Cihan University/ Sulaymaniyah

College of Health Science

Medical Laboratory Analysis

4th Stage- 1st Semester

Clinical Immunology

Lecture- 1: An Overview of the Immune System

2024- 2025

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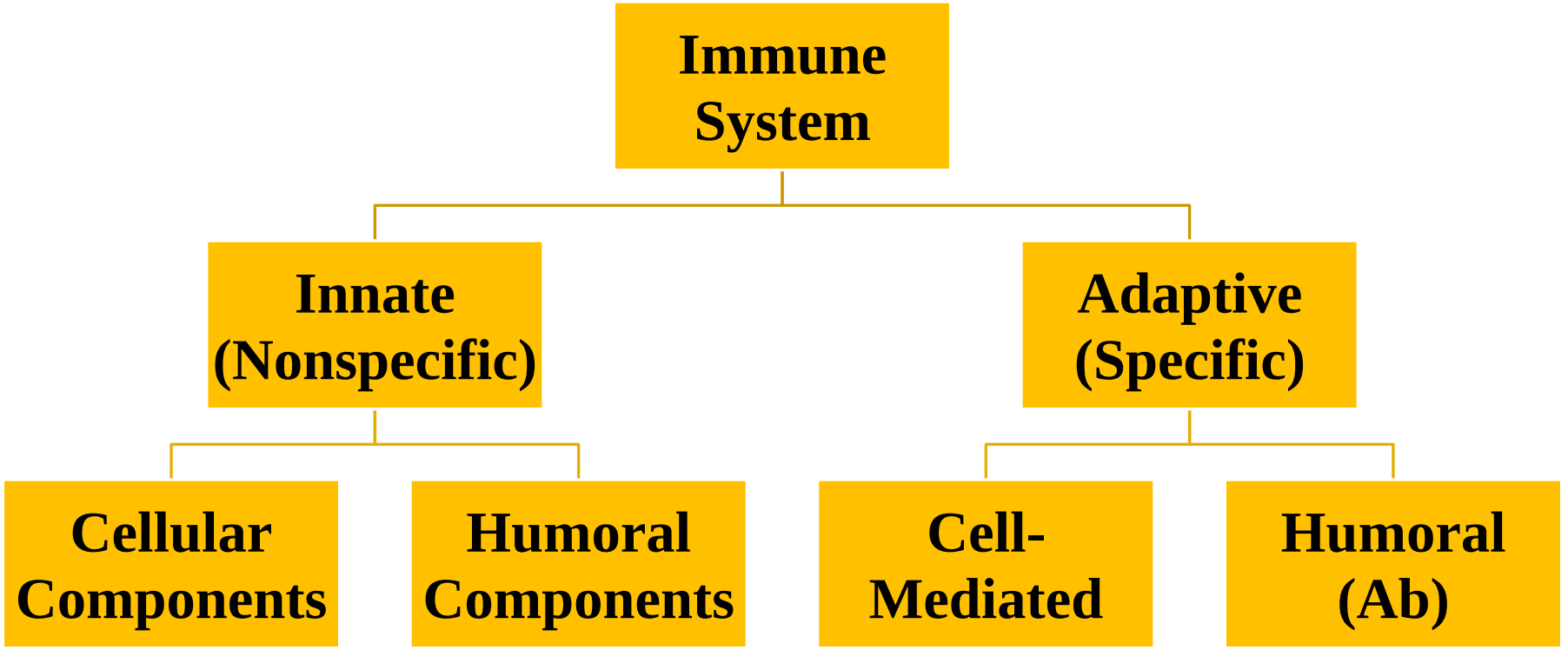
Some Terminology

- **Immune system:** cells, tissues, and molecules that mediate resistance to infections.
- **Immunology**: study of structure and function of the immune system.
- **Immunity:** resistance of a host to pathogens and their toxic effects.
- **Immune response:** collective and coordinated response to the introduction of foreign substances in an individual mediated by the cells and molecules of the immune system.

