Physiology team 434

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White Blood Cells

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Objectives

At the end of this lecture student should be able to:

1. Describe different Types of WBC
2. Recognize the general functions of WBC
3. Describe genesis and site of formation of WBC.
4. Describe stages of neutrophil formation
5. Describe the role of neutrophils in defending the body against infection
6. Describe the process of phagocytosis.
7. Describe Esinophils formation and functions
8. Describe Basophils formation and functions
9. Describe Monocytes and macrophage formation and functions.
10. Describe Reticuloendothelial componants and functions
11. Describe lymphocytes formation and maturation.
12. Describe the functions of the different types of lymphocytes.
13. Recognise leucocytosis and leucopenia.
14. Recognize type of leukaemia

Objectives in gray will be taken after hajj vacation.

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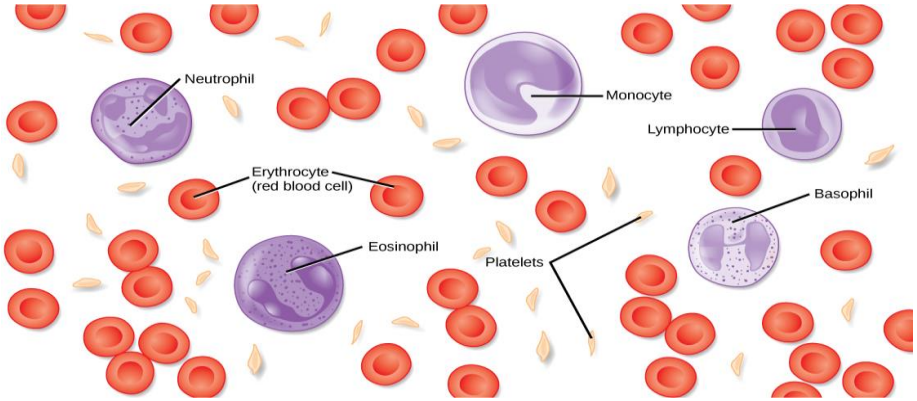
White Blood Cells

- White blood cells are produces in "Bone marrow & Lymphoid tissue"
- Their count in blood is "**4000-11000/ml**" compared to red blood cells "**5-6 millions/ml**"
- Function of white blood cells is protection against infections by 2 methods:

