



Blood groups and blood types

Physiology Lab-3

May 2021

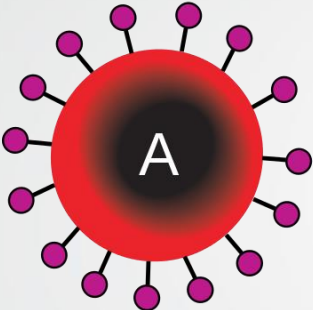
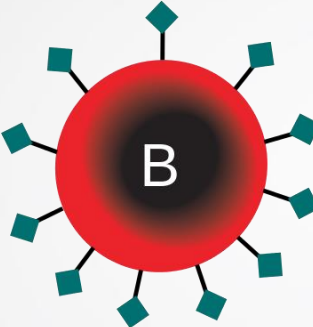
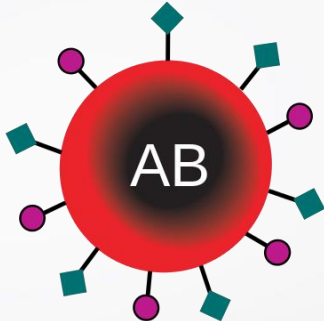
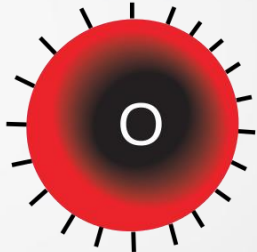


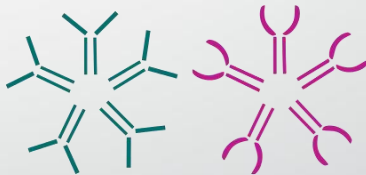



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PRINCIPLE

- A blood type (also called a blood group) is a classification of blood based on the presence or absence of inherited antigenic substances on the surface of red blood cells (RBCs).
- Blood is characterized into different blood groups, based on the presence or absence of these antigens or agglutinogens.
- The ABO blood group is characterized by two glycolipid antigens, called A and B – depending on whether the RBCs have none, only one or both antigens, blood groups are distinguished as type O, type A, type B, or type AB.

Agglutinins of ABO System

- Blood plasma contains antibodies or agglutinins that react with non-self antigens.
- They are absent in a newborn; the ABO antibodies start appearing in the plasma by the age of 3–4 months due to cross reactivity of ABO antigens present in naturally occurring bacteria, viruses, pollen, etc. present in the environment.
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- These antigens are absorbed into blood and stimulate the formation of antibodies against antigens not present in the infants' red cells, i.e. those antigens that are recognized as "non-self" by the body's immune system.

	Group A	Group B	Group AB	Group O
Red blood cell type	 <p>A</p>	 <p>B</p>	 <p>AB</p>	 <p>O</p>
Antibodies in Plasma	 <p>Anti-B</p>	 <p>Anti-A</p>	None	 <p>Anti-A and Anti-B</p>
Antigens in Red Blood Cell	 <p>A antigen</p>	 <p>B antigen</p>	 <p>A and B antigens</p>	None

