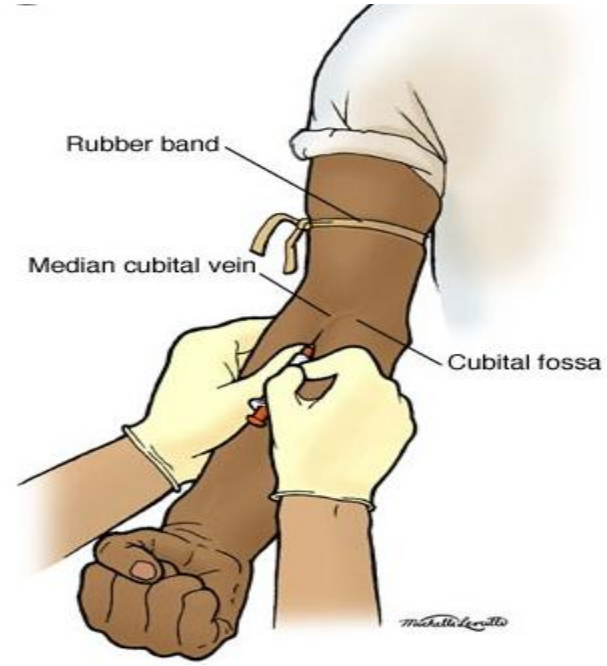
***Hematology*:** is the branch of medicine concerned with the study of the nature, genesis, function, and diseases of the blood. This field scopes deal with the cause, diagnosis, treatment, and prevention of diseases related to blood such as; anemia, polycythemia, thalassemia, hemophilia, leukemia.

Blood collection

The first step in any hematological tests is the collection of blood specimens from patients. Two types of blood samples are commonly used for most hematological examinations: *Venous blood* and *Capillary (peripheral) blood*.



Venous Blood

Venous blood is the choice specimen for most routine laboratory tests. Before deciding on a puncture site, an inspection of all possible areas is imperative. The order of that should correspond to the list of priority sites.

Vein Selection: Priority List

1. Antecubital veins

2. Dorsal hand veins

3. Foot veins

4. Subclavian vein

5. Femoral vein

Capillary (Peripheral) Blood

Capillary blood is often the choice specimen for infants, very young children, elderly patients with fragile veins, and severely burned patients. It collected from earlobe or finger of an adult or from the heel of an infant.

1. Pricking Finger - adult

2. Pricking Ear Lobe - adult

3. Pricking Heel - infant

Blood Collection Tubes

Most blood collection tubes contain an additive that either accelerates clotting of the blood (clot activator) or prevents the blood from clotting (anticoagulant).

A tube that contains a clot activator will produce a serum sample when the blood is separated by centrifugation and a tube that contains an anticoagulant will produce a plasma sample after centrifugation. Some tests require the use of serum, some require plasma, and other tests require anticoagulated whole blood.

Anticoagulants

Whole blood is necessary for most hematological tests. Blood samples must be collected into tubes or bottles containing different anticoagulants to prevent coagulation (clotting). The anticoagulants commonly used in hematological tests are:

□ Ethylene diamine tetra-acetic Acid (EDTA)

Ethylene diamine tetra-acetic Acid is a chelating agent produced as a series of salts. The sodium and potassium salts of EDTA are powerful anticoagulants, and they are especially suitable for routine hematological work.

Chemical Action

EDTA acts by its chelating effect on the calcium molecules in the blood. It removes calcium ions, which are essential for coagulation.

Use

EDTA is the choice anticoagulant for blood counts and blood films. It is also ideal for platelet counts as it prevents platelets from clumping. This anticoagulant, however, is not suitable for coagulation studies because it destroys clotting factors V and VIII.

Trisodium Citrate

Chemical Action

Trisodium citrate removes free calcium ions by loosely binding to them forming a calcium citrate complex.

Use

This anticoagulant is used for coagulation studies and the estimation of the erythrocyte sedimentation rate (ESR).

Heparin

Heparin is a natural substance, synthesized by the liver and basophils leukocytes.

Chemical Action

Heparin prevents coagulation by complexing with thrombin and inactivating it, also it inactivates factors Xa, IXa, XIa, XIIa

Use

Heparin is an effective anticoagulant and it does not alter the size of red cells.

It serves as a good dry anticoagulant when it's important to minimize the lysis after blood withdrawn. Heparin is the best anticoagulant for osmotic fragility and is suitable for immunophenotyping.

Heparin is not suitable for blood counting because of its clumping effect on platelets and leukocytes. It also should not be used for making blood films because it gives a blue coloration to the background. It is not suitable for use in the study of polymerase chain reaction (PCR).

Storage of Blood

When blood is stored in a liquid state there is a progressive loss of viability and depletion of ATP of the red cells, leading to changes in red cell shape (discs to spheres, loss of membrane lipids and increased rigidity). Therefore, when require storage of sample, the anticoagulant solutions should prevent coagulation, and provide proper nutrients for continued metabolism of cells during storage. It is important to ensure that the anticoagulant is thoroughly mixed in the blood added to it.

Anticoagulated blood should be used within 24 hr. of collection, because anticoagulant is gradually broken down in storage and the blood then clots.

RBCs are best preserved at 1-6 C°, this will slow down the metabolism as well as prevent microbial multiplication. Do not freeze the blood, as it would cause hemolysis of the red cells due to intracellular ice formation and probably to hypertonicity.