Phagocytosis

Secretion of Antibodies



Blood Film

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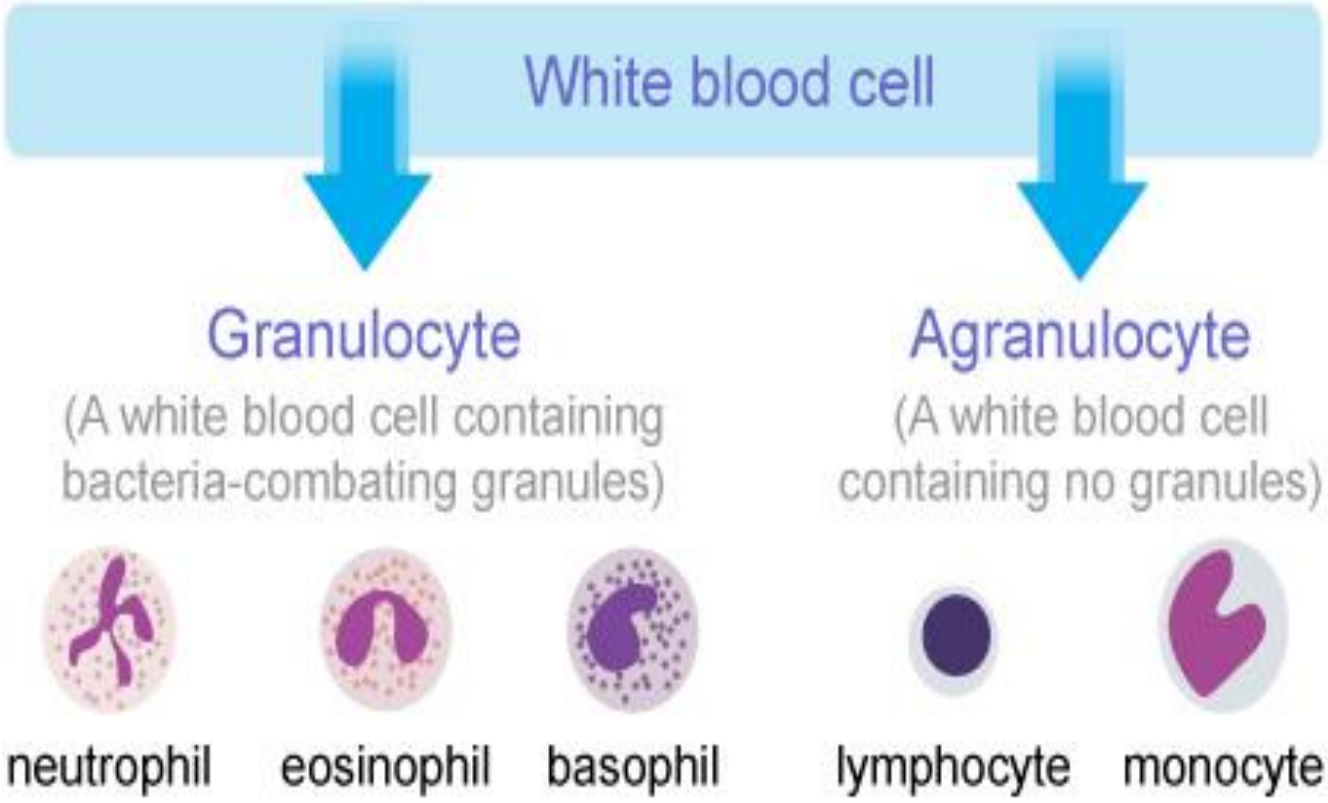
Types of White Blood Cells



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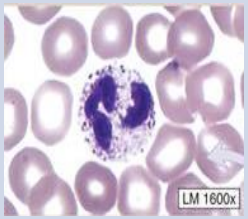
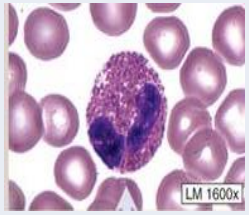
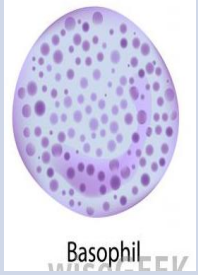
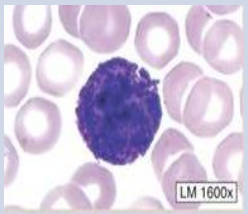
Granulocytes

	Under Microscopes	Percentage	Size (µm)	Nucleus Description	Color of Granules	Life Span
		62%	10-16	Lobulated nucleus (2-5) lobes	**Purple** cytoplasmic granules	4-5 days
		2.3%	12-18	2 lobe nucleus	Coarse "rough" **Red** granules	4-5 days
		0.4%	10-14	Rarely segmented "lobulated" nucleus	Large round **Blue** granules	4-5 days

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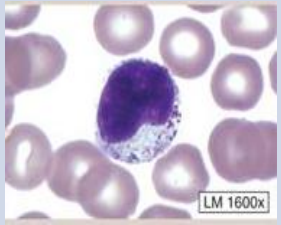
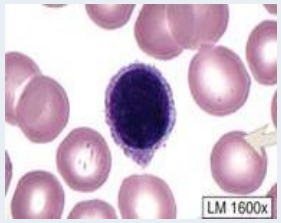
Agranulocytes

	Under Microscopes	Percentage	Size (µm)	Nucleus Description	Life Span	Site of Formation
		5.3%	15-20	Kidney shape nucleus	10-20 houres	Bone Marrow
		30%	Small 5-8 Large 9-15	Round nucleus	Weeks to months "depends on the type"	Bone marrow, Thymus, Lymphoid tissue.

