Blood & Lymphoreticular System Physiology Lab

Dr. Tamara Alqudah

Blood Groups

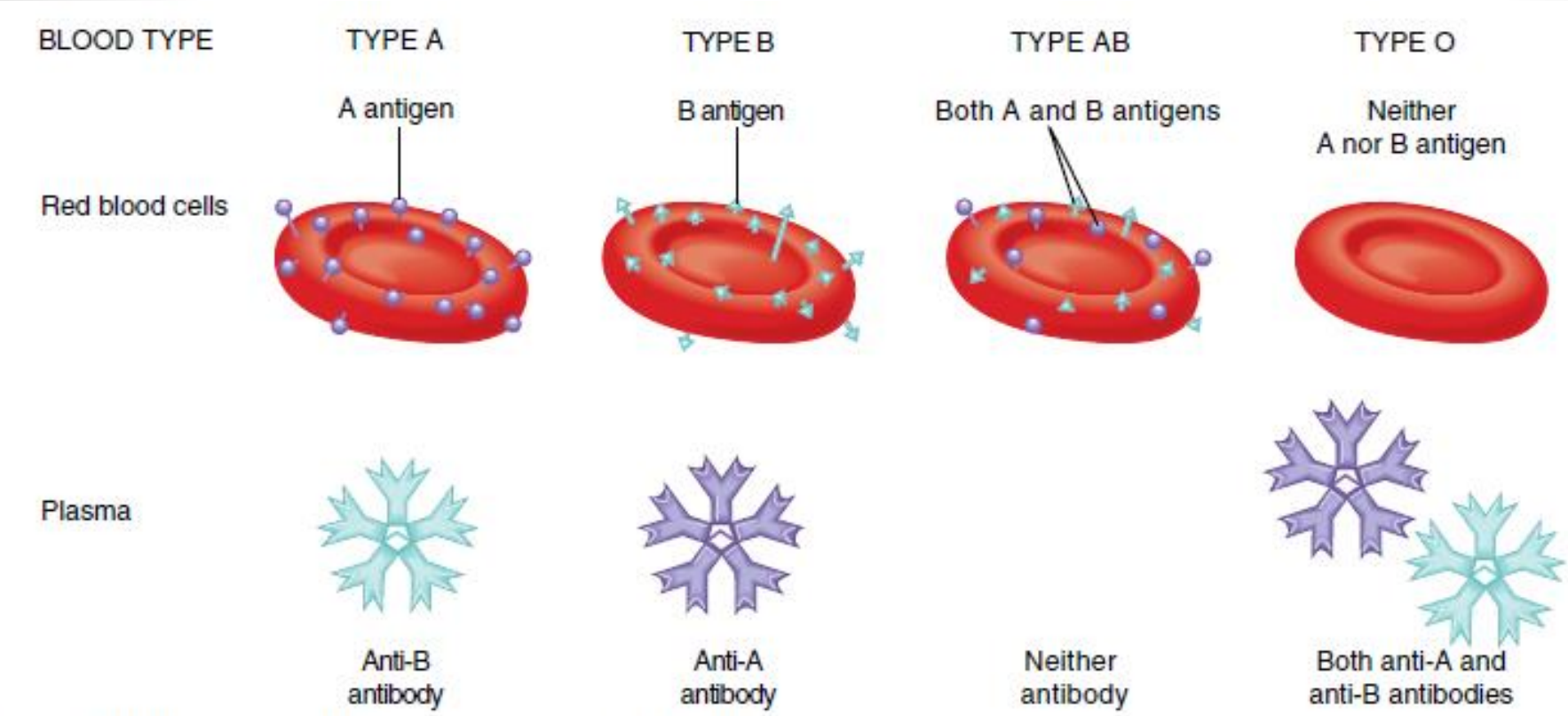
- At least 30 commonly occurring antigens and hundreds of other rare antigens composed of glycoproteins and glycolipids are found on the surface of RBCs.
- Each of which can at times cause antigen- antibody reactions, however most of the antigens are weak.

- Two particular types of antigens (agglutinogens) are likely to cause blood transfusion reactions: the *ABO* system of antigens and the *Rh* system.
- Based on these two systems we have 8 blood groups:
- A +ve, A –ve, B +ve, B –ve, AB +ve, AB –ve, O +ve & O -ve

ABO Blood Group

- The ABO blood group is based on two glycolipid antigens called A and B.

