

**University of Baghdad**  
**College of Science for Women**  
**Department of Chemistry**



# **CLINICAL BIOCHEMISTRY LAB**

**Third class/ Second Course**

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# Blood Sampling

| Stopper color | Additive        | Uses                                                                                 |
|---------------|-----------------|--------------------------------------------------------------------------------------|
| Red           | None            | Collecting serum sample                                                              |
| Purple        | EDTA            | Collecting plasma sample                                                             |
| Blue          | Sodium citrate  | PT & PTT tube                                                                        |
| Black         | Sodium citrate  | ESR tube                                                                             |
| Gray          | Sodium fluoride | Blood sugar tube                                                                     |
| Green         | Lithium heparin | Collecting heparinated blood                                                         |
| Gold          | None            | Serum separator tube (SST) contains a gel at the bottom to separate blood from serum |

# Hemolysis

- Hemolysis is the destruction of the encasing membrane of the red blood cell and the subsequent release of hemoglobin into the plasma.
- *Causes of blood hemolysis*
  - Incorrect venipuncture technique
  - Collecting blood from a narrow vein
  - When a vein collapses can also cause some hemolysis.
  - Alcohol don't dry (it cause lysis to RBCs membrane)
  - Using excess EDTA or moisten EDTA as anticoagulant
  - Slow drawing blood from the vein

- Mishandling of the specimen
- Forcing blood through the needle into tubes
- Using wet tube or stopper
- Shaking the tube very hard
- Holding blood in too warm area

# Blood groups

- Red blood cells contain certain proteins on their surface. These proteins are called **Antigens**. There are various types of red blood cell antigens - **The ABO** and **Rhesus types** are the most important.



# ABO antigens

**The two major antigens or surface identifiers on human RBCs are the A and B antigens.**

**Blood is grouped according to the presence or absence of these antigens.**

- **People who are blood type A will have Anti-B antibodies, blood type B will have Anti-A antibodies, blood type O will have both Anti-A and Anti-B antibodies, and blood type AB will have neither.**

# Rh factor

- Rh factor is an inherited protein found on the surface of red blood cells; having it means you are Rh-positive (about 85% of people), while lacking it makes you Rh-negative. It is critical in blood transfusions and pregnancy, as Rh-negative individuals can develop antibodies if exposed to Rh-positive blood.

# The ABO system

- According to the ABO blood group system there are four different kinds of blood groups: A, B, AB or O
- *A blood group individuals* will have type A antigens on the surface of red blood cells and anti-B antibodies in plasma.
- *B blood group individuals* will have type B antigens on the surface of red blood cells and anti-A antibodies in your plasma.
- *AB blood group* are those who will have type A and type B antigens on the surface of red blood cells and no antibodies to A or B antigens in plasma.

- *O blood group* are those who will have neither type A or type B antigens on the surface of red blood cells but will have anti-A and anti-B antibodies in plasma.



**Antigen A**



**Antigen B**



**Group A**



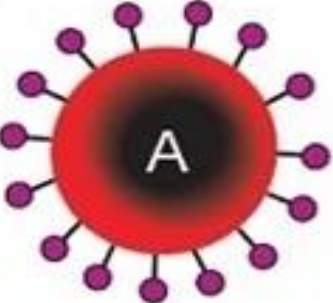
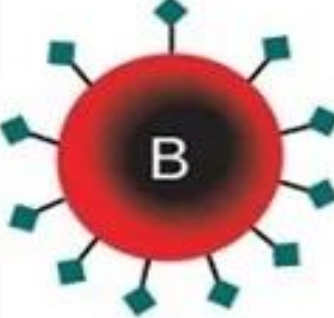
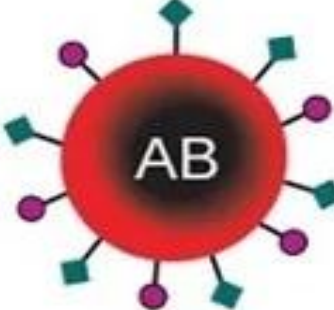
**Group AB**



