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HISTOLOGY SHEET

Doctor 2021 -mercy- I medicine I MU

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DOCTOR

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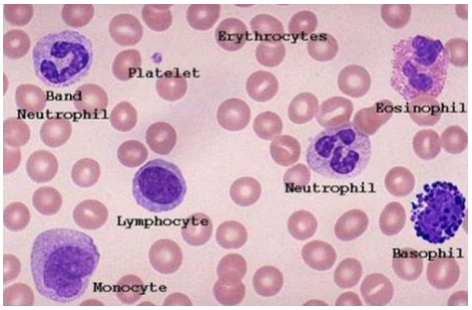
Leukocytes

The formed blood elements



45 % of blood volume

- Red blood corpuscles =Erythrocytes (RBCs)
- Blood platelets = Thrombocytes
- White blood cells =Leucocytes (WBCs):

1- Granular leucocytes(have granules in cytoplasm) (neutrophils, eosinophils, basophils)

2- Agranular leucocytes (lymphocytes, monocytes)

5 type of WBC have non specific granules when it have also specific it call granular

Stains of blood film

Giemsa's / Leishman's = methylene blue+ eosin

►basophilic (violet)

►eosinophilic (pink)

►azurophilic (red purple)

Difference between RBCs & WBCs

RBCs

- 4-5.5million/micro-liter/ mm3
- Biconcave
- No nuclei. / no organelles
- True cell but the nuclei move out in maturation
- Contain hemoglobin
- Life span=120 days
- No amoeboid (it can't move out from blood)
- Function : carry O2&CO2

WBCs

Function white blood cells : they don't have function within blood stream but , they receive a stimulus , they leave the bloodstream to enter the connective tissue and perform an immune function.

- **4000-11000/micro-liter =mm^3 blood.**
- **Rounded**
- **(nuclei+ organelles)**
- **No hemoglobin**
- **From days to years**
- **Amoeboid movement**
- **Defense & immunity**

Leukocytes (WBCs)

Normal total Count 4000-11,000 / mm^3 blood.

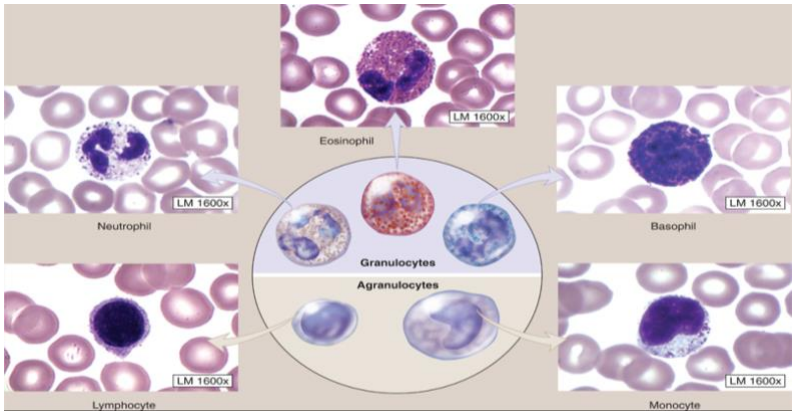
Granular leukocytes:

1-Neutrophils. 60-70-%(first most numerous)

2-Eosinophils. 1-4%

3-Basophils. 1/2- 1%

The name come from staining affinity of granules

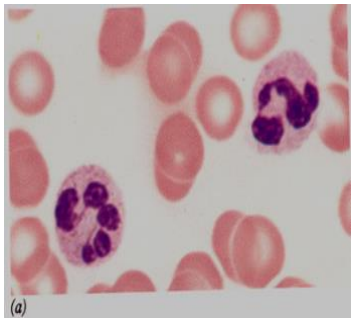


Agranular leukocytes:

1- lymphocytes.20-30%(second most numerous)

2- Monocytes. 3-8%

Neutrophils= Microphage =polymorphonuclear leucocytes=Pus cells



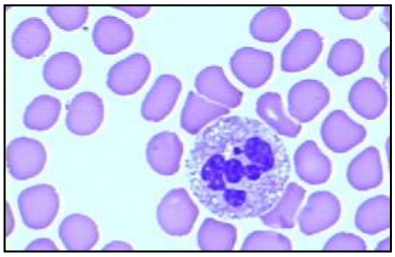
***Why it's named neutrophilic ? because their granules have a natural stating affinity to the stains in blood film(does not take stain from* Giemsa's / Leishman's = methylene blue+ eosin)**