- Blood plasma usually contains antibodies called agglutinins that react with the A or B antigens. These are the anti-A antibody, which reacts with antigen A, and the anti-B antibody, which reacts with antigen B.
- Agglutinins start to appear in the blood within a few months after birth.
- They are formed naturally. Their production is thought to be stimulated when the immune system encounters the "missing" ABO blood group antigens in food or in micro-organisms.


BLOOD TYPE
TYPE A
TYPE B
TYPE AB
TYPE O
A antigen
B antigen
Both A and B antigens
Neither
A nor B antigen
Red blood cells
Plasma
Anti-B
antibody
Anti-A
antibody
Neither
antibody
Both anti-A and
anti-B antibodies

Rh blood group

- There are six common types of Rh antigens, each of which is called an Rh factor, These types are designated C, **D**, E, c, d, and e.
- The type D antigen is widely prevalent in the population and considerably more antigenic than the other Rh antigens.
- Anyone who has D antigen is said to be Rh positive (85% of population), whereas a person who doesn't have type D antigen is said to be Rh negative.

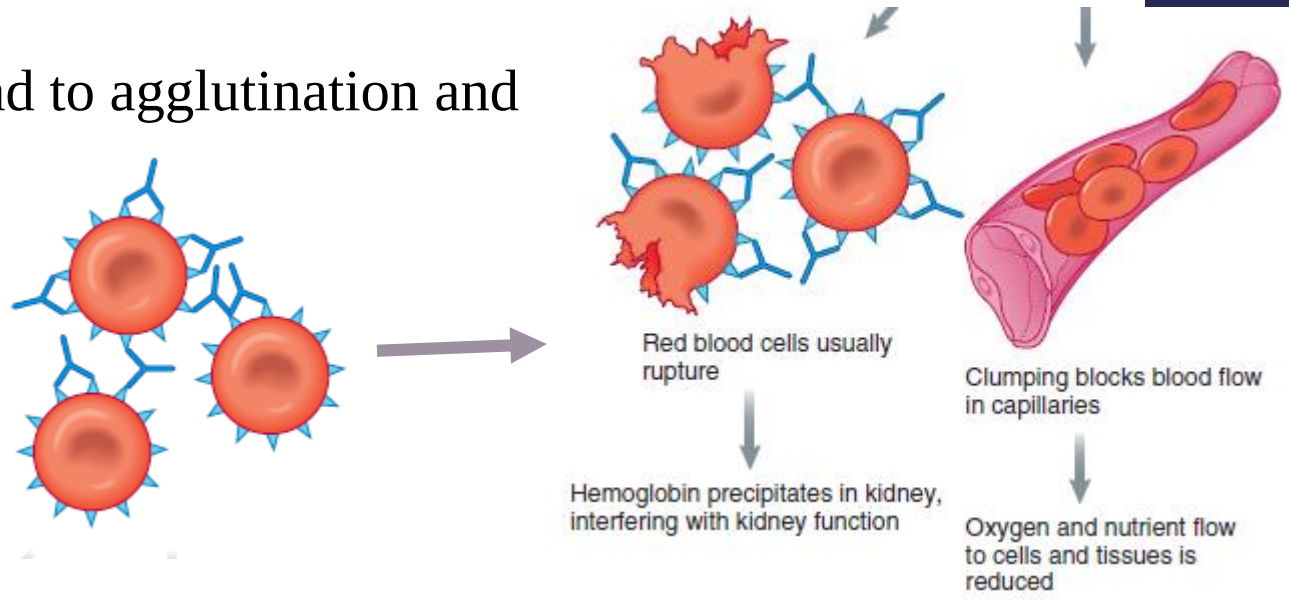
- In contrast to ABO system there is no preformed Anti-D in the Rh–ve individual
- When Rh positive RBCs are transfused into an Rh–ve individual, anti-Rh agglutinins develop slowly, reaching a maximum concentration 2 - 4 months later.

Transfusion Reaction

- If a person is given blood of an incompatible type, two antigen–antibody interactions take place.