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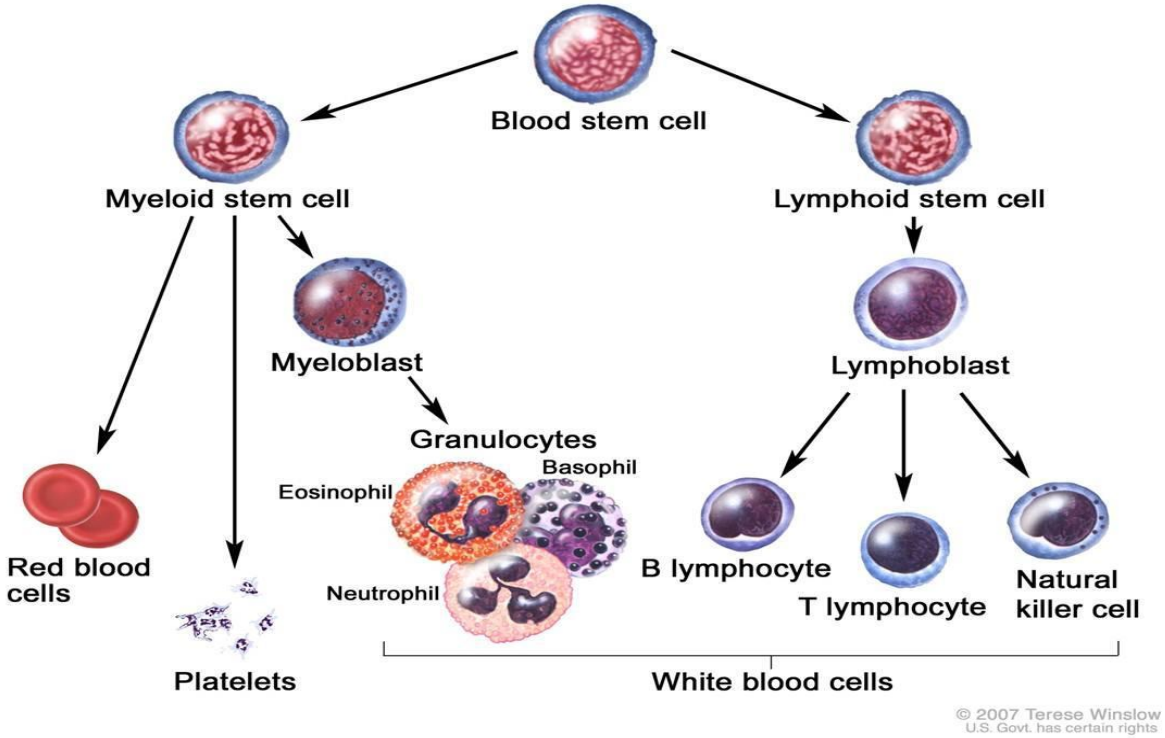
Genesis (Formation) of White Blood Cells

Two major lineage "paths" of WBC formation:

