Leukocytes

Are mobile units of the body's protective system

- Granulocytes
    a. Neutrophils
    b. Eosinophils
    c. Basophils
- Agranulocytes
    a. Monocytes
    b. Lymphocytes

Normal Percentages Of Different WBCS

- Polymorphonuclear neutrophils 62 %
- Polymorphonuclear eosinophils 2-3 %
- Polymorphonuclear basophils 0.4 %
- Monocytes 5.3 %
- Lymphocytes 30.0 %

Granulopoiesis

Myeloblast.

Size : 20-25 Micro meter

Shape: Round/ Oval

Nucleus:

Large, oval or round and eccentric. Has a thin nuclear membrane and finely dispersed, granular, purplish, pale chromatin. 2-5 light blue-gray nucleoli.

Cytoplasm:

Small, basophilic, lacks granules

Nuclear/ cytoplasmic ratio 7:1

Promyelocyte.

Size: 14-20 Micro meter

Shape: Round or Oval

Nucleus:

Round, oval or eccentric, possibly slightly indented and surrounded by a thin membrane, still large but is beginning to shrink. Chromatin condensation appear.

1 – 3 nucleoli may be faintly visible.

Cytoplasm:

Pale blue. nuclear / cytoplasmic ratio is

4:1 or 5:1. Non - specific, azurophilic granules are characteristic

Myelocyte.

Size: 15- 18 Micro meter

Shape: Round

Nucleus:

Condensed, oval, slightly indented and

eccentric. Chromatin coarse. Nucleoli absent

Cytoplasm:

Light pink, acidophilic. Nuclear/ cytoplasmic ratio is 2:1

or 1.5 : 1 contain specific granules that are coarse

A few non specific granules also seen.

Metamyelocyte.

(Juvenile cell that is last cell capable of mitotic division)

Size: 12 – 18 Micro meter

Shape: Round

Nucleus:

Eccentric, condensed, indented.

Nuclear membrane thick and heavy. Chromatin concentrated into irregular thick and thin areas.

Cytoplasm:

Abundant, pale or pink

Nuclear cytoplasmic ratio 1:1 very few non specific granules present. Neutrophilic granules vary in size but somewhat finer than the previous stage. Basophilic and eosinophilic granules are large and equal in size.

Band granulocyte (Stab cell).

Size: 10 – 15 Micro meter

Shape: Round

Nucleus: elongated, curved and U-shaped.

Not segmented but slightly indented at 1 or 2 points. Chromatin thick and coarse.

Cytoplasm: pale or colorless

Nuclear cytoplasmic ratio 1 : 2

Contains few non specific and more specific granules.

Segmented(mature) granulocyte.

Size: 10 – 15 Micro meter

Shape: Round

Nucleus:

Eccentric with thick chromatin masses.