**Group B**



**Group O**

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

# When to Get Tested?

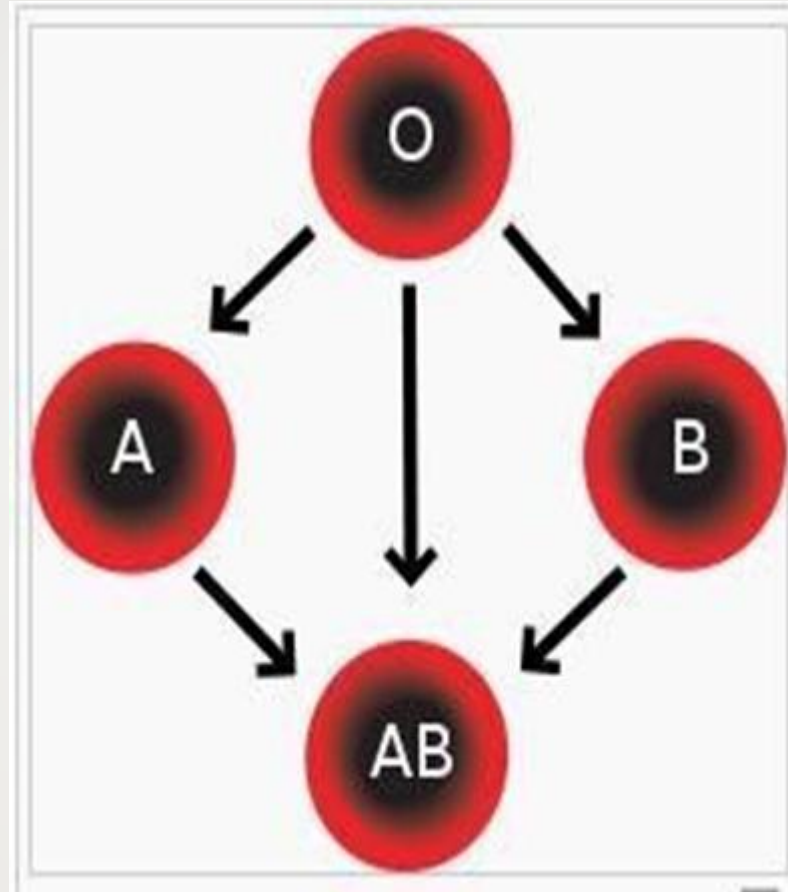
When need to be transfused with blood or blood components

Cases in which blood or blood products are needed for treatment may include:

- Severe anemia
- Surgical patients with intra-operative or post-operative bleeding
- Injury or trauma patients with excessive blood loss
- Bleeding disorder such as Hemophilia

## Who can receive blood from whom ?

- you can always give A blood to persons with blood group A.
- B blood to persons with blood group B.
- In some cases, you can receive blood with another type of blood group , or donate blood to a person with another kind of blood group .
- A universal blood donor is someone who has an O blood type and is Rh negative. This means that they have no A or B antigens or Rh factor on their red blood cells. Their red blood cells can be given to a patient with any ABO or Rh blood type



# A universal blood recipient متلقي الدم العالمي

- universal recipient is a person who has AB blood type and is Rh positive . They can receive red blood cells of any ABO or Rh type with no risk

| Recipient<br>[1] | Donor <sup>[1]</sup> |    |    |    |    |    |     |     |
|------------------|----------------------|----|----|----|----|----|-----|-----|
|                  | O−                   | O+ | A− | A+ | B− | B+ | AB− | AB+ |
| O−               | ✓                    |    |    |    |    |    |     |     |
| O+               | ✓                    | ✓  |    |    |    |    |     |     |
| A−               | ✓                    |    | ✓  |    |    |    |     |     |
| A+               | ✓                    | ✓  | ✓  | ✓  |    |    |     |     |
| B−               | ✓                    |    |    |    | ✓  |    |     |     |
| B+               | ✓                    | ✓  |    |    | ✓  | ✓  |     |     |
| AB−              | ✓                    |    | ✓  |    | ✓  |    | ✓   |     |
| AB+              | ✓                    | ✓  | ✓  | ✓  | ✓  | ✓  | ✓   | ✓   |

# What happens when blood clumps or agglutinates

- For a blood transfusion to be successful, ABO and Rh blood groups must be compatible between the donor blood and the patient blood. If they are not, the red blood cells from the donated blood will clump or agglutinate.
- The A antigen and the A antibodies can bind to each other in the same way that the B antigens can bind to the B antibodies. The red blood cells will be linked together, , by the antibodies.

- **The agglutinated red cells can clog blood vessels and stop the circulation of the blood to various parts of the body. The agglutinated red blood cells also crack and its contents leak out in the body. The red blood cells contain hemoglobin which becomes toxic when outside the cell. This can have fatal consequences for the patient**