


Practical 3

Phagocytosis

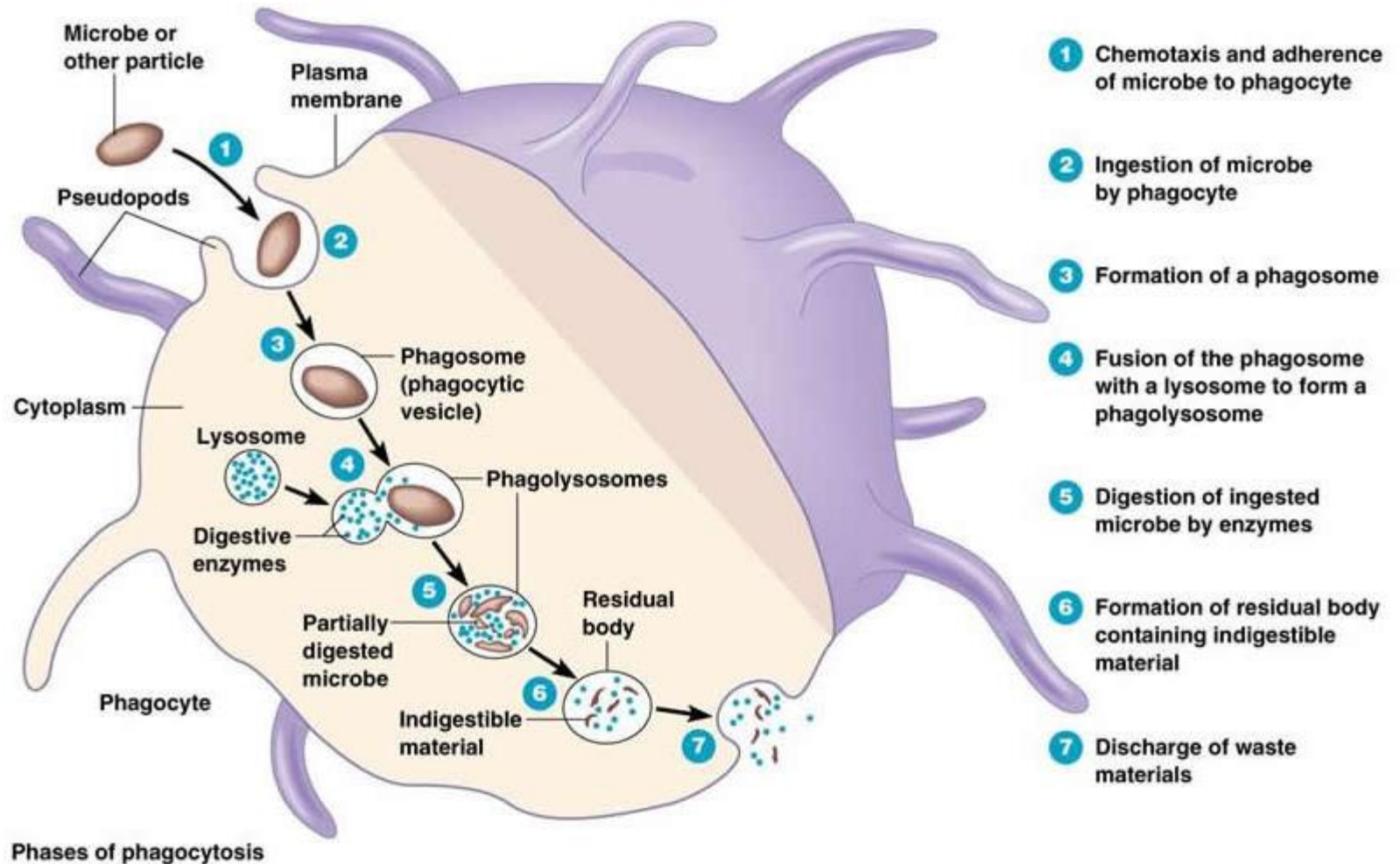
FI, FA

- Peripheral Blood Leukocytes (nrml. 4.5-11,000cells/ul)
 - Lymphocytes (~ 30%)
 - Granulocytes (~ 70%)
- Granulocytes:
 - **Neutrophils** (~ 60% of total leukocytes in blood)
 - Eosinophils (~ 3%)
 - Basophils (<1%, rare)
 - **Monocytes** (~ 6%)
 - **Monocytes**  **Macrophages** (tissues)
- Kupffer cells (lining liver sinusoids)

Professional Phagocytes	
Main location	Variety of phenotypes
Blood	neutrophils, monocytes
Bone marrow	macrophages, monocytes, sinusoidal cells, lining cells
Gut and intestinal Peyer's patches	macrophages
Skin	resident Langerhans cells, other dendritic cells, conventional macrophages, mast cells

Non-professional Phagocytes	
Main location	Variety of phenotypes
Blood, lymph and lymph nodes	Lymphocytes
Skin	epithelial cells
Connective tissue	Fibroblasts
Blood	Erythrocytes