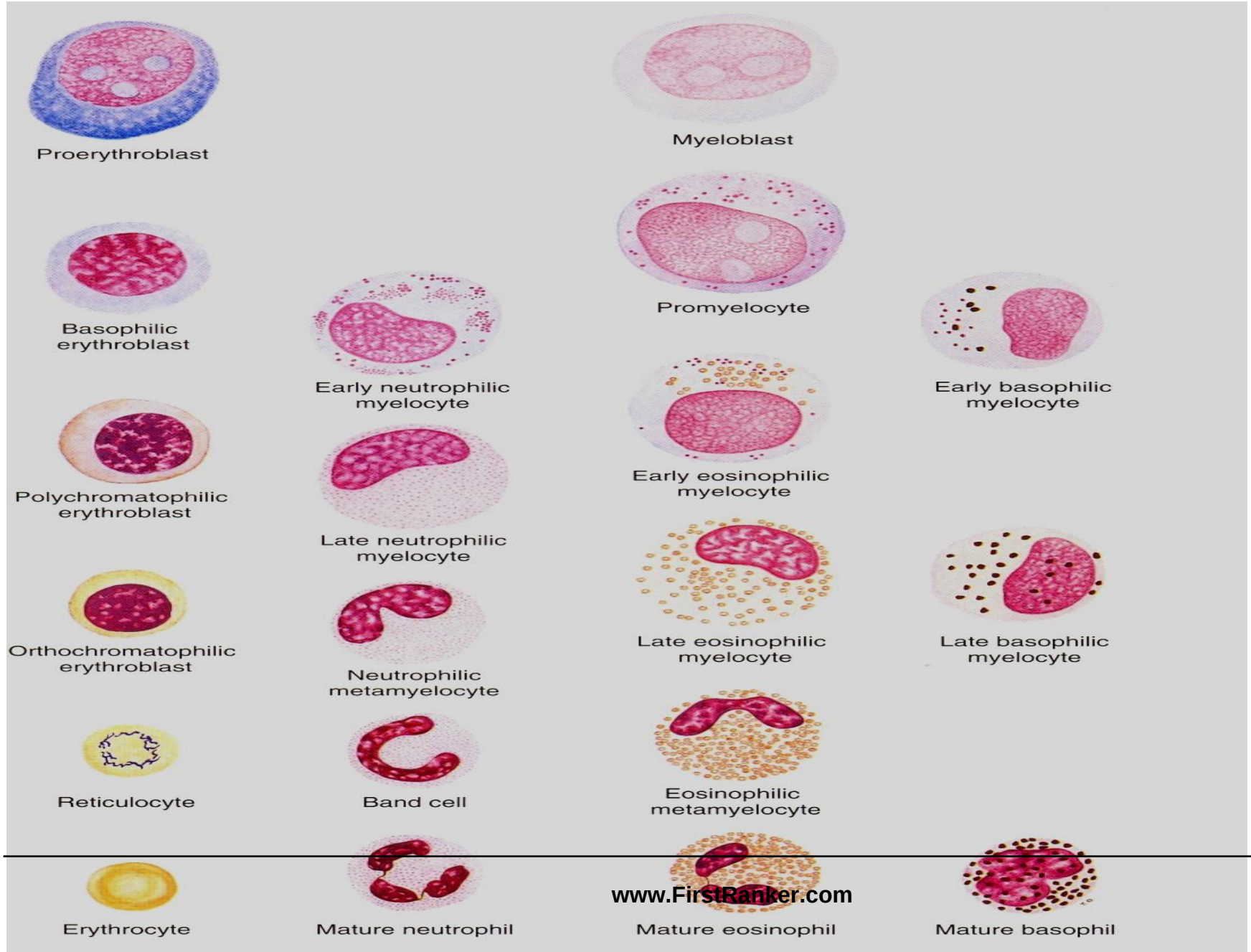
Divided into 2 – 5 lobes connected to each other by thin bridges of nuclear membrane.

Cytoplasm:

