

Blood Biochemistry BCH 471 [Practical]

**Lab (9) Erythrocyte Sedimentation Rate (ESR) and
Hematocrit (HCT)**

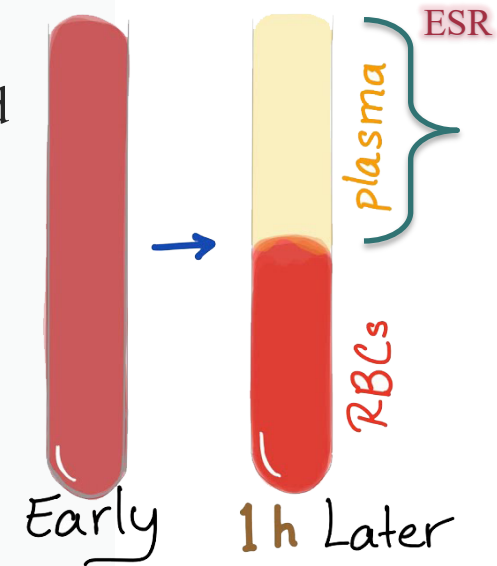


Objectives

- Determination of erythrocyte sedimentation rate (ESR).
- Determination of hematocrit (HCT).
- To assess the condition of a patient by such tests.

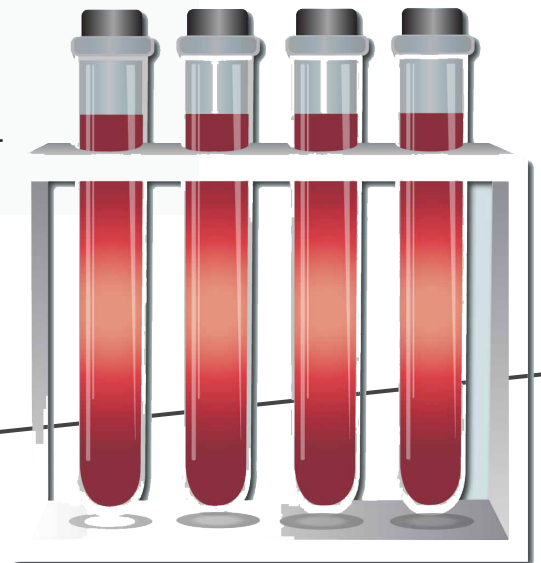
Erythrocyte Sedimentation Rate (ESR)

- **Sedimentation** occurs when RBC aggregate or clump together in a column-like manner.
- **ESR** is the mm of plasma separated **per hour** which measures how quickly red blood cells settle at the bottom of a blood sample.
- It is used clinically as a **non-specific** screening test to:
 1. Detect the presence of infection in the body in general.
 2. Monitor the status of chronic inflammatory disease such as rheumatoid arthritis.
- ESR is **not diagnostic** of any particular disease, but rather is **an indication** that a disease process is ongoing and must be investigated.



Principle

- In this technique, **anticoagulated whole blood** are allowed to sediment under the effect of gravity, using a narrow vertical tube called **Westergren's tube**.
- This test is based on the fact that inflammatory and necrotic processes cause an alteration in blood proteins, resulting in an aggregation of RBCs, which make them heavier and more likely to fall rapidly when placed in a special vertical tube.
- The length of the column of **clear plasma** at the top is noted at the end of 1 hour.



