# WEEK NO. 1

# MICROBIOLOGY & IMMUNOLOGY

## DOCTOR 2019 | MEDICINE | JU


DONE BY : Rawan Fratekh

SCIENTIFIC CORRECTION :

GRAMMATICAL CORRECTION :

DOCTOR : Anas abu-Humaidan

Immunity → Resistance to disease specifically infectious ones.

Vaccination → stimulating the immune responses agains microbes [the most effective way to protect people from infections).

Immune system functions ?

1) Defense against infections 2) Prevent the growth of tumers. 3) Clearance of dead cells & initiating tissue repair [remember patho → irreversible injury]

The immune system → Collection of cells, tissues & molecules that mediate the resistance aginst the disease.

The immune system may "over-react" → Defense against ANY foreign body, doesn't have to be infectous.

Excessive defense aginst bacteria → harmful to the body

Resistance aginst organ transplantation.

| Role of the immune system | Implications |
|---|---|
| Defense against infections | Deficient immunity results in increased susceptibility to infections; exemplified by AIDS<br>Vaccination boosts immune defenses and protects against infections |
| Defense against tumors | Potential for immunotherapy of cancer |
| The immune system can injure cells and induce pathologic inflammation | Immune responses are the cause of allergic, autoimmune, and other inflammatory diseases |
| The immune system recognizes and responds to tissue grafts and newly introduced proteins | Immune responses are barriers to transplantation and gene therapy |

## History.

① Robert koch → ① Main founder of **bacteriology** ② Identified the **causatives** of tuberculosis, cholera & anthrax.

② Pasteur → Discovered the pricple of **vaccination**, **pasteurisation** & **microbial fermentation**

Disproved the dictorine of **spontaneous generation**.

③ Paul Ehrilch → specific antigen ✗ specific antibody, key & lock principle

*The most important scientists in immunology Paul Ehrlich & Élie Methchnikoff. ✱

↓

introducing the idea

of cells involved in defense

Immunity < innate
adaptive < Humoral → extracellular microbes
cell-mediated → intracellular microbes

What are the steps of how the immune system attacks a foriegn body?

1) Recognise → The foriegner

2) Restore → Homeostasis

3) Remember → The foriegner

Antigen – Antibody → stimulate the immune system to generate

↓

Epitope = the recognised part.