1. The effect of the recipient's plasma antibodies on the donor RBCs, which has more serious consequences
2. The effect of the donor's antibodies on the recipient's RBCs
   - Significant only if large amount of blood is transfused

- These reactions lead to agglutination and hemolysis of RBCs



Determination of blood type

- We will test for the presence of the A antigen, the B antigen and the Rh factor on the RBCs
- We need antibodies against these three antigens, Anti-A, Anti-B and Anti-D

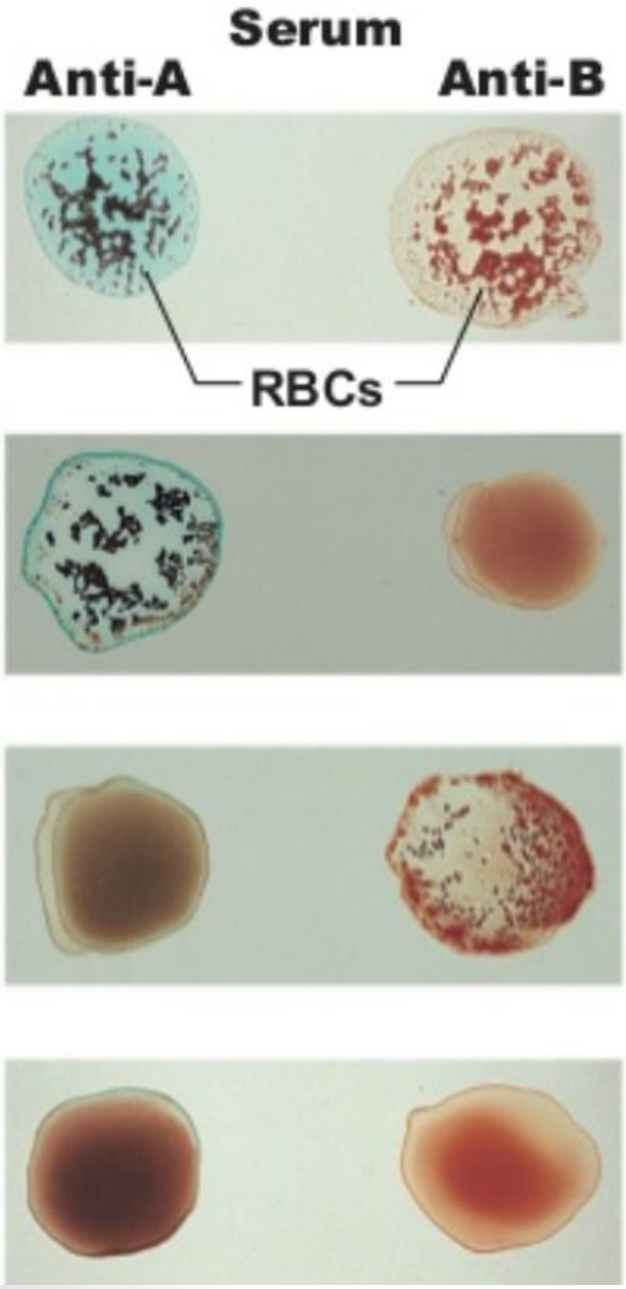
1. Prick the tip of a finger with a lancet and put three separate drops of blood on a clean microscopic slide.
2. Add one drop of Anti-A to the first drop, Anti-B to the second drop, and Anti-D to the third drop.
3. Mix well, using separate wooden sticks.
4. The results are read directly from the slide.


Anti-A
MONOCLONAL ANTIBODIES
Store at 2-8°C
DO NOT FREEZE
M L No. KD-522
Anti-B
MONOCLONAL ANTIBODIES
Store at 2-8°C
DO NOT FREEZE
M L No. KD-522
Anti-D
Store at 2-8°C
DO NOT FREEZE
M L No. KD-522

Determination of blood type

- If agglutination occurs in the first drop the blood type is A , if agglutination occur in the second drop the blood type is B, if it occurs in both it is AB and if it doesn't occur in any drop it is type O.
- If agglutination occurs in the Rh drop the blood is considered as Rh+ve. (This reaction might take some time to develop)

- The strength of agglutination reaction is not the same in all samples, so in some cases it may be necessary to examine the slide under the microscope to look for agglutination.



Type AB

Type A

Type B

Type O

Hemostasis

- Hemostasis is prevention of blood loss from circulatory system.
- Depends on the integrity of blood vessels, platelets and clotting factors.