Why it's named polymorphnuclear leukocytes ? Because the cell contains multiobulated of nucleus which increase in maturation (according to its age of the cell)

It name pus cell because it release some chemical destruct antigen and it will become death(pus is the destruction anti gen ,death cell and destruction tissue) so that it call pus cell

- **Differential count 60-70%**
- **Diameter=10-12 microns**
- **Shape: rounded**

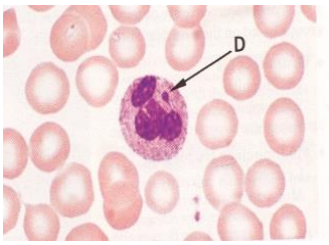
Neutrophils : the first line of defense against any invading micro-organism



LM:

Nucleus : multilobulated 2-8 lobes

Barr body?? Condensed inactive X- Chromosome in females



Cytoplasm: contains

How I can determine the sex from blood? The neutrophils cell in WBC have barr body in females only

1- specific granules (neutral & small)

2- non specific : azurophilic granules (few & large, stained by azure)

EM of Neutrophils

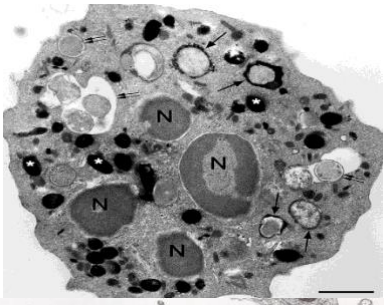
Shape: irregular. When active

Irregular outline due to extension of pseudopodia : motility & phagocytosis

- **Cytoplasm:**

❖ **Few organelles.**

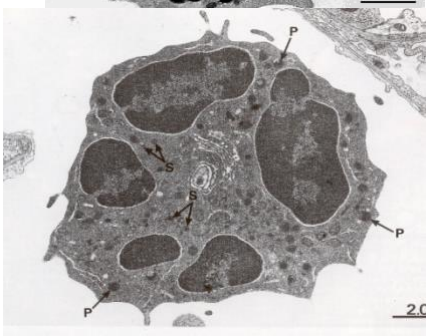
❖ **Granules:**



1- specific granules

Rice grain appearance= Collagenase

Small and Contain protease enzymes (collgenase) : makes a distruction for collagen



2- nonspecific azurophilic granules

= Lysosomal hydrolytic enzymes.

Neutrophils (polymorphs)=Pus cells

Functions

The first line of defense.

1- Phagocytosis & destruction of micro-organisms in the C.T. How…?

Chemotaxis→ migration → phagocytosis → killing of bacteria by phagocyting & digestion by lysosomal enzymes (1ry, azurophilic granules) → death of neutrophils (pus cells)

2. Stimulation of bone marrow to form new neutrophils

3- Attraction of monocytes to the site of infection.

➔ **Production of pyrogens & pus**

Life span: 1- 4 days in blood ► ► CT

- **Secretion of cytokines:**

❖ **Chemotaxis**

❖ **bone marrow stimulation**

During the imflamntory reaction , neaturophils themselves are damaged by the bacterial toxins causing their death and then they are called pus cells.

in female with a normal Karyotyping (44,xx) one of the x-chromosome is condensed and attached to the nucleus forming drumstick appearance (Barr body)

Abnormal neutrophil count

Neutrophilia: =in acute pyogenic Pus = acute inflammations e.g.:

Increase in number

- **Appendicitis**
- **Tonsillitis**

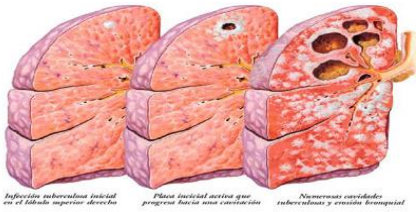
Neutropenia:

Decrease in number

Sever viral infection

Chronic infection

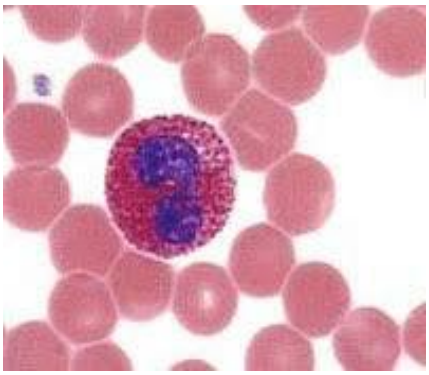
Suppuration of bone marrow (Cancer patient treated with x-rays and chemotherapy, immune suppressant, larg dose of cortisone