Results

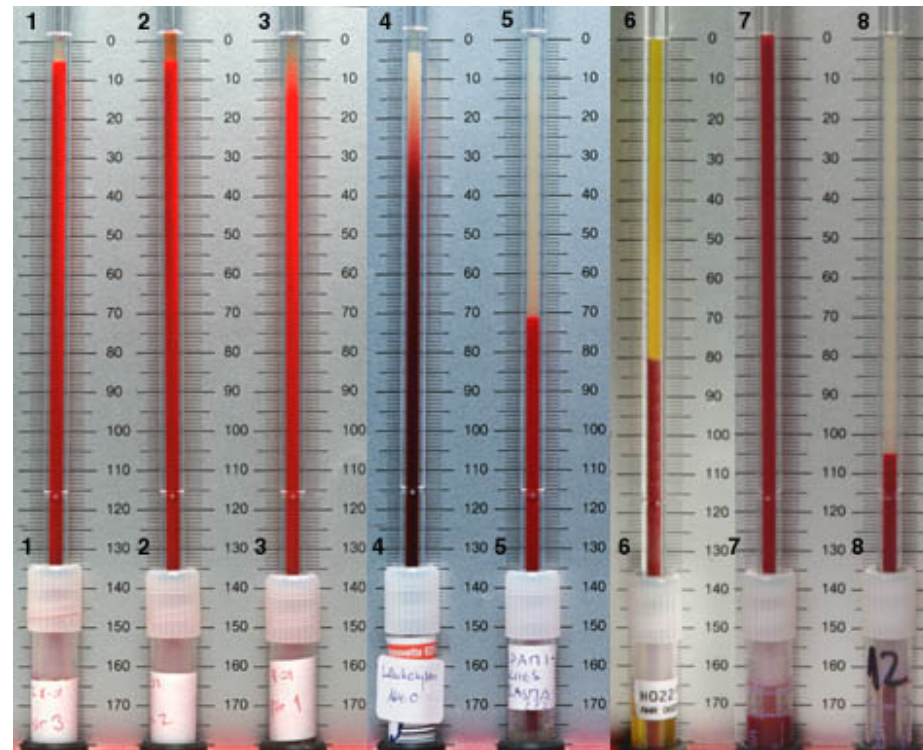
Normal range

Men → 0 - 5 mm/ hr

Women → 0 - 10 mm/hr [They tend to have a higher ESR, and menstruation and pregnancy can cause temporary elevations]

Low ESR

- Polycythemia
- Leukocytosis
- Sickle cell
- Abnormal proteins



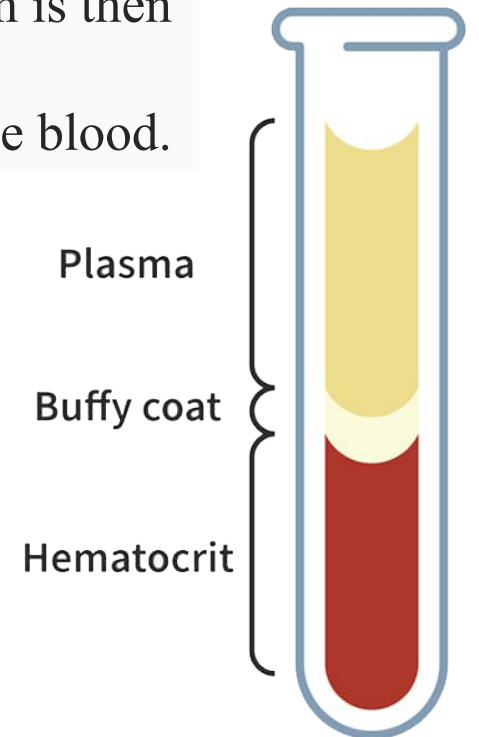
High ESR

- Inflammation
- Infections
- Cancer
- Autoimmune diseases



Hematocrit (HCT)

- **HCT or packed cell volume (PCV)** is the volume percentage (%) of RBCs in blood, thus, a measure of oxygen carrying capacity of the blood.
- It is used as a simple screening test for **anemia**.
- Blood is collected in **heparinized capillary tube (microhematocrit tube)**, which is then sealed, centrifuged and the red cell volume expressed as a percentage of the whole blood.