The hemostatic response to vascular injury is achieved by several mechanisms:

1. Vasoconstriction
2. Formation of a platelet plug
3. Formation of a blood clot

Bleeding time

- A **bleeding time** is used to evaluate the second phase of hemostasis, which involves adherence of the platelets to the injured vessel, platelet activation and aggregation (formation of a plug).

✓The time measures how long it takes for a platelet plug to form.

✓It increases when the platelets count is low (thrombocytopenia), platelet function is abnormal or with the use of aspirin .

- Disadvantages: Insensitive, Invasive & operator dependent.
- Advantages: good test to evaluate the platelet's function and structural abnormalities.

The Duke method

1. Clean the tip of the finger or the ear lobe with alcohol.
2. Puncture the skin with a special lancet. The wound should be 3–4 mm deep.
3. Wipe the blood drop by a filter paper every 30 seconds
4. Repeat until no more blood is absorbed by the filter paper. Which indicates a platelet plug has formed
5. Multiply the number of blood drops by 30 seconds
   - Or divide the number of spots of blood by 2 and that will give you the bleeding time in minutes.
   - Normal value: is less than 5 minutes

Clotting time

- It measures the time required for a blood sample to coagulate in vitro. Clotting time depends on the **availability of coagulation factors.**

- Many techniques are used the one we use in our lab depends on using non-hepranized capillary tubes

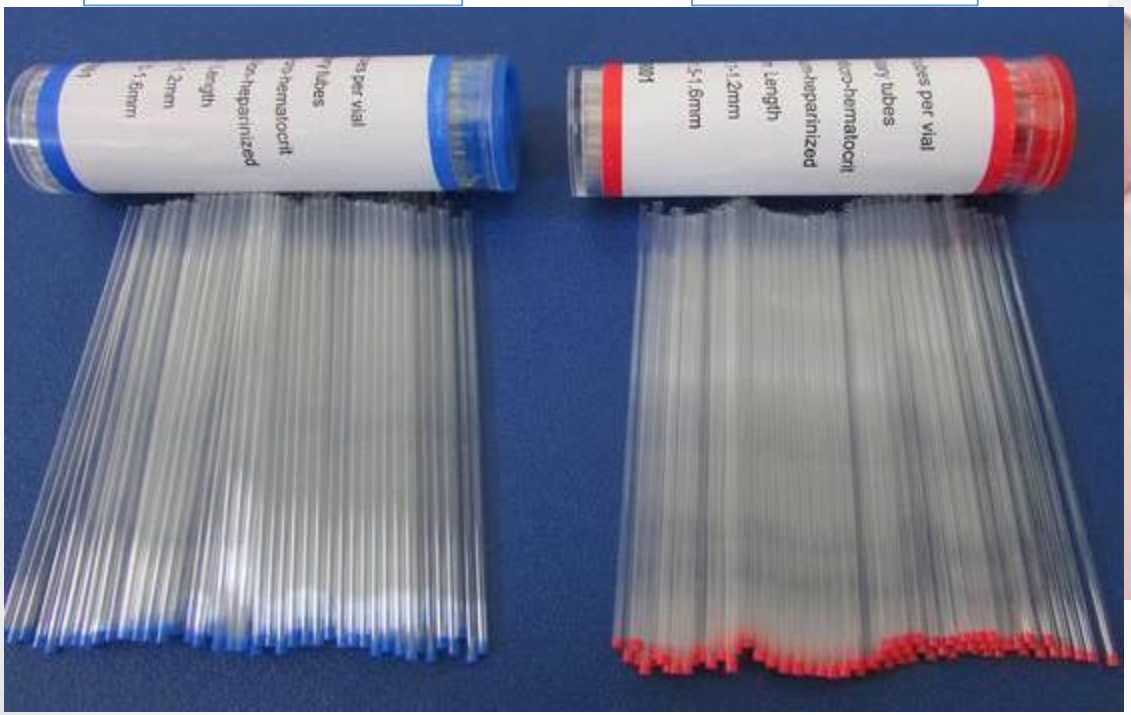
- Clotting time is prolonged in conditions like hemophilia, vitamin K deficiency, liver diseases, and warfarin overdose.

