

# Human Blood

Dr. Martin A. Salah

Vertebrate Histology (ZOO 415) - Blood Tissue  
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## INTRODUCTION

- Blood may be considered one type of atypical connective tissue, consisting of free cells and a fluid intercellular substance (plasma).
- The mesenchymal origin gives rise to the blood as well as to most of the connective tissues.
- Functionally, however, it does not fit into the connective tissue picture, for connective tissue is usually defined as a medium of support, or connection between the various body structures.

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- ## Blood Constitution
- Erythrocytes (Red Blood Cells).
  - Leukocytes
    - Agranulocytes (mononuclear cells)
      - Lymphocytes
      - Monocytes
    - Granulocytes
      - Neutrophils
      - Eosinophils
      - Basophils
  - Platelets
  - Plasma (the liquid component)
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## Erythrocytes (Red Blood Cells)

- Biconcave in nature and contain hemoglobin.
- Most numerous, above 5.5 million per cubic mm.
- Transport Respiratory gases

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- ## White Blood Cells.
- These are true cells for they contain nuclei.
  - Some granules may be found in the cytoplasm of lymphocytes and monocytes, but granules in the polymorphonuclear cells are usually more distinct and in great abundance.
  - About 5,000 to 9,000 cells per cubic mm.
  - Size of the cells varies with type.
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## Agranulocytes

Cytoplasm without granules or with azurophilic granules

### 1. Lymphocytes

- Cells are small, medium, and large, the small being most common. They are larger than erythrocytes, with a relatively large nucleus, about which there may be a narrow rim of slightly basophilic cytoplasm.
- In some cytoplasm is so scanty that only the large spherical nucleus is distinguishable.
- The nucleus of large lymphocytes may be located at one side of the cell.
- Percentage: 20-25%. Size: 12-15 microns.

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## 2. Monocytes

- Cells which are typically larger than lymphocytes though cannot always be sharply differentiated from some of the larger lymphocytes.
- Large mononuclear leukocytes.
- The typical monocyte has far more cytoplasm than a lymphocyte and the nucleus, usually eccentric in position, round, oval, slightly indented, or crescent in shape.
- The chromatin is finer, the nucleus is paler than that of a lymphocyte, and the cytoplasm is faintly basophilic with occasional granules.
- Percentage: 3-8%. Size 12-15 Microns



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## Granulocytes

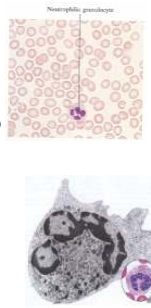
- Cytoplasm contains specific granules, that is, either neutrophilic, eosinophilic, or basophilic granules.
- The granules by electron microscopy are membrane-bounded granules of complex structure.
- They contain hydrolytic enzymes active at acid pH and are of class of lysosomes.
- Polynuclear leukocytes are so named because the nucleus is lobed. These blood cells are generally larger than erythrocytes

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## 1. Neutrophils

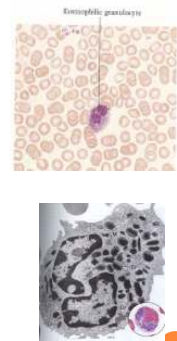
- Cells almost twice in size as an erythrocyte.
- The nucleus is highly polymorphous. May be elongated with a bent or twisted body which consists of several irregular, thin nuclear threads.
- The number of lobes varies from two to five, the most common number being three.
- Percentage based on character of nucleus: 5-12% band-form nuclei (stab cells); 50-60%, two to five lobes; and 3%, more than five lobes.
- The cytoplasm is finely granular and stains in faint lilac salmon pink in color.
- Percentage: 2-5%. Size: 8-10 microns



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## 2. Eosinophils

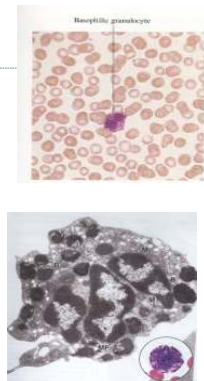
- Cells about twice the size of an erythrocyte.
- The nucleus often has two oval lobes connected by a nuclear thread.
- The cytoplasm contains coarse refractive granules which stain a red color.
- Percentage: 2.5-5%. Size: 10-14 microns



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## 2. Basophils

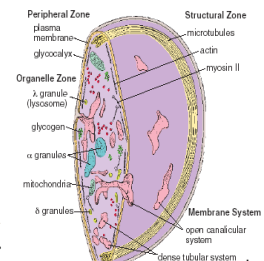
- Cells which are somewhat larger than an erythrocyte.
- The nucleus is usually bent in the form of S and is provided with two or more constrictions.
- It is usually centrally placed and stains faintly.
- The cytoplasm contains very large irregular granules which stain a deep blue color.
- These coarse granules often completely obscure the nucleus.
- Percentage: 0.5-1%. Size: 8-10 microns



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## Platelets (Thrombocytes)

- Platelets are fragments of cytoplasm, important in the clotting of blood.
- In fresh blood, stained and dried on a slide, they appear singly, but more often in clumps.
- The clear, slightly blue cytoplasm is usually filled with azurophilic granules.



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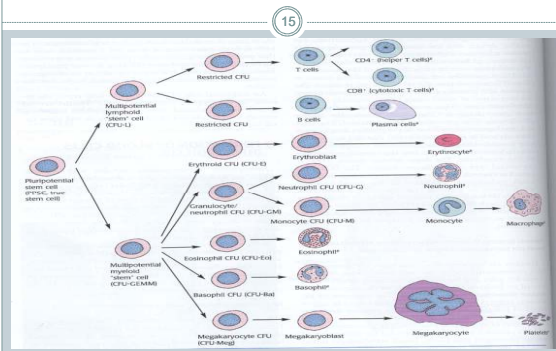
## Plasma

- Plasma is 55% of blood, while cellular elements constitute 45%.
- The plasma appears most often as a granular, but structureless mass.
- The fibrous elements (fibrin) appears as fine to coarse interlacing threads.

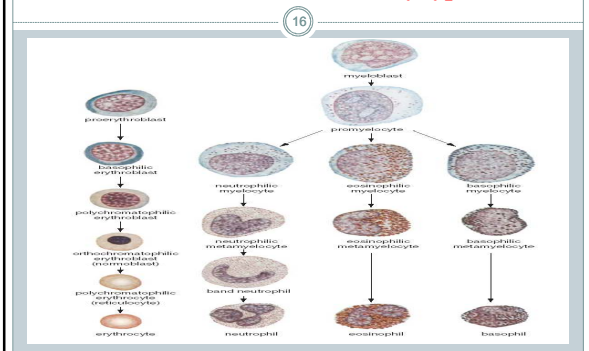
## Lymph

- It is composed of a liquid collected from the lymphatic vessels all over the body.
- In the thoracic duct it contains a large number of cells.
- About 99% of these cells are lymphocytes.
- There may be a few erythrocytes, an occasional eosinophilic leukocyte, but rarely a monocyte.

## Hemopoiesis (Formation of Blood cells)



## Stages of erythrocytic and granular leukocyte differentiation with Romanovsky-type stain



## Dynamics of hemopoiesis in embryonic and fetal life.

