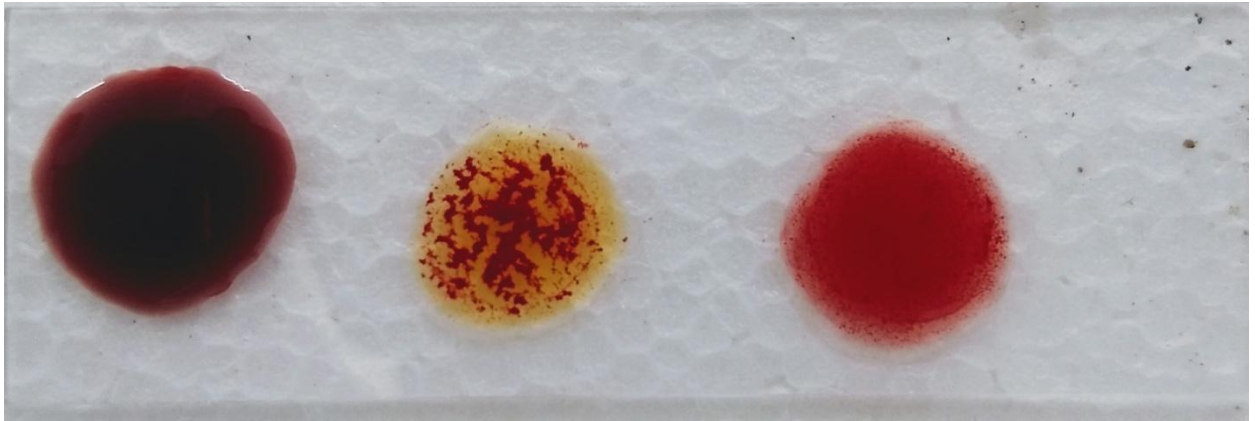


OBSERVATION:

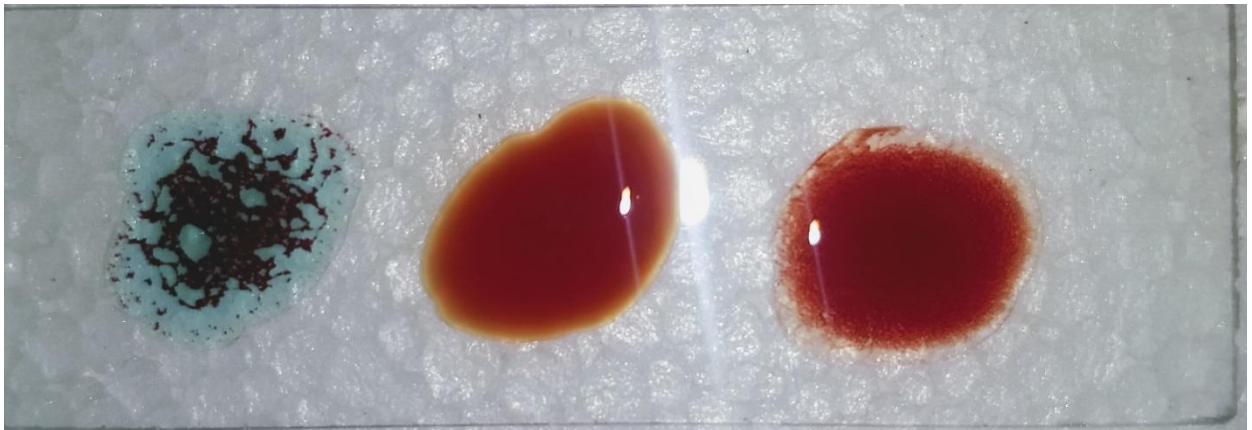
We observed the following coagulation in the blood of three different donors, they are as follows:



Here, coagulation took place by anti **A** & anti **B**. Hence, the blood group is **AB** negative.



Here, coagulation took place by anti **A** & anti **D**. Hence, the blood group is **B** negative.



Here, the coagulation took place by anti **B** & anti **D**. Hence, the blood group is **A** negative.

CONCLUSION:

We can conclude any blood group by observing its colour, and other observations like coagulation or else we can use the following table:

Anti-A	Anti-B	Anti-D	Control	Blood Type
				O-pos
				O-neg