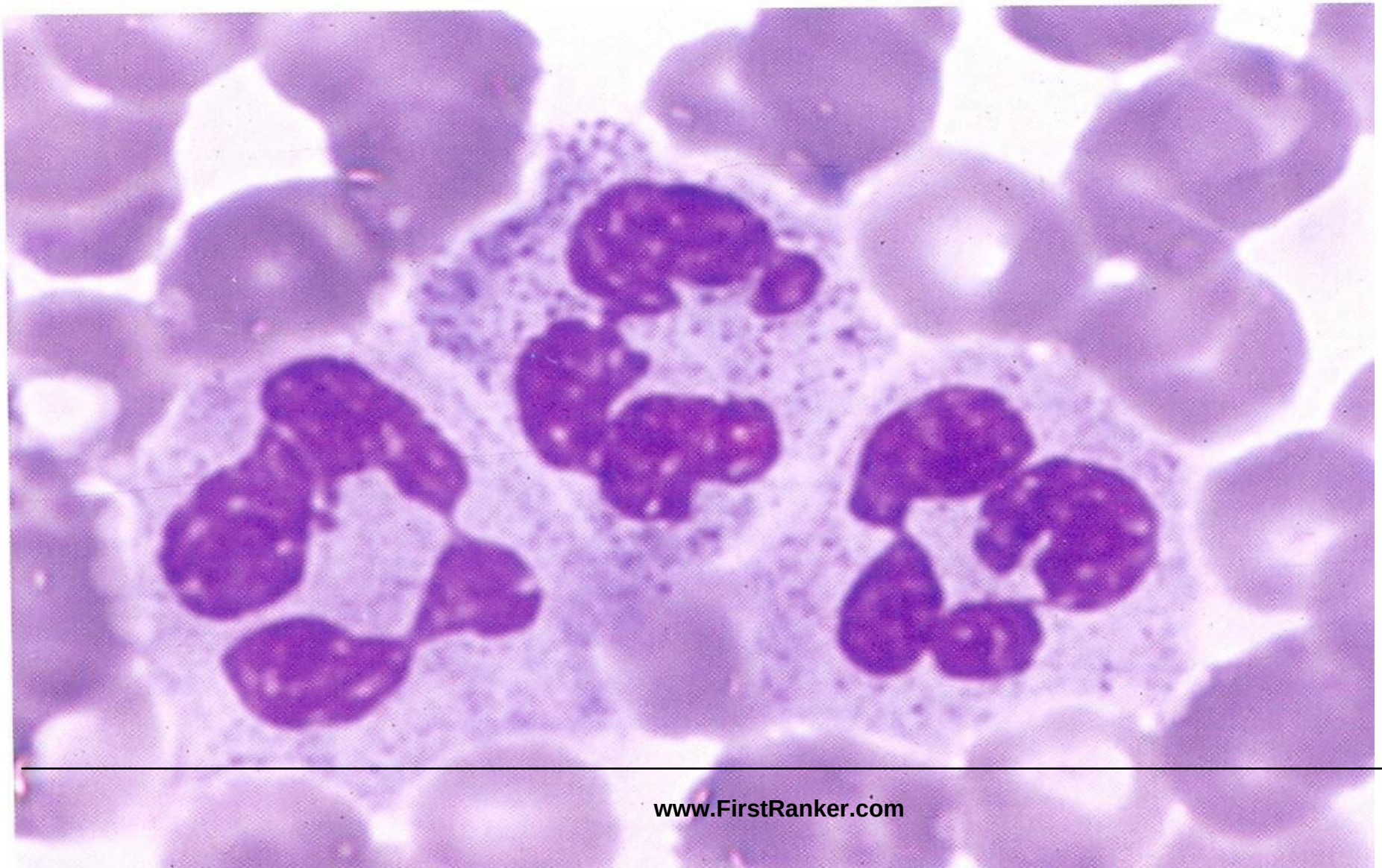
Abundant, colorless or eosinophilic.