Purpose of blood typing

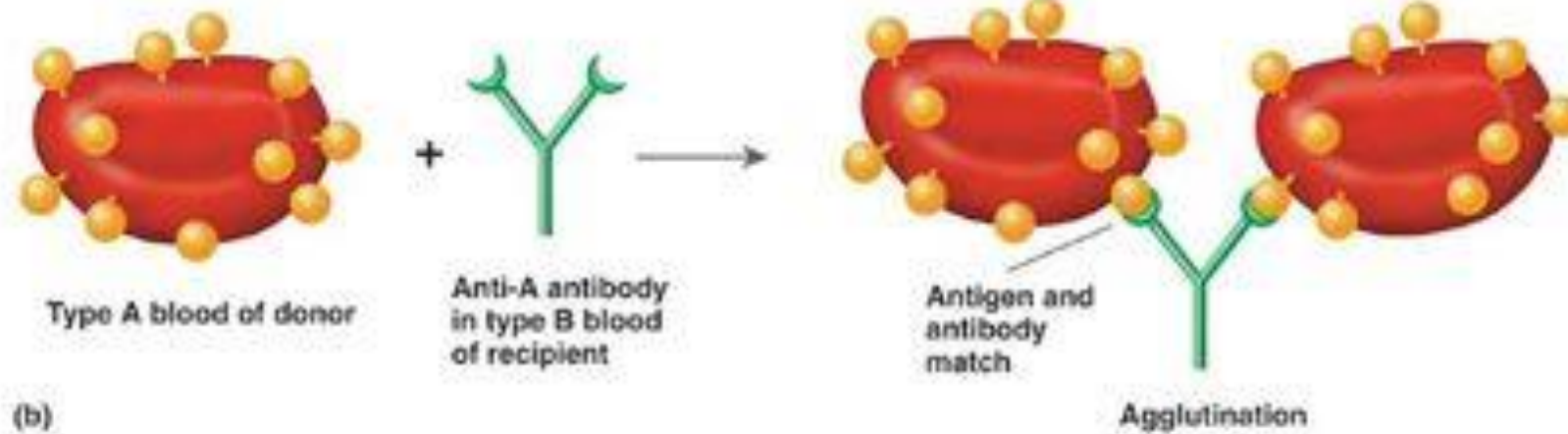
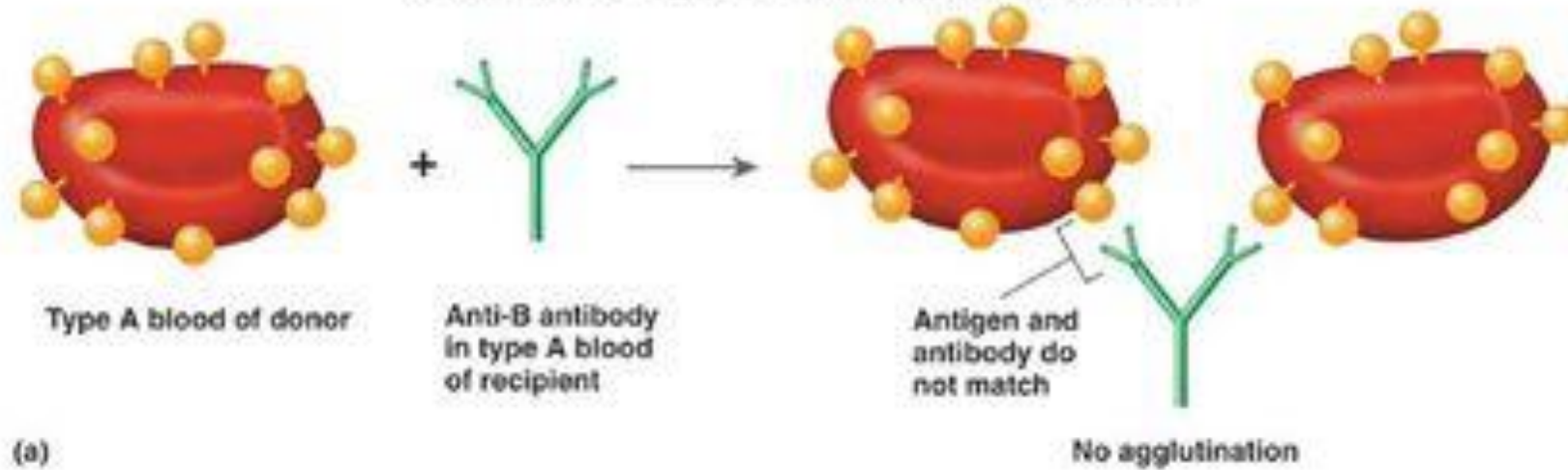
- Blood transfusion is a life-saving procedure in all cases of severe loss of blood, and in life-threatening anemias. However, blood can only be given after blood grouping which is an essential requirement before blood is given to any individual

Agglutination

- If someone receives blood of the wrong type, the worst problem is the reaction of the recipient's antibodies on the donor's RBCs.
- When the body encounters a foreign antigen, agglutination occurs.
- Agglutination is the clumping of RBCs due to binding of antibodies (part of the immune system) to antigen, and causes blockage of blood vessels and eventually death. In your blood, you have antibodies for the antigens you don't have.

Agglutination Reaction

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Blood Groups

Blood Group	Antigens	Antibodies	Can give blood (RBC) to	Can receive blood (RBC) from
AB	A and B	None	AB	AB, A, B, O
A	A	B	A and AB	A and O
B	B	A	B and AB	B and O
O	None	A and B	AB, A, B, O	O

RH factor

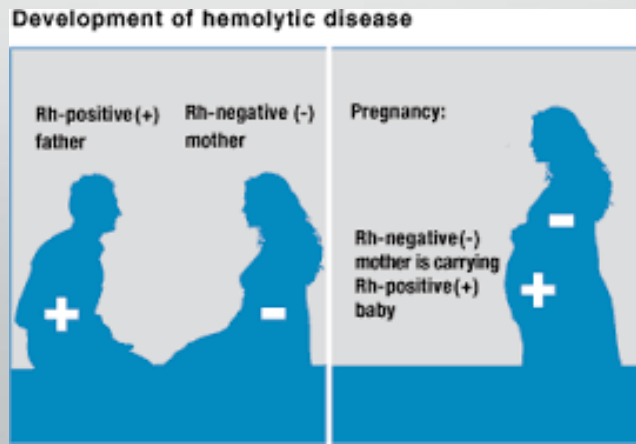
- In addition to antigens of ABO system, the red cells of humans also contain an additional antigen, called Rh antigen (or Rh factor).
- There are several varieties of Rh antigen—C, D, E, c, d, and e—but the D antigen is the most common, and antigenically, the most potent. Therefore, Rh +ve persons are also called D +ve and Rh –ve are called D –ve.
- Persons whose red cells contain this additional antigen are called “Rh positive” (Rh +) while those who lack this antigen are called “Rh negative” (Rh –).
- However, there are no naturally occurring antibodies against Rh (D) antigen.
- The Rh (D) antigen is not present in body fluids and tissues, but only on red cells.