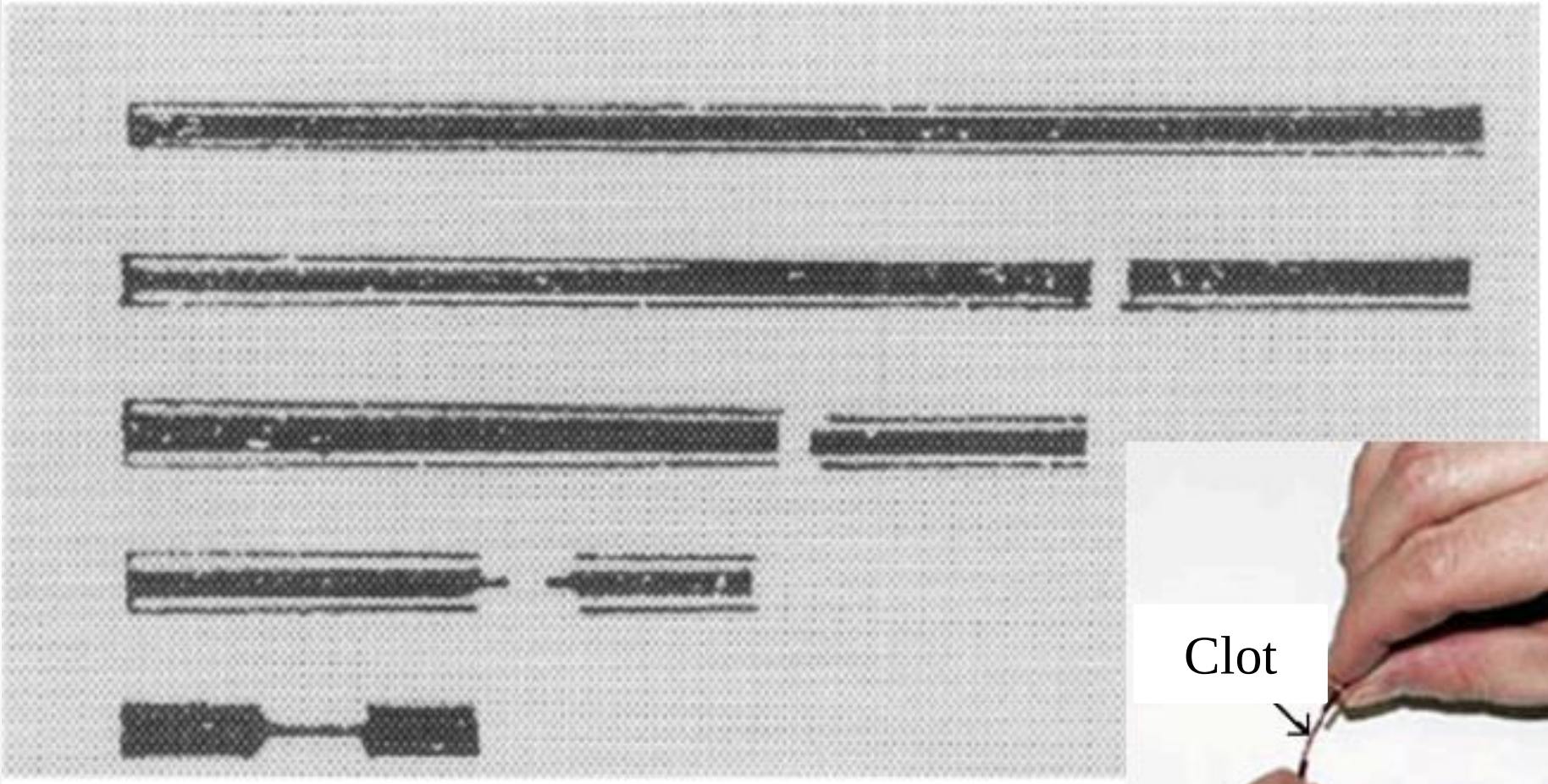
1. Clean the tip of the finger with alcohol then prick it with a lancet.
2. Draw blood into few <u>non-heparinized</u> capillary tubes.
3. After 2 minutes, start breaking the capillary tubes to see whether a thread of coagulated blood is formed between the two broken ends.

- Normal value is less than 10 minutes.

Non-heparinized

Heparinized





Clot