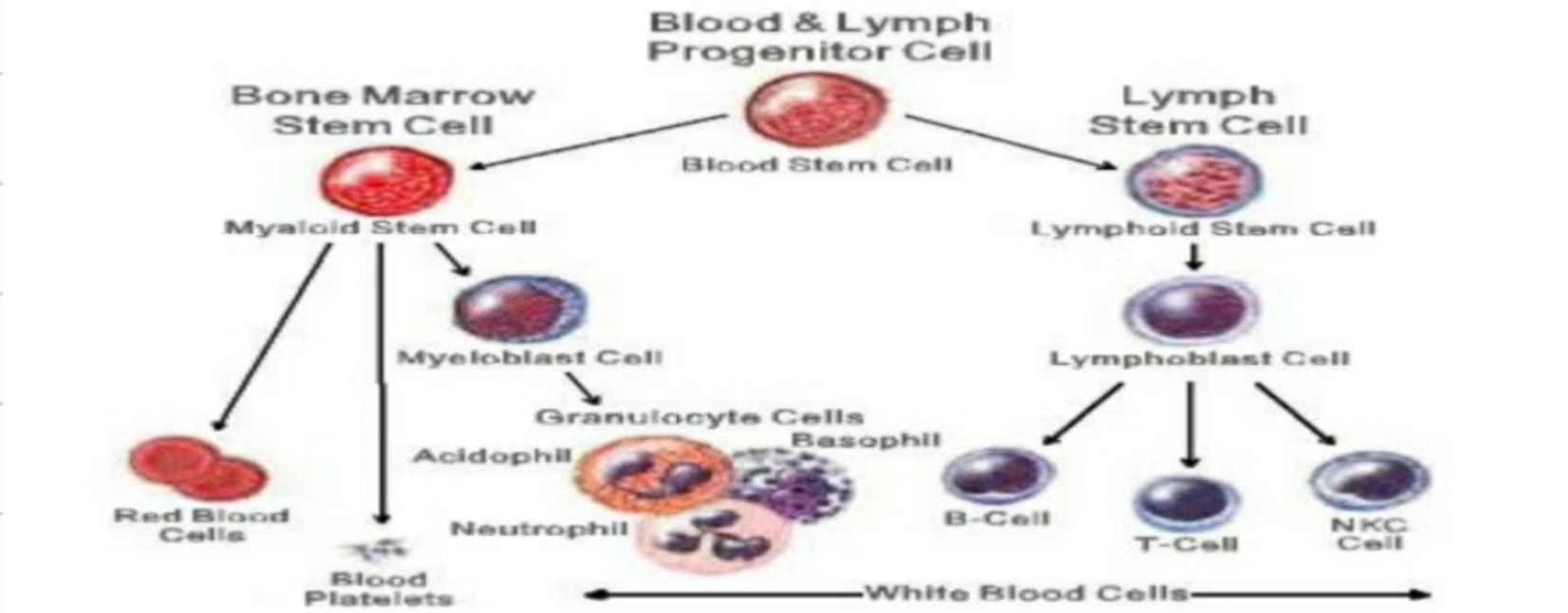
| | Innate immunity | Adaptive Immunity |
|---|---|---|
| **Components** | 1. Physical and chemical barriers<br>2. Phagocytic leukocytes<br>3. Dendritic cells<br>4. Natural Killer cells<br>5. Plasma proteins (complement) | 1. Humoral immunity (B cells, which mature into antibody secreting plasma cells)<br>2. Cell-mediated immunity (T cells, which mature into effector helper and cytotoxic T cells) |
| **Activity** | Always present | Normally silent |
| **Response and potency** | Immediate response, but has a limited and lower potency | Slower response (over 1-2 weeks, but is much more potent |
| **Specificity** | General: can recognize general classes of pathogens (i.e. bacteria, viruses, fungi, parasites) but cannot make fine distinctions | Recognizes highly specific antigens |
| **Course** | Attempts to immediately destroy the pathogen, and if it can't, it contains the infection until the more powerful adaptive immune system acts. | Slower to respond; effector cells are generally produced in 1 week and the entire response occurs over 1-2 weeks. However, this course can vary somewhat during different responses in an individual. |