- **TB**
- **Influenza**
- **Measles**

Eosinophils(pink color)

Why it's named or called eosinophils ? because their granules have a strong affinity to the eosin



- **Differential count: 1- 4%**
- **Diameter=12-15 microns.**
- **Shape: rounded**

L.M:

***Nucleus: bilobulated C- shape**

Cytoplasm contains

- **Specific granules. large acidophilic**
- **Nonspecific granules**

azurophilic granules =Lysosomal hydrolytic enzymes

E.M:

Bilobed nucleus C- shape

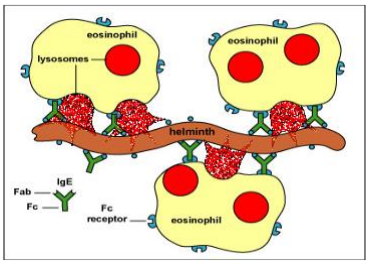
Cytoplasm contains glycogen, mitochondria, rER, & sER

- **specific granules**
  - **Large specific granules**
  - **Small specific azurophilic granules**

  with crystalloid dense hydrolytic enzymes(core)=Histaminase, peroxidase
- **nonspecific azurophilic granules =Lysosomal hydrolytic enzymes**

There is inverse relationship between abountant of specific and nonspecific granules

Function of Eosinophils



- **▼ ▼ regulation of allergic reactions.**
- **Parasitic infestation. (Not phagocytic)**

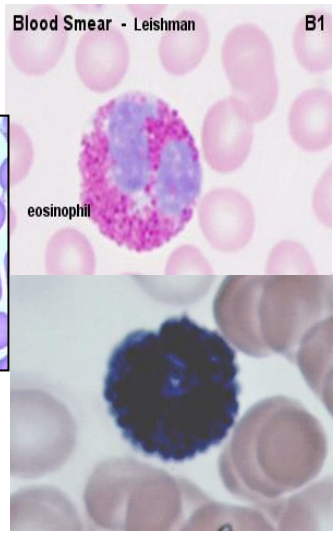
Abnormal Eosinophil Count

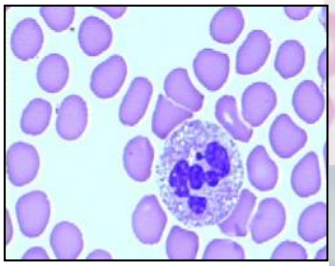
- **Eosinophilia:**
  - **Allergic reactions e.g., bronchial asthma, urticaria.**
  - **Parasitic infections e.g., Bilharziasis.**
- **Eosinopenia:**
  - **Bone marrow depression e.g., Steroid therapy.**

Basophils (Mast cell of the blood)

Why it's called basophils ? Because their granules have a strong affinity to the basic component of the stains

Why it's called mast cell of the blood ? LM: Because they secrete heparin and histamine like the connective tissue (mast cell)





- **Differential count: ½ - 1%**
- **Size: 10 microns**
- **Shape : Rounded**

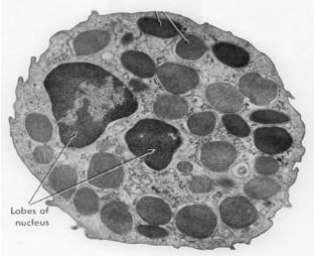
LM:

- **Nucleus: bilobed, (S-shaped)**
- **Obscured by abundant deep blue granules.**
- **granules stain red with toluidine blue = (Metachromasia).**

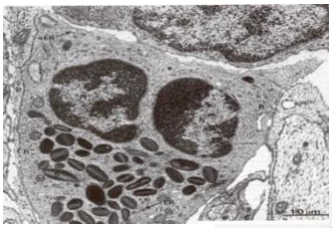
E.M.