Nuclear cytoplasmic ratio 1:2

Stages of Granulopoiesis



Neutrophils



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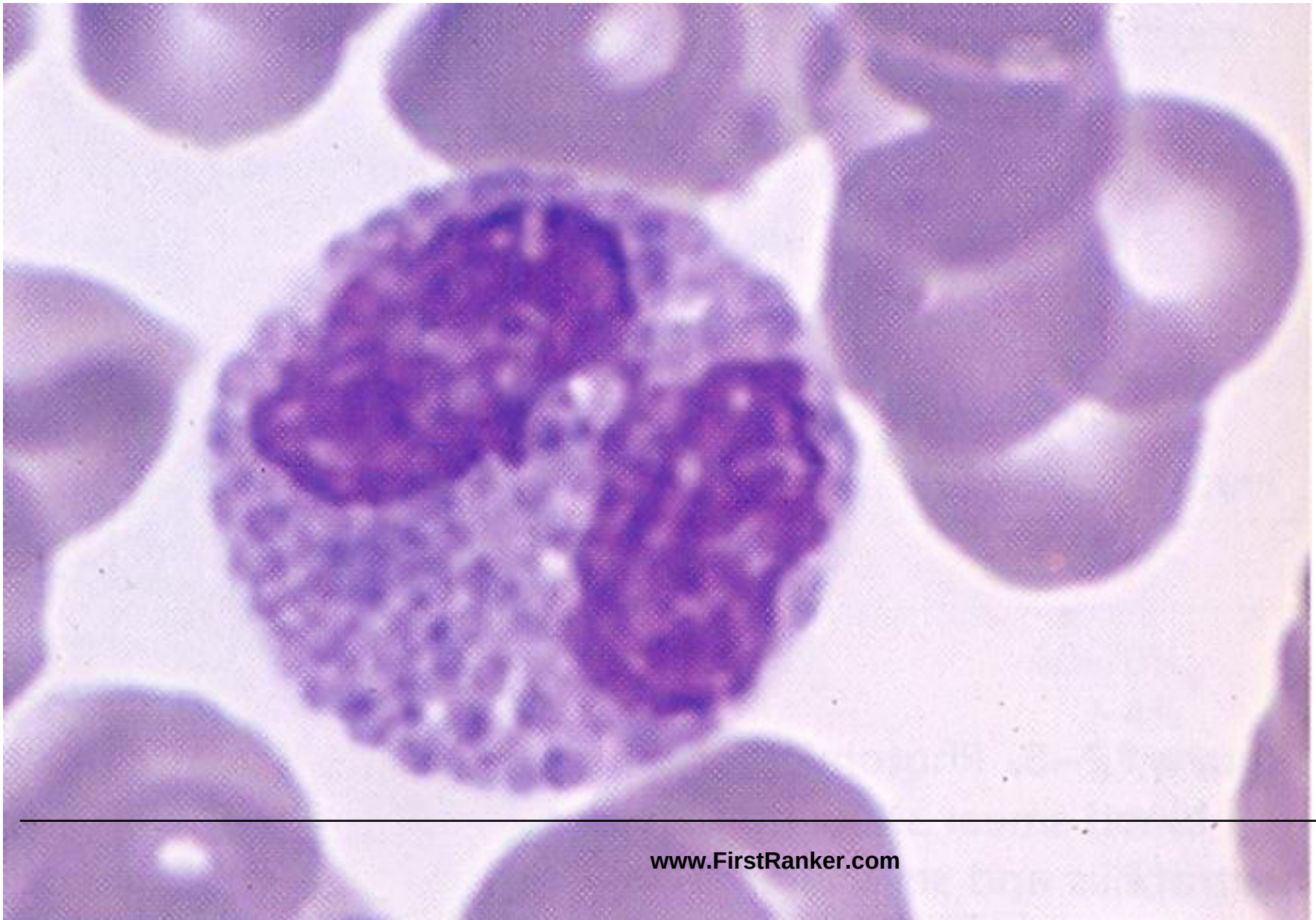
Eosinophils



