

The blood group

practical physiology

Aim:

To determine the blood group and Rh factor of an individual.

Introduction:

Blood grouping is the classification of blood based on the presence or absence of two inherited antigenic substances on the surface of red blood cells (RBCs). The ABO and Rh are the major, clinically significant and the most important of all the blood group systems. The ABO blood group system was first discovered by Karl Landsteiner in 1900. The human ABO blood group system is divided into the following four major groups depending on the antigen present on the surface of their red blood cells:

1. "A" group
2. "B" group
3. "AB" group
4. "O" group

Table 1: ABO Blood Group System

Antigens on the surface of Red Blood Cells	Antibodies in the Serum	ABO Blood Group	Genotype
A	Anti B	A	AA or AO
B	Anti A	B	BB or BO
A and B	Neither Anti A nor Anti B	AB	AB
Neither A nor B	Anti A, Anti B, Anti AB	O	OO

The Rhesus system (Rh) is the second most important blood group system in humans. The most significant and immunogenic Rhesus antigen is the RhD antigen. The individuals carrying the Rh antigen are considered to have positive blood group whereas those individuals that lack this antigen are considered to have negative blood group.

Principle:

The ABO and Rh blood grouping system is based on agglutination reaction. When red blood cells carrying one or both the antigens are exposed to the corresponding antibodies they interact with each other to form visible agglutination or clumping. Blood group A individuals have A antigens on RBCs

and anti-B antibodies in serum. Similarly, blood group B individuals have B antigens on RBCs and anti-A antibodies in serum. Blood group AB individuals have both A and B antigens on RBCs and neither anti-A nor anti-B antibodies in serum. Whereas, blood group O individuals have neither A antigens nor B antigens, but possess both anti-A and anti-B antibodies in serum.

The Rh antigens are transmembrane proteins in which the loops exposed on the surface of red blood cells interact with the corresponding antibodies.

Materials

Blood group kit

Reagents: 70% Alcohol/ Spirit, Blood Grouping Kit

Blood Grouping Teaching Kit is stable for 6 months from the date of receipt without showing any reduction in performance. Store the Anti A Sera, Anti B Sera and Anti RhD Sera at 2-8oC. Other contents can be stored at room temperature (15-25oC).

Other requirements: Cotton,lancet.



Blood Grouping Kit

Important Instructions:

Procedure:

1. Dangle the hand down to increase the flow of blood in the fingers.
2. Clean the fingertip to be pierced with spirit or 70% alcohol (usually ring or middle finger).
3. With the help of the sterile lancet, pierce the fingertip and place one drop of blood in each of the cavities.
4. Add one drop of antiserum into each cavity as shown below:
 1. Before starting the experiment the entire procedure has to be read carefully.
 2. Always wear gloves while performing the experiment.

3. Ensure the slide is clean and dry prior to use.
4. Do not allow the antisera reagent dropper to touch the blood sample.
5. The result of the reaction should be interpreted immediately after mixing.
6. Avoid intermixing of the antisera reagents while performing the experiment as it may give false result.
7. Mix each blood drop and the antiserum using a fresh mixing stick.
7. Observe agglutination in the form of fine red granules within 30 seconds. Anti RhD takes slightly longer time to agglutinate compared to Anti A and Anti B.

Note: Proper care should be taken while disposing the lancet and mixing sticks.

Interpretation:

- _ If agglutination is observed when blood is mixed with Anti A reagent, then the individual is said to have blood group "A".
- _ If agglutination is observed when blood is mixed with Anti B reagent, then the individual is said to have blood group "B".
- _ If agglutination is observed when blood is mixed with Anti A and Anti B reagent, then the individual is said to have blood group "AB".
- _ If no agglutination is observed when blood is mixed with Anti A and Anti B reagent, then the individual is said to have blood group "O".
- _ If agglutination is observed when blood is mixed with Anti RhD reagent, then the individual is said to have "+ve" Rh factor.
- _ If no agglutination is observed when blood is mixed with Anti RhD reagent, then the individual is said to have "-ve" Rh factor.

Observation and Result:

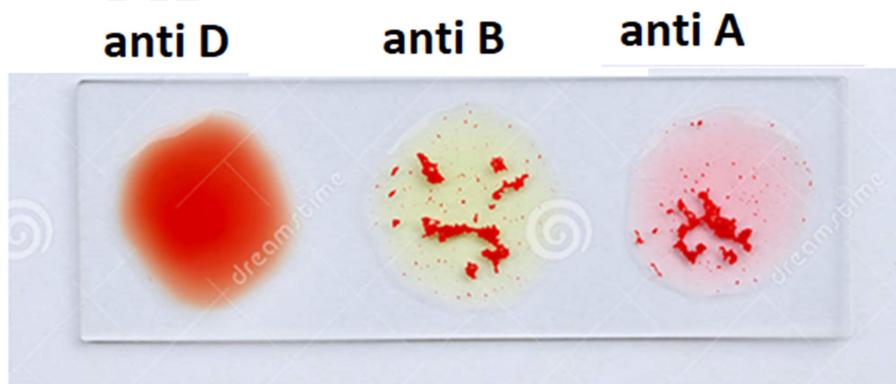
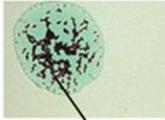
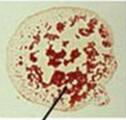
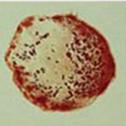
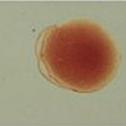
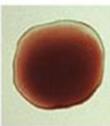
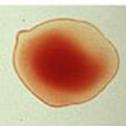