Innate immunity < Prevent / eliminate

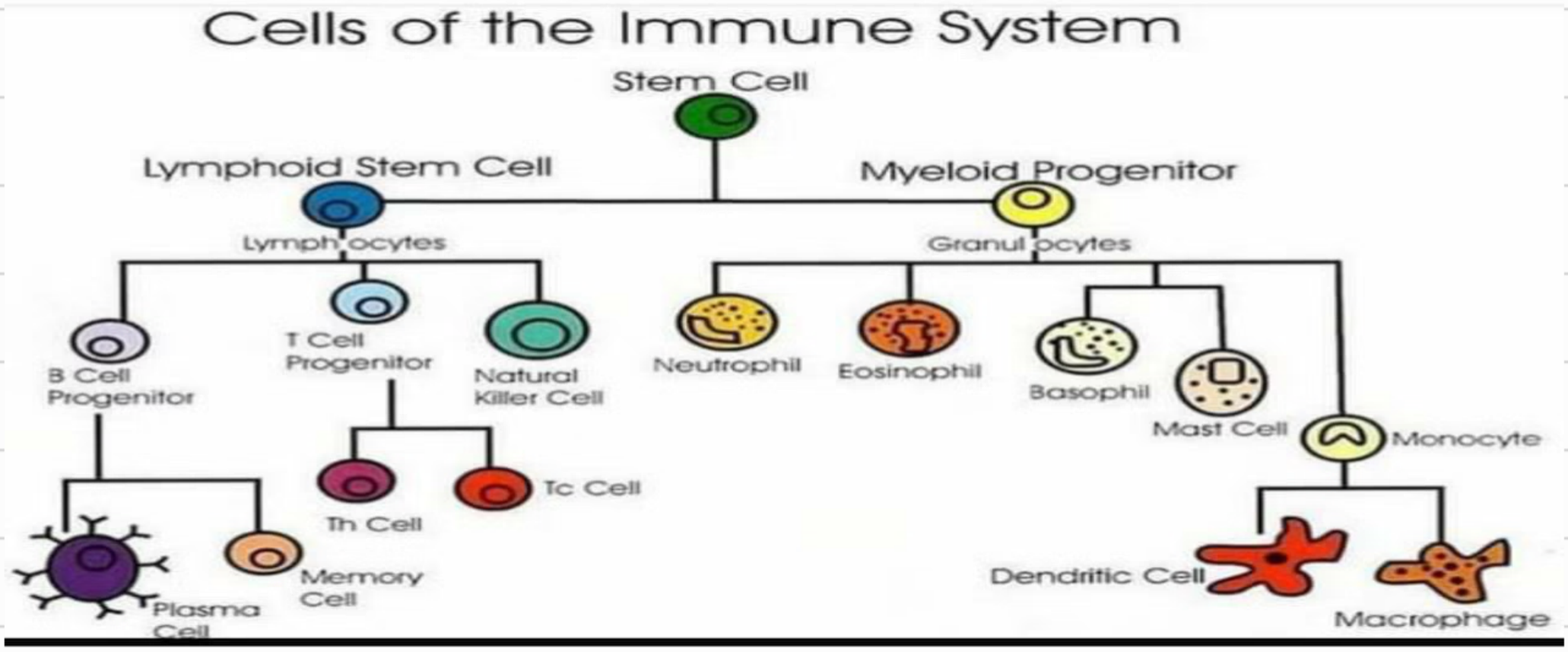
Adaptive immunity →

Antibodies block, T-cells eradicate

Immune cells originate from → The bone marrow then < lymphoid / Myeloid




# Immune cells




① lymphoid cells < NK / T, B lymph cells

② Myeloid stem cells.

- Cells don't have a relation with the IS < Erythroblasts [RBCs eventually] / Megakaryoblasts [platelets eventually]

- Cells that have a relation with the IS < Putative mast cells precursor [we're not sure yet] / Myeloblasts [3 cells granulocytes < neutrophiles, Basophiles, eosinophiles] / Monoblasts [macrophages & dentritic cells]

① White blood cells ← T, B cells
← Natural killers
← Granulocytes → Neutro, baso, eosino. mast cells.

Phagocytosis → Eat → Break (w/ lysosome) ← Discharge
← Present

↓ Neutrophiles & macrophages

Eat → foriegner

Break → lysosome

Present → antigen for lymphocytes → stronger response.

- Neutrophiles → Most abundant, segmented nucleus, 6 hours life span, their production stimulated by Granulocyt colony-stimulating factor.

Granules → specific : lysozymes : Break NAM, NAG
collagenase : Break peptid bond
elastase : Break elastic fibers
} → Penetration of the ECM.

→ Azurophilic : lysosoms

NET → Neutrophiles "throw" their DNA out the cell & trap foriegners.
↓
with histones, ROS, myeloperoxidase [harmfull for ]

Macrophages → Original from monocytes, circulate in the blood, tissue specific due to microenvironmental changes in the monocytes.

Liver / sinusoids → kupffer cells  Kidney → mesangical cells  Brain → Microglial cells

connective tissue → Hisocytes.  Bones → osteoclasts.

