

# **Sample collection, processing and handling**

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**Medical biochemistry 2022-2023**

# Intended learning outcomes



**Outline the type of biological samples**

**Describe the blood samples in details**

**Describe the Blood collection techniques**

# Types of biological samples

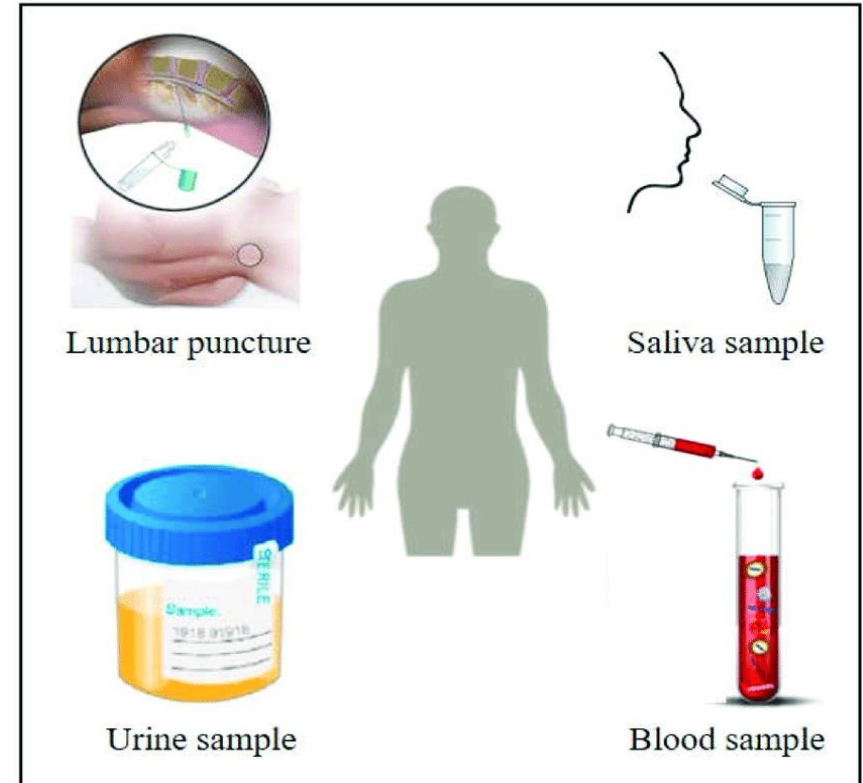
- **Blood**

- **Whole blood**
- **Serum**
- **Plasma**

- **Urine**

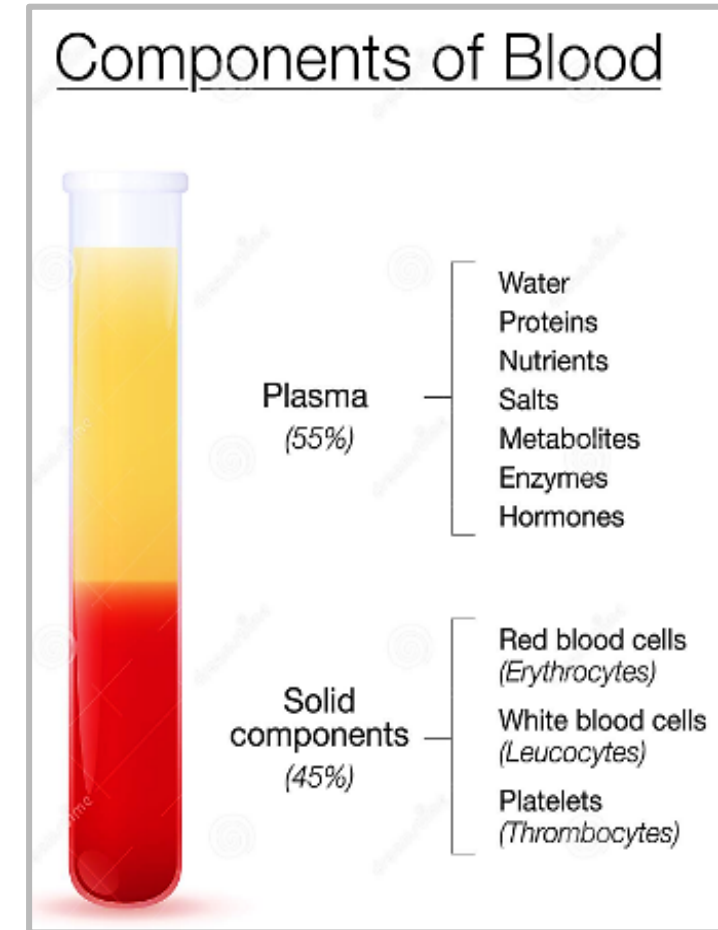
- **Feces**

- **Other body fluids:** Saliva, Spinal fluid, Synovial fluid, Pleural, Pericardial and Peritoneal fluids