Have extension of pseudopodia

***Bilobed S- shape nucleus Mitochondria, ribosomes, glycogen in cytoplasm.**



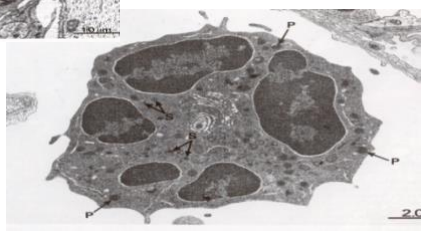
1- specific granules



- **large**
- **Functional histamine, heparin**

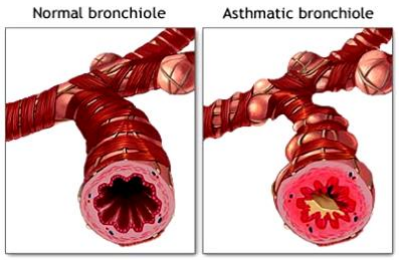
2-nonspecific azurophilic granules

= Lysosomal hydrolytic enzymes



Functions

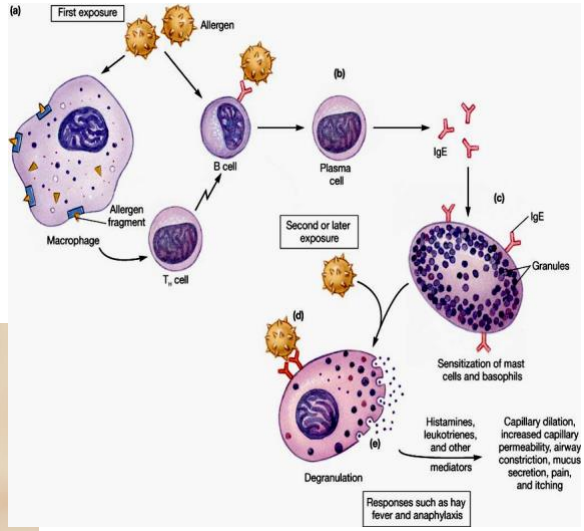
- **Secretion of histamine which initiates allergic reactions.**
- **Secretion of heparin which is a natural anti-coagulant.**
- **=Mast cell of blood: = hypersensitivity reaction**
- **1- heparin: anticoagulant**
- **2- histamine: (anaphylaxis) (redness ,edema ,hotness)**
- **In wall of mast cell and basophil receptor (immunoglobulin E receptor)(IGE)**



- **When Ig attach to receptor is stimulation of cell to do degranulation (histamine and heparin) histamine make spasm and contraction of smooth muscle in bronchi and vasodilation in capillary which cause droop in BP that is anaphylaxis shock**

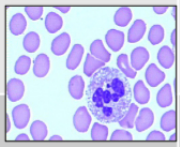
Basophils abnormal count

- **In abnormality it increase only does not decrease**



Basophilia:

- **viral infections as small pox and chicken pox.**
- **Systemic allergy**

	Neutrophils	Eosinophils	Basophils mast cell of the blood .
Number	**60-70% of leukocytic count**	**1-4% of leukocytic count**	**0-1% of leukocytic count**
Size	**10-12** µm in diameter 	**larger than neutrophils (12-15 µm in diameter,**	**(10 mm) in diameter,**
Shape	spherical in shape + Neutral granules	spherical in shape + Acidophilic granules	spherical in shape (basophilic) specific granules with heparin and histamine
Structure	multi-lobed nucleus human females may have **inactivated second X** chromosome (Barr body drum stick	bi-lobed nucleus C-shape or 	S-shape lobed nucleus, obscured by basophilic granules 
Life span	lifespan 1-4 days in circulation;	several days Up to week	1-2 weeks
Function	first line of defense against any invading micro-organism	• Kill parasites, • associated with allergic reactions	Basophils are responsible for the release of Histamine in systemic allergic reaction
Abnormality	**Neutrophilia:** i.e. abnormal increase in the number of neutrophils. This is observed in acute inflammations e.g. appendicitis, tonsillitis. **Neutropenia:** i.e. abnormal decrease in the number of neutrophils e.g. in influenza, typhoid fever.	1-Eosinophilia: i.e. abnormal increase in the number - Allergic reactions e.g. asthma, urticaria -Parasitic infections e.g. Bilharziasis. 2-Eosinopenia: i.e. l decrease in the number prolonged corticosteroid therapy .	Basophilia in systemic allergic reaction

إن الذي يرتجي شيئاً بهمّتهِ

يلقاهُ لو حاربَتْهُ الانسُ والجنُّ

فاقصد إلى قمم الاشياءِ تدركها

تجري الرياح كما رادت لها السفنُ