Figure: group AB (ngative)

Blood being tested	Serum		
	Anti-A	Anti-B	
Type AB (contains agglutinogens A and B)			This slide shows how blood typing is done. A specific anti-serum is added to a blood sample. If it agglutinate, it indicates the presence of the antigen which is is how the blood type is determined.
	RBCs		
Type B (contains agglutinin B)			
Type A (contains agglutinin A)			← This sample agglutinated after Anit-A serum added But not with Anti-B serum.
Type O (contains no agglutinogens)			

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Mention the blood group of the following samples

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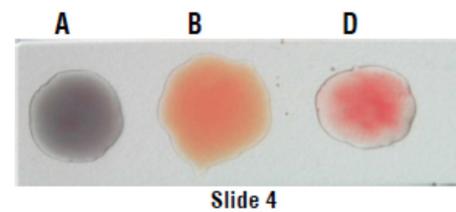
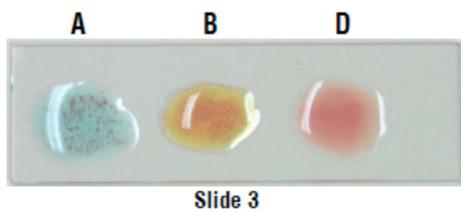
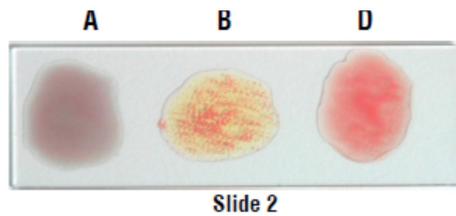
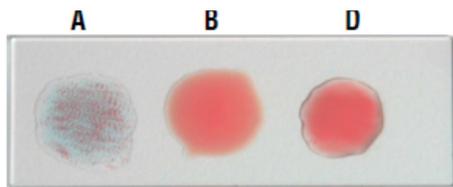
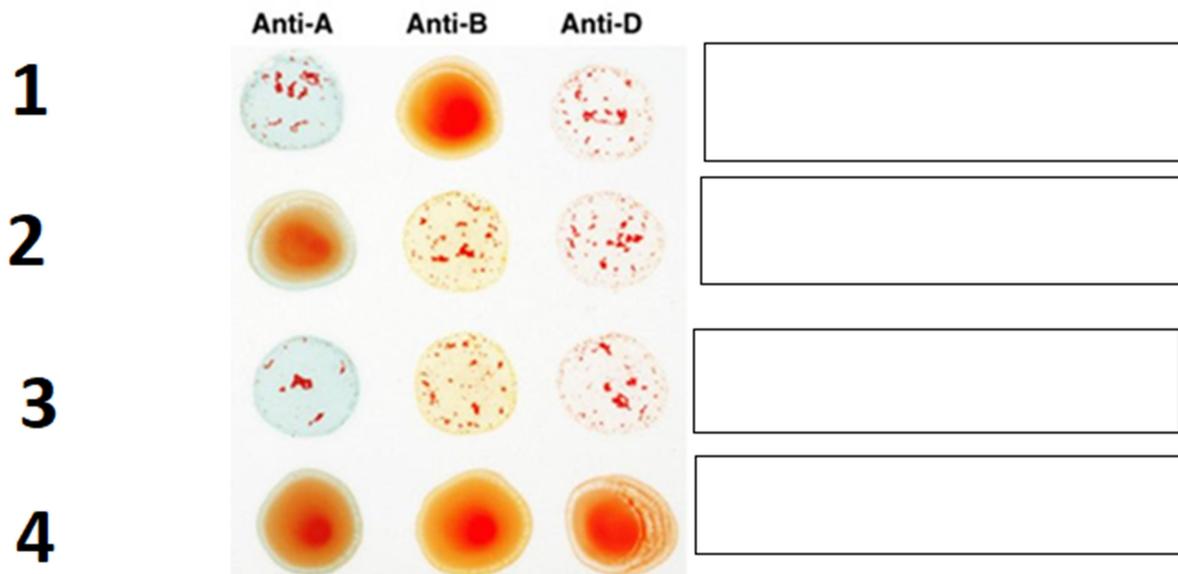


Table 3: Determination of blood group and Rh factor based on agglutination seen

Sr. No.	Anti A	Anti B	Anti RhD	Blood Group
Slide 1	✓	×	✓	A +ve
Slide 2	×	✓	✓	B +ve
Slide 3	✓	✓	✓	AB +ve
Slide 4	×	×	✓	O +ve

Blood sample	Anti-A	Anti-B	Anti-D	Blood type
				A ⁺
				B ⁺
				AB ⁺
				O ⁻

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