1- Myelocytic – Granular + Monocyte

2- Lymphocytic – Lymphocytes



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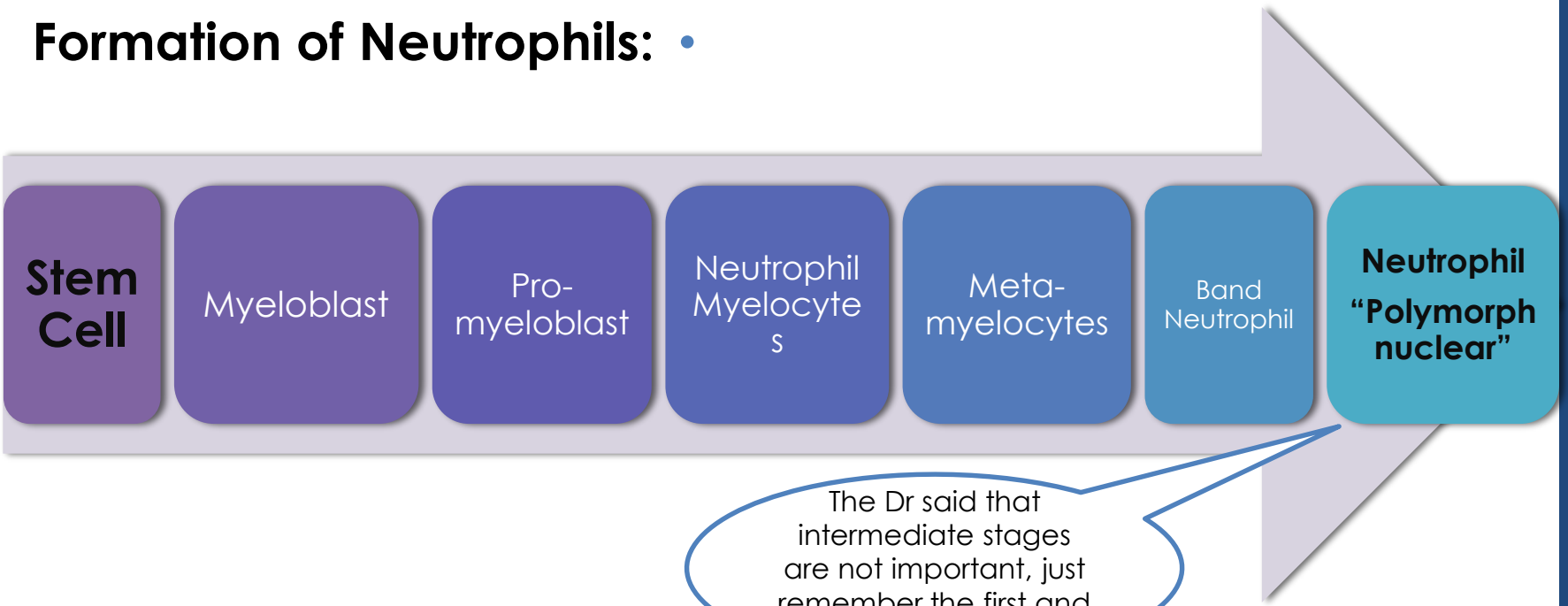
Neutophils

Formation of Neutrophils:



Function of Neutrophils:

Defense against infection: Neutrophil has the ability of engulfing bacteria or organism by a process of phyagocytosis

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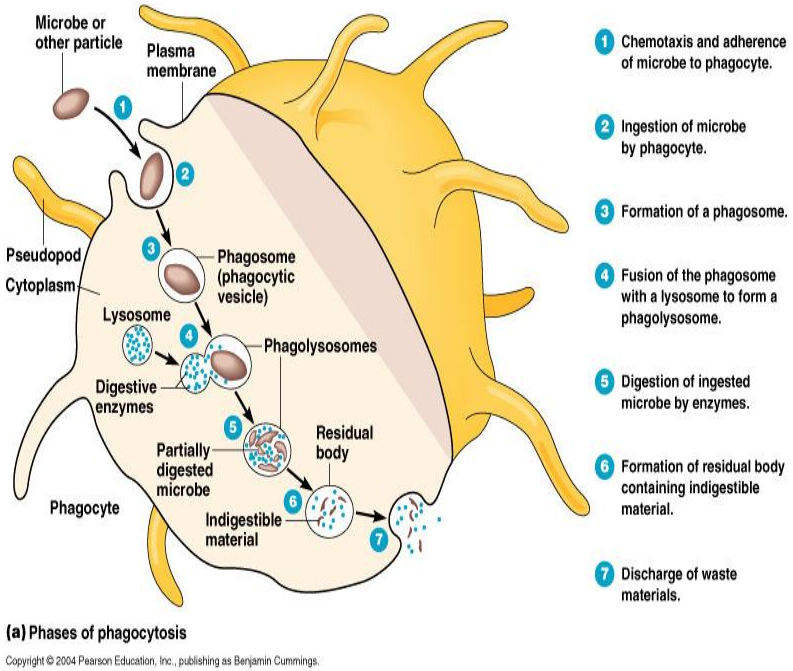
Phagocytosis

Selective process: foreign substance recognize by:

- Rough surface .A
- No protective protein coat, which prevents phagocytosis .B
- Marked by certain substance e.g Complement 3 or antibodies making them ready for killing a process known as opsonization .C

- Neutrophils encircled the bacteria with pseudopodia and engulf it inside into a vacuole (phagosome), takes 3-20 bacteria.