# Blood

- **Blood:** is the red fluid in the body that delivers necessary substances such as nutrients and oxygen to the cells and transport metabolic waste products away from those cells.
- It consists of 55% fluid and 45% blood cells.



# Blood

**Blood cells are classified as:**

**White blood  
cells  
(leukocytes)**

**Platelets  
(thrombocytes)**

**Red blood  
cells  
(erythrocytes)**

# Types of blood specimens

- ❖ **Whole blood:** A venous, arterial or capillary blood sample collected in anticoagulant tube.
- ❖ **Serum:** blood collected without any anticoagulant and centrifuged. Clear supernatant fluid devoid of any fibrin products (clotting factor).
- ❖ **Plasma:** blood collected and mixed with anticoagulant and centrifuged. Clear supernatant fluid with thrombosis inhibited. No changes occur in blood.

# Types of blood specimens

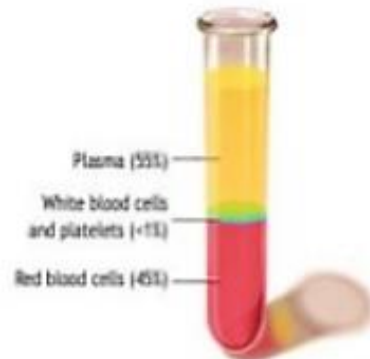
## Plasma vs. serum

• **Plasma** is the liquid, cell-free part of blood, that has been **treated with anti-coagulants**.

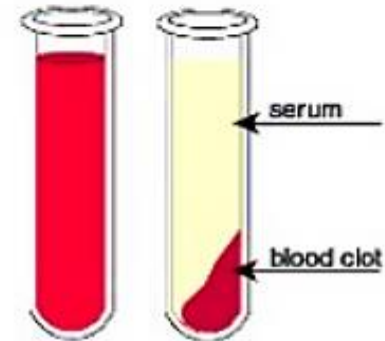
**Serum** is the liquid part of blood **AFTER coagulation**, therefore devoid of clotting factors as fibrinogen.

Anticoagulated

Clotted



• serum = plasma - fibrinogen



# Blood collection techniques

The process of collecting a blood sample is called as **phlebotomy**.



- ❖ **Capillary blood collection:** capillary blood is a mixture of blood originating from artery, vein and capillary. It is collected from fingertip, earlobe or heel which used for pediatric and geriatric, and to obtain blood for rapid analysis.



# Blood collection techniques

- ❖ **Arterial blood collection:** used for blood gas analysis, required special training and must be performed by skilled physician.



- ❖ **Venous blood collection:** is the most commonly used and it is used for clinical chemistry and serology.

# Venipuncture equipment



**Antiseptic (70% isopropyl alcohol) and cotton, Gloves, Tourniquets,  
Syringe, Tube**

# Procedure of blood collection

1. The laboratory staff should ask the patient some questions like **full name, drug, diet, venous state, chronic disease, and intravenous fluid.**
2. Patient position:
  - **Patient should be comfortable, sitting or lying on a bed.**
  - **Never perform on a standing patient**
  - **Arm to be extended straight from wrist to shoulder**
3. Wash your hands, wear protective gloves and face mask

# Procedure of blood collection

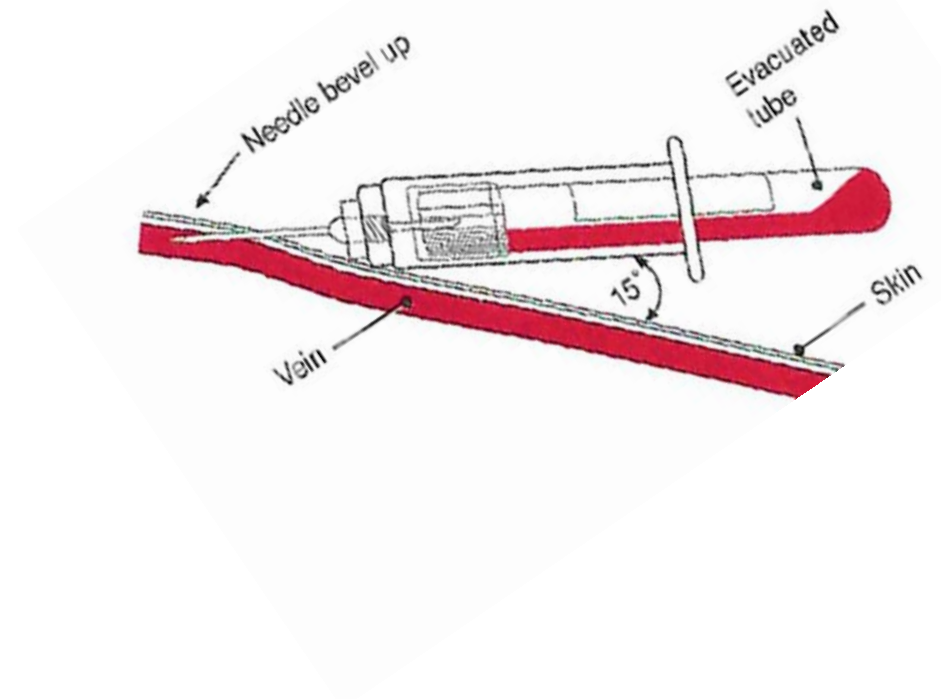
4. Select a suitable site for venipuncture, by placing the tourniquet **3 to 4 inches** above the selected puncture site on the patient.
5. **Do not** put the tourniquet on too tightly or leave it on the patient longer than one minute.
6. When a vein is selected, cleans the area in circular motion with alcohol. Allow the area to dry as alcohol can cause hemolysis and interfere with results. After the area is cleansed, it should not be touched or palpated again.

# Procedure of blood collection



# Procedure of blood collection

7. Swiftly insert the needle through the skin into lumen of the vein. The needle should form a **15-30 degree angle** with the arm surface. Avoid excess probing.



# Procedure of blood collection

8. **Before removing the needle from the vein**, remove the tourniquet and put cotton ball over the needle site as the needle is removed.

9. After blood is collected, blood is transferred into appropriate tube by **gentle ejection**.



# Procedure of blood collection

- **Timing** – The time at which a specimen is obtained is important for constituents that have diurnal variation e.g. cortisol and samples of therapeutic drug monitoring
- Timing also very important for measurement of glucose and alcohol (concentration may change later)
- **Types of timed samples:**
  - **Fasting sample** is best for biochemical investigations (12- 14 hours or overnight fast)
  - **Post prandial sample** is taken 2 hours after a meal
  - **Random sample** can be taken anytime.



# Haemolysis of sample

- **Haemolysis:** is rupturing (lysis) of red blood cells and release of their contents (cytoplasm) into surrounding fluid. This should be avoided since it makes blood sample invalid **because:**
  1. It has dilution effect on constituents of lower concentration in RBC than in plasma like: **Na<sup>+</sup>**. (low false reading)
  2. Increase in plasma concentration of constituents with higher concentration in RBC than in plasma like: **K<sup>+</sup>**, **AST**, and **LDH**. (high false reading)
  3. Heam released from destructed RBC may interfere with spectrophotometric measurements of some parameters like **bilirubin**

# **Causes of Hemolysis**

- 1. Moisture in the collecting tube, syringe or during the blood collection.**
- 2. Vigorous mixing of the blood or rapid expansion of the blood in the tube or centrifuge.**
- 3. Incorrect needle size (small or large).**
- 4. During the bad separation process.**

# Kinds of anticoagulants

1. **EDTA (Ethylene Diamine Tetra Acetic Acid):** it works by chelating the calcium molecules in the blood.
2. **Heparin:** it is the most commonly used because it has the least interference, it acts by preventing the formation of fibrin from fibrinogen.
3. **Citrate:** it works by chelating the calcium. It interfere with some enzyme assays like AST, ALT and ALP
4. **Oxalate:** this form insoluble complex with calcium ions. It may interfere with some enzyme assays like ALP, amylase, and LDH
5. **Sodium fluoride:** it is a weak anticoagulant but used mainly as a preservative for blood glucose samples

THANK YOU !

ANY QUESTIONS ??

PLEASE ASK