Clinical Significance of Rh factor

- Although there are no natural anti-Rh antibodies, and they never develop spontaneously, they can be produced only in Rh –ve persons. This can happen in either of 2 ways:
- ***In transfusions.*** When an Rh –ve person receives Rh +ve blood, there is no immediate reaction since there are no antibodies. But during the next few weeks/months, he/she may produce anti-Rh antibodies that will remain in the blood. (Even 0.5 ml of Rh +ve blood is enough to produce immune response). However, if within a few weeks, or even years later, a second Rh +ve blood is injected, the newly donated red cells will be agglutinated and hemolysed, thus resulting in a serious transfusion reaction.

In pregnancy. The most common problem due to Rh incompatibility may arise when an Rh –ve mother (phenotype dd) carries an Rh +ve fetus

- Normally, no direct contact occurs between maternal and fetal bloods. However, if a small amount of Rh +ve blood leaks (at the time of delivery) from the fetus through the placenta into the mother's blood, the mother's immune system will start to make anti- Rh antibodies.
- As a result, some mothers develop high concentration of anti-Rh antibodies during the period following delivery. Therefore, the first-born baby will not be affected.
- However, during the second and subsequent pregnancies, the mother's anti-Rh antibodies cross the placental membrane into the fetus where they cause agglutination and hemolysis. The clinical condition that develops in the fetus is called "*hemolytic disease of the newborn (HDN)*" or "*erythroblastosis fetalis*"



APPARATUS AND MATERIALS

1. Microscope.
2. Sterile blood lancet, Sterile cotton/ gauze swabs, Alcohol and Toothpicks.
3. Clean, dry microscope slides.
4. Anti-A serum: [contains monoclonal anti-A antibodies (against human)].
5. Anti-B serum: [contains monoclonal anti-B antibodies (against human)].
6. Anti-D (anti-Rh) serum: [Contains monoclonal anti-Rh (D) antibodies (against human). These



Determining Your Own Blood Type

1. Clean your finger with alcohol and let dry.
2. Prick finger with lancet, near the tip but not too close to the nail. You will need three fairly large drops of blood. Prick so that blood flows freely. Try squeezing up from your wrist if blood does not flow after pricking finger.
3. Use one slide for ABO typing and Rh factor. Place three drops of blood on the slide, add the appropriate typing serum, and determine your blood type. Be sure the serum dropper does not touch the drop of blood. Results should be readable in about a minute.

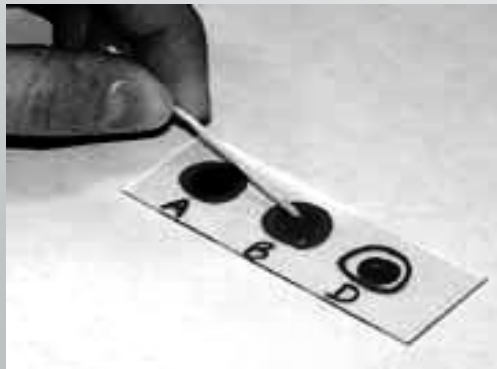


Figure Mixing the anti-serum with the blood sample to determine blood type.

OBSERVATIONS AND RESULTS

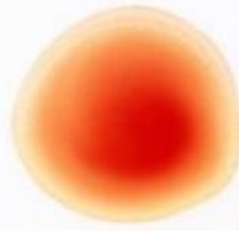
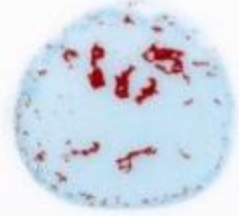
- It is essential that you should be able to distinguish between “*agglutination*” and “*no agglutination*”. The features of each are:
 1. If agglutination occurs, it is usually visible to the naked eye. The hemolysed red cells appear as isolated (separate), dark-red masses (clumps) of different sizes and shapes.
 2. There is brick-red coloring of the serum by the hemoglobin released from ruptured red cells.

Anti-A

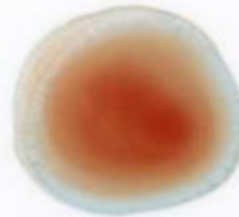
Anti-B

Anti-D

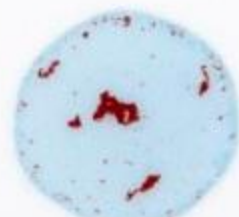
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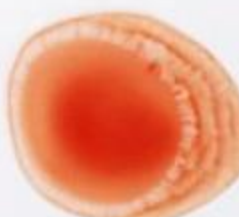
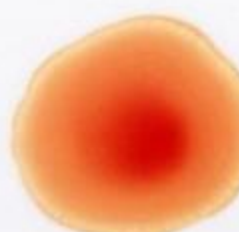
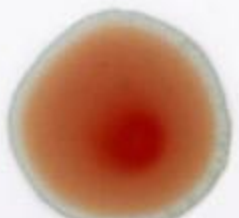
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Thank you