Steps of Phygocytosis:



Chemotaxis → Margination → Diapedesis → Ameoboid Movement → Engulfing & Microbial Killing

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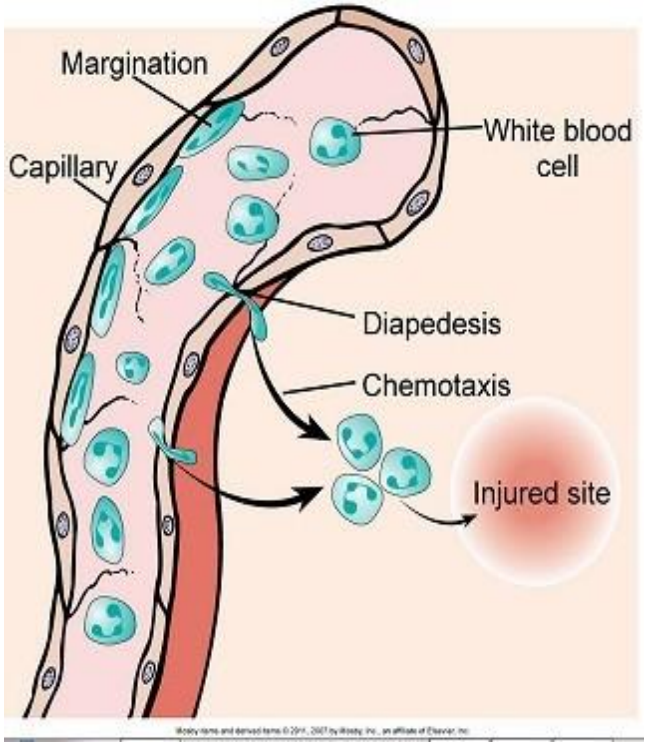
Chemotaxis

The attraction of the neutrophils to inflamed area following chemotactic substances release from infected site:



Chemotactic substances:

1- Bacterial toxin

2- Degenerative products of inflamed tissue

3- Complement system

4- Reaction product of plasma clotting

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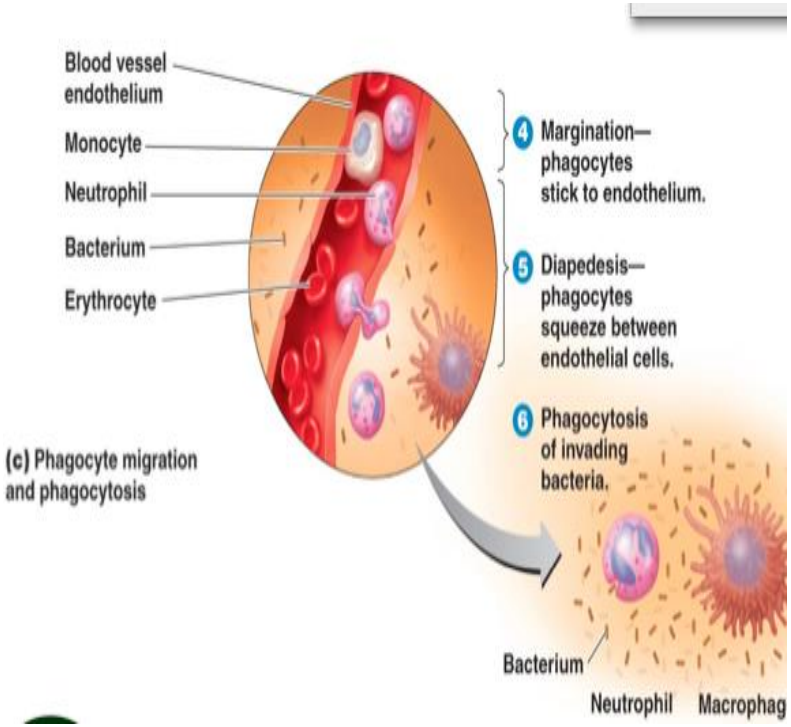
Margination & Diapedesis