Macrophage become activated in the site of infection

Functions → Ingesting microbes & dead host cells

• Activated → Serete proteins (cytokines)

APC → Antigen presenting cell ← serve as APCs to activate T-cells

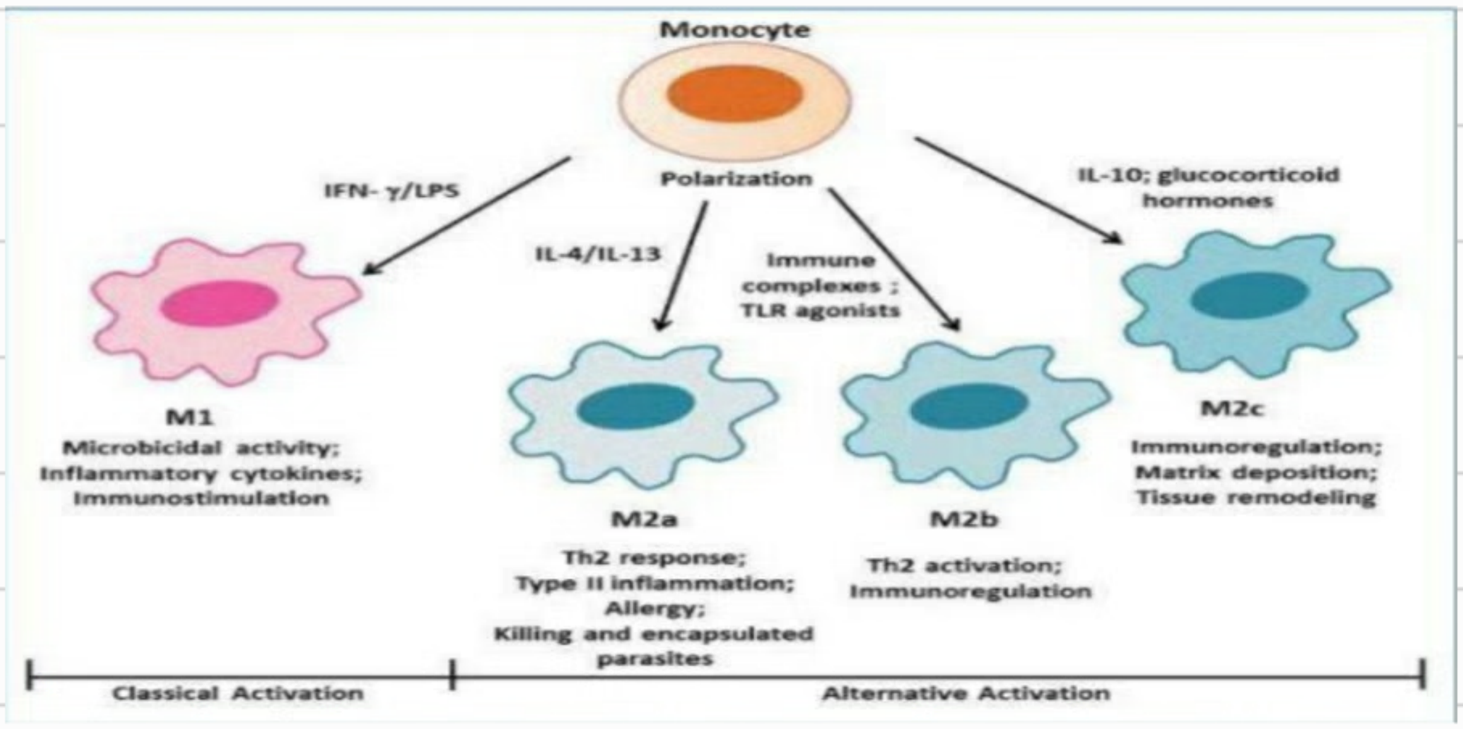
promote repair of damaged tissues

Monocytes response vary.

1) IFYG or LPS → M1 → secret cytokines → Immunostimulation

2) Already infected site → $M_2$ → immunoregulation.

3) After injury → become an immune regulatory macrophage




most important

Mast cells, basophiles, eosinophiles → Immune response agains helminth and cause allergic diseases.

Mast cells → From the bone marrow

Present in the skin & mucosal epithelium

Rich with cytoplasmic granules filled with cytokines, histamine & others

- found in tissues [sites of allergy] not the circulation.
- Receptors for IgE / IgG. [antigen bind to the receptors → Mast cell release histamine → allergy]

Basophiles → IgG & IgE receptors, less than 1% of blood leukocytes

Eosinophiles → Express cytoplasmic granules that contain enzyme harmful for the cell walls of parasites & for the host cell