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Basophils

Characteristics of Granulocytes

Margination

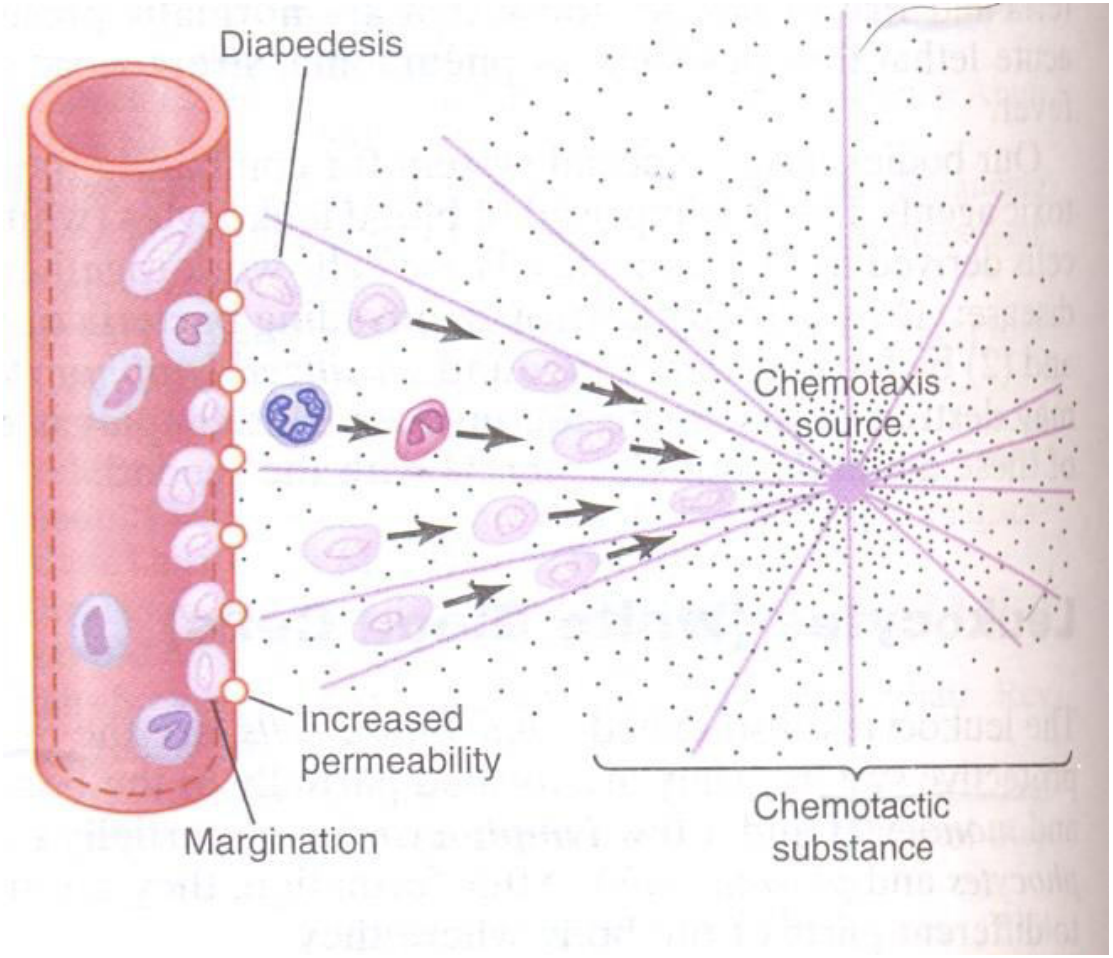
Migration or Diapedesis

Amoeboid movement

Chemotaxis

Phagocytosis

Movement of neutrophils showing characteristics of granulocytes



Functions of Neutrophils

- Phagocytosis
- Lysosomes: Proteolytic enzymes

  Myeloperoxidase

  H_2O_2+Cl $\longrightarrow$ Hypochlorite
- Bactericidal agents. e.g. Superoxide ions, Hydrogen peroxide, Hydroxyl ions

Neutrophilia

Increased number of neutrophils in blood

Causes:

- Acute bacterial infections. e.g. Pneumonias, appendicitis, tonsillitis
- Burns, hemorrhage, tissue injury
- Polycythemia vera
- Strenuous exercise

Neutropenia

Decreased number of neutrophils in blood.

Causes:

- Bacterial infections. e.g. Typhoid fever.
- viral hepatitis
- Kalazar (Schistosomiasis)
- Bone marrow depression
- Hypersplenism

Characteristics of Eosinophils.

- Weakly phagocytic
- Lysosomes contain hydrolytic enzymes
- Major basic protein
- Reactive oxygen
- Histaminase
- Peroxidases

Eosinophilia

Increased number of eosinophils in blood

Causes:

- Allergic conditions e.g. Bronchial asthma, hay fever
- Parasitic infestations e.g. hookworm, trichinosis(Trichinella), schistosomiasis etc.
- Dermatitis
- Penicillin

Eosinopenia

Decreased number of Eosinophils in blood

Causes:

Coticosteroids

Over activity of adrenal cortex

Diurnal variation: less in the morning ,may be in response to increased secretion of ACTH in the morning

Contents of Basophils

- Heparin
- Histamine
- SRS (slow reacting substance of anaphylaxis)
- Serotonin
- Leukotreins
- Bradykinin
- Eosinophil chemotactic factor
- Neutrophil chemotactic factor
- Many other lysosomal enzymes