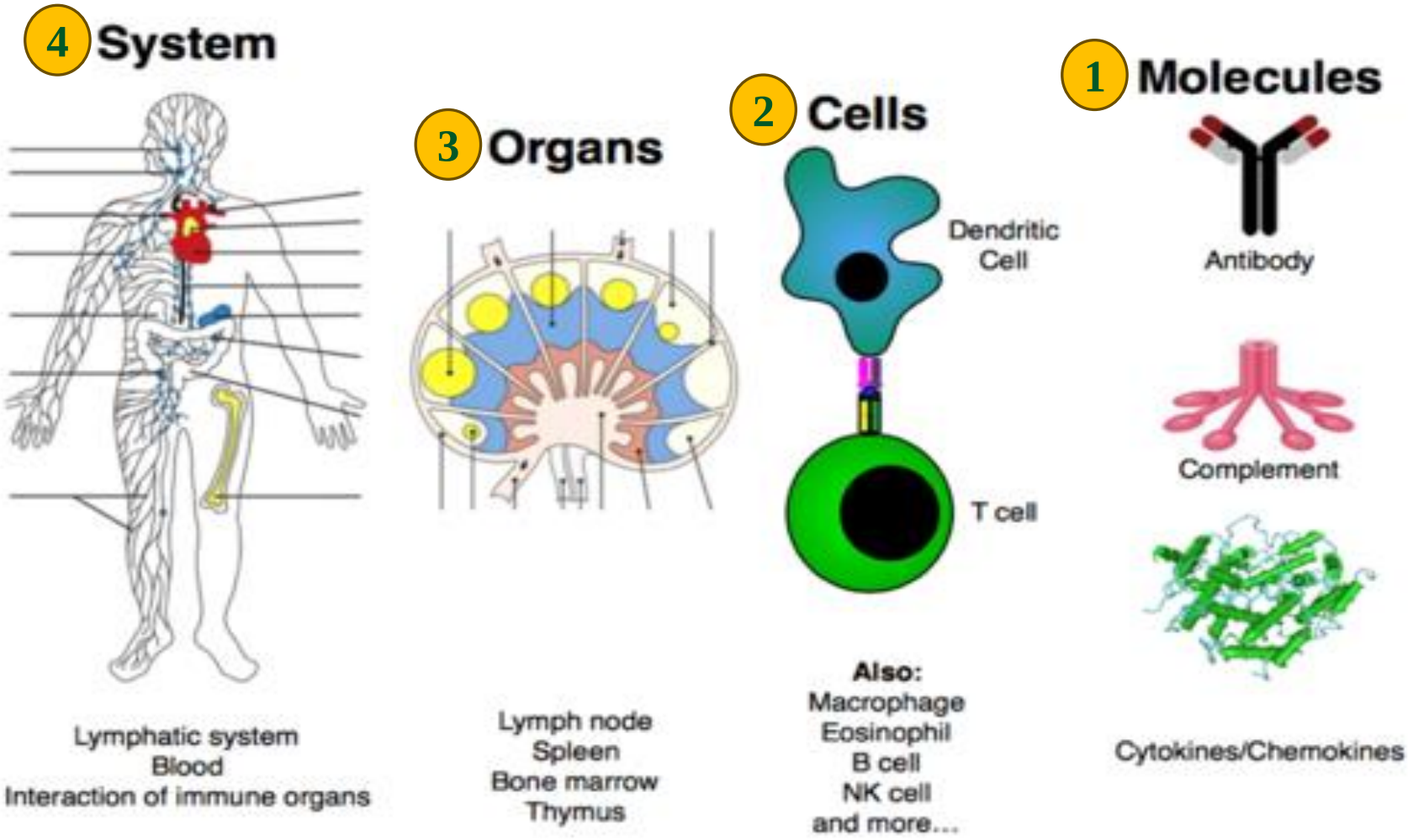
The Immune System