Phagocytosis and Bacterial Pathogens

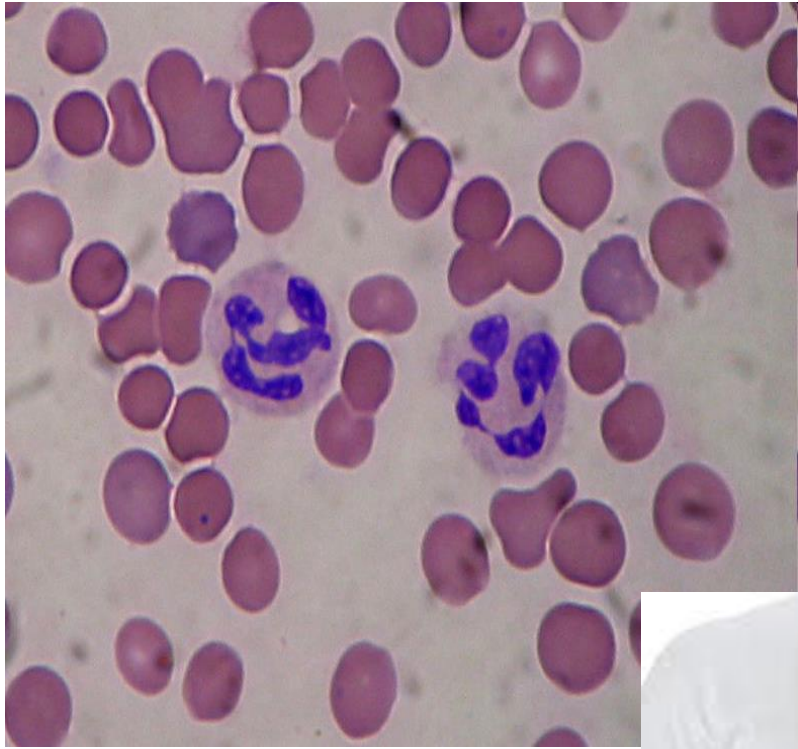


Summary

1. Phagocytosis is a component of innate and acquired immunity. It is the principal means of destroying pathogenic bacteria and fungi. Phagocytosis initiates the process of antigen presentation.
2. Many phagocytic receptors recognize a diverse array of microbial pathogens. Some pathogens (e.g., *S. pneumoniae*) require opsonization for their clearance.
3. Bugs fight back.
4. Phagocytosis is an essential component of development and tissue remodeling. Ingestion of apoptotic bodies is immunologically “silent” and is normally accompanied by a suppression of inflammation.
5. Failure of this mechanism may result in autoimmunity.

Inhibit adherence: M protein, capsules	<i>Streptococcus pyogenes</i> , <i>S. pneumoniae</i>
Kill phagocytes: Leukocidins	<i>Staphylococcus aureus</i>
Lyse phagocytes: Membrane attack complex	<i>Listeria monocytogenes</i>
Escape phagosome	<i>Shigella</i> , <i>Rickettsia</i>
Prevent phagosome-lysosome fusion	HIV, <i>Mycobacterium tuberculosis</i>
Survive in phagolysosome	<i>Coxiella burnettii</i>

- The phagocytosis test allows the quantitative determination of leukocyte phagocytosis (ingestion of bacteria or yeasts). In the phagocytosis test whole blood is incubated with *E. coli* or *Candida sp.* The blood smear is done and stained by May Grunwald method.
- **It measures:**
- - the percentage of neutrophils that have ingested bacteria – **PHAGOCYtic ACTIVITY**
- - number of ingested bacteria per one phagocytic cell- it reflects functional properties of phagocytes - **PHAGOCYtic INDEX**
- phagocytosing PMN's and non-phagocytosing PMN's until 100.
- Number of phagocytosing PMNL in % is determining the phagocytosis or **phagocytic activity**.
- In phagocytosing PMNL we register the number of foreign bodies – yeast that are localised intracellularly.
- **The phagocytosis index** is calculated by dividing the no of phagocytosed foreign bodies by no of phagocytosing PMNL. This is the value of functional properties of phagocytes.



Phagocytosis – FA- activity, FI - index

FA % = nº of phagocytosing PMN's

- phagocytosing PMN's and non-phagocytosing PMN's until 100.
- Number of phagocytosing PMNL in % is determining the phagocytosis or phagocytic activity.

$$\text{FA} = 77,1 \pm 8,8 \%$$

The fagocytosis index is calculated by dividin the Nº of phagocytosed foreign bodies by Nº of phagocytosing PMNL. This is the value of functional properties of phagocytes.

$$\text{FI} = \frac{\text{nº of fagocytosed yeasts}}{\text{nº of phagocytosing PMN's}}$$

$$\text{FI} = 3,6 \pm 0,8$$