- WBC marginate along the wall of blood capillaries
- WBC squeezes itself through endothelial holes leaving blood capillaries (diapedesis)
- WBC move by amoeboid motion towards inflammation area following chemotactic substance released from site of infection
- Upon reaching the site of infection neutrophils start to engulf infecting organism



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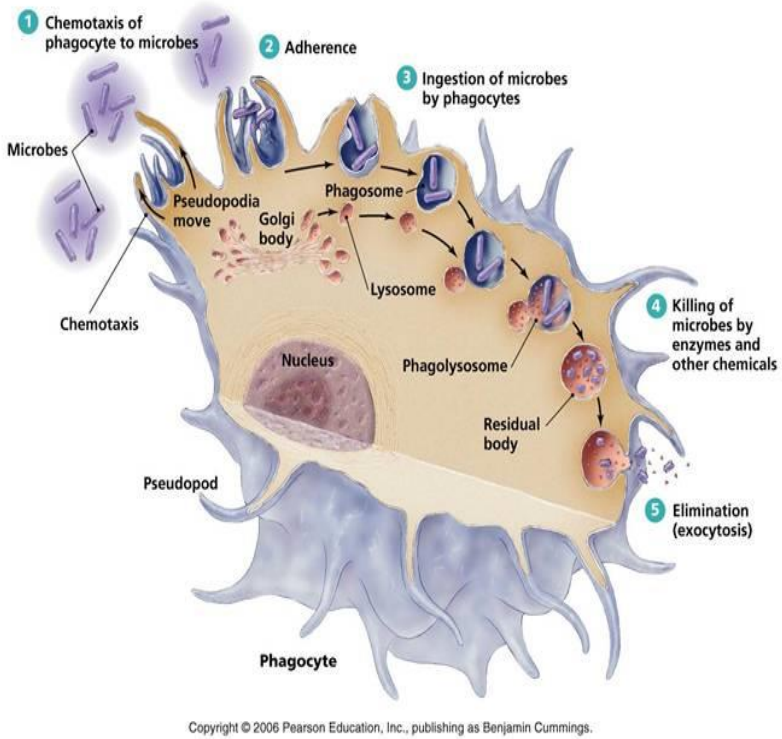
Microbial Killing

- Digestion of organism inside the phagosom
- Fusion of intracellular lysosomes with phagosome vacuole
- Lysosomes discharge its proteolytic enzymes such as myeloperoxidase, catalase into the vacuole, killing and digesting the engulfed bacteria.
- And or
- Release of bactericidal such as superoxide, hydrogen peroxide to kill the bacteria



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Some Youtube Videos

http://www.youtube.com/watch?v=Tdx-U8S6ZMk
White Blood Cells Types and Functions

http://www.youtube.com/watch?v=nvNOa9KewIQ
WBC Types and Basic Function

http://www.youtube.com/watch?v=tDTLC2swhIQ
How White Blood Cells Are Formed

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Check your understanding!

1. All the following cells are granulocytes <u>EXCEPT</u>:
a) Neutrophil
b) Platelets
c) Basophil
d) Eosinophil

2. Function of Neutrophils is:
A) Defense Against infection
B) Filtiration of lymph
C) Produce antibodies
d) Genesis of red blood cells

3. It is "The attraction of the neutrophils to inflamed area following chemotactic substances release from infected sit":
a) Margination
b)Phagocytosis
c) Chemotaxis
d) Diapedesis

Answers:
1) B
2) A
3) C

Done by :

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