BLOOD PRACTICAL

ESR and Differential WBC

Dr Sitelbanat

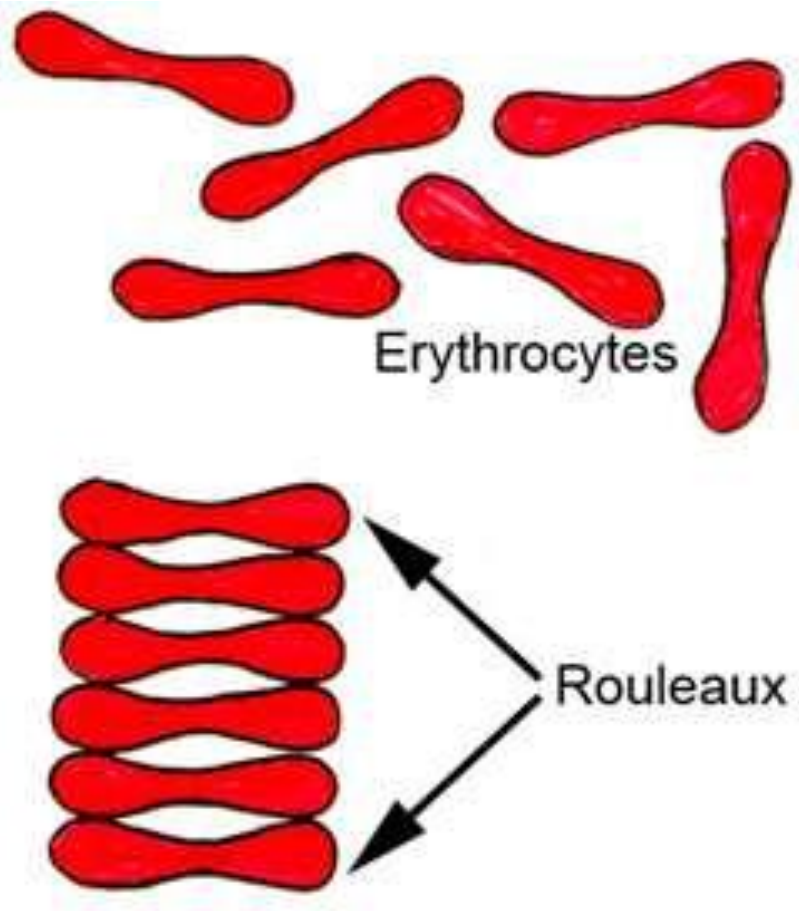
Erythrocyte Sedimentation Rate (ESR)

- **Is the rate at which red blood cells sediment in a period of 1 hour**
- **non-specific measure of inflammation.**

RBC Sedimentation

- **Is controlled by the balance between plasma protein fibrinogen, and the negative charge of the erythrocytes.**
- **In inflammatory, the high fibrinogen level causes RBCs to stick to each other to form stacks (rouleaux), which settle faster.**

Rouleaux formation



Material and methods

- **Westergren's sedimentation apparatus**
- **Anticoagulant (EDTA)**
- **Disposable sterile syringes and needles**

Procedure

1. **Using a sterile syringe remove 1.6ml of blood from a suitable vein. Transfer it to a test tube containing EDTA and then draw up blood into a Westergren tube exactly to the zero mark.**
2. **Place the tube upright in the stand and leave undisturbed. The height of the column of clear plasma at the top of the tube is noted at the end of an hour and again at the end of 2nd hours.**

Westergren apparatus

ESR Results

- **Normal ESR in male = 3-5 mm/ 1st hour and 7-15mm/2nd hour. In females values are slightly higher.**
- **Moderately elevated ESR occurs: inflammation, anemia, pregnancy, and old age.**
- **A very high ESR associated with multiple myeloma, polymyalagia Rheumatic, temporal arteritis.**

Clinical application of ESR

- **Nonspecific test**
- **Prognostic not diagnostic**
- **Monitor disease activity and response to therapy.**
- **ESR is a nonspecific marker of inflammation and is affected by other factors, ESR results must be used along with other clinical findings**

C-reactive protein & ESR

- **C-reactive protein is an acute phase protein produced by the liver during an inflammatory reaction.**
- **Since C-reactive protein levels in the blood rise more quickly after the inflammatory or infective process begins, ESR is often replaced with C-reactive protein measurement.**

Objectives

At the end of this session the student should be able to

- **To know how to measure the erythrocyte sedimentation rate**
- **To recognize what is the clinical value of taking these measurements.**

Differential WBC count

WBC

- **A white blood cell (WBC) count determines the concentration of white blood cells in the patient's blood.**
- **A differential determines the percentage of each of the five types of mature white blood cells**

WBC Differential count

1. **Automatic using Coulter counter**
2. **Manual Using Slide and microscope**

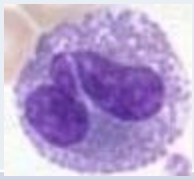
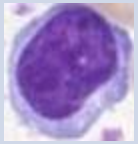
Direct counting

Reagents and apparatus

- A microscope with an oil immersion objective
- Mineral or cedar wood oil
- Various dyes for staining blood films (e.g., Wright's stain)
- Microscope slides

Procedure

- **Examine the stained blood film under the oil immersion objective and identify the different leucocytes.**
- **Make colour diagrams of these cells.**
- **Count at least 100 leucocytes and record your findings in the table below.**
- **Express your results as the percentage of the total white blood cells identified.**

Cells		Number of cells	%
Neutrophils		59	40-60%
Eosinophils		3	1-4%
Basophils		1	0.5-1%
Monocytes		5	2-8%
Lymphocytes		32	20-40%
Total		100	100%

Clinical Application

- **Leucocytosis: High WBC count, in infection, allergy, systemic illness, inflammation, tissue injury.**
- **Differential count provides clues about certain illnesses**
  1. **Neutrophilia: pyogenic illness**
  2. **Eosinophilia: Allergy**
  3. **Lymphocytosis: infectious mononucleosis**

OBJECTIVES

At the end of this lesson student should be able:

1. **to identify the different types of leucocytes under the microscope using theoretical knowledge of the histological characteristics of these cells.**
2. **To practice the procedure for differential leucocytes counting.**
3. **To know the normal values expected for the differential white cell count.**
4. **To understand the use of the differential white cell count in the diagnosis of disease processes.**