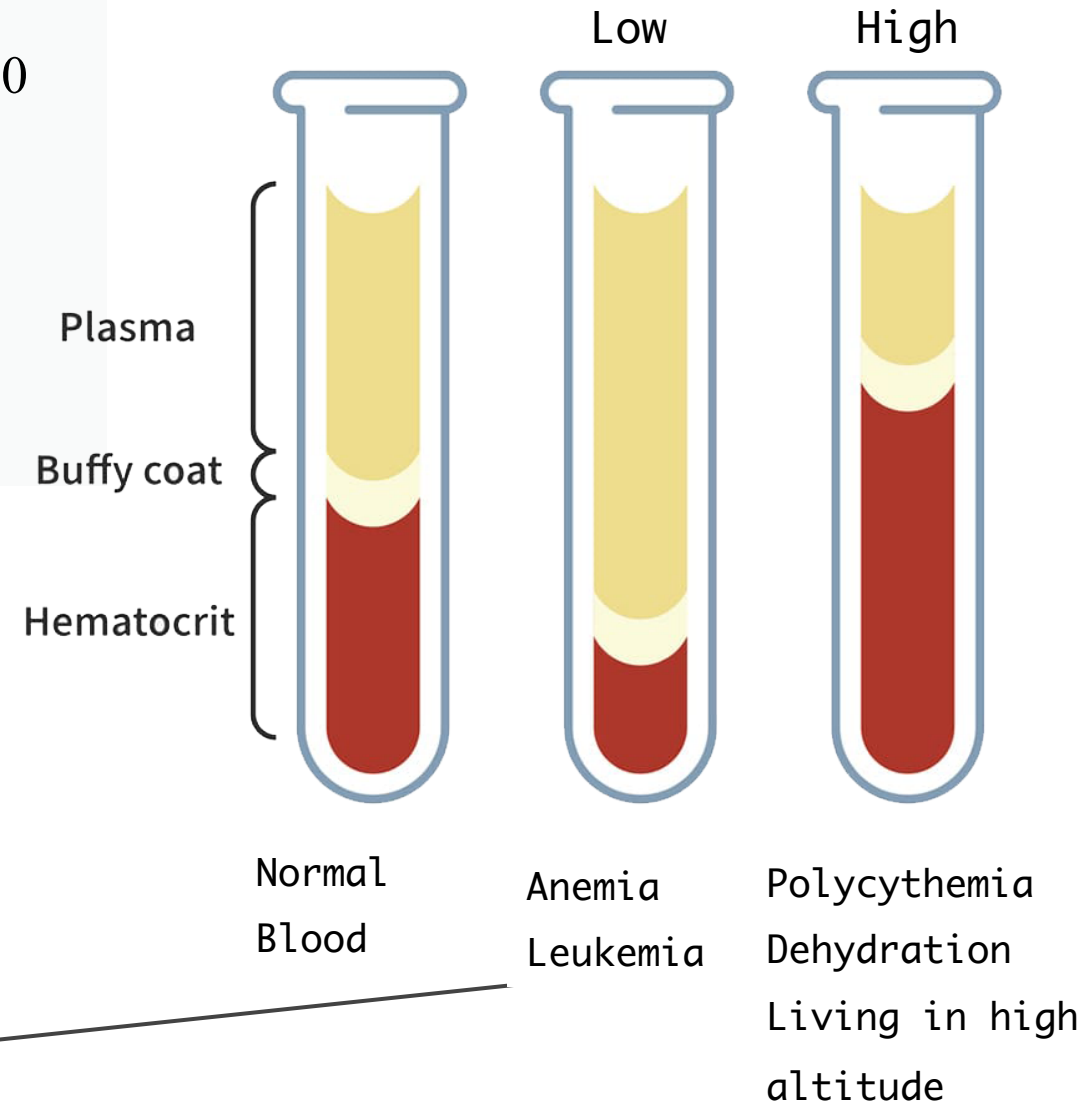
Calculations:

$$\text{HCT} = \frac{\text{Length of column of RBC}}{\text{Total length of blood component}} \times 100$$

Normal ranges:

Male: 40.7 - 50.3%

Female: 36.1 - 44.3%





Homework:

1. What is a coagulation profile? What are the different tests used?
2. What are the different techniques used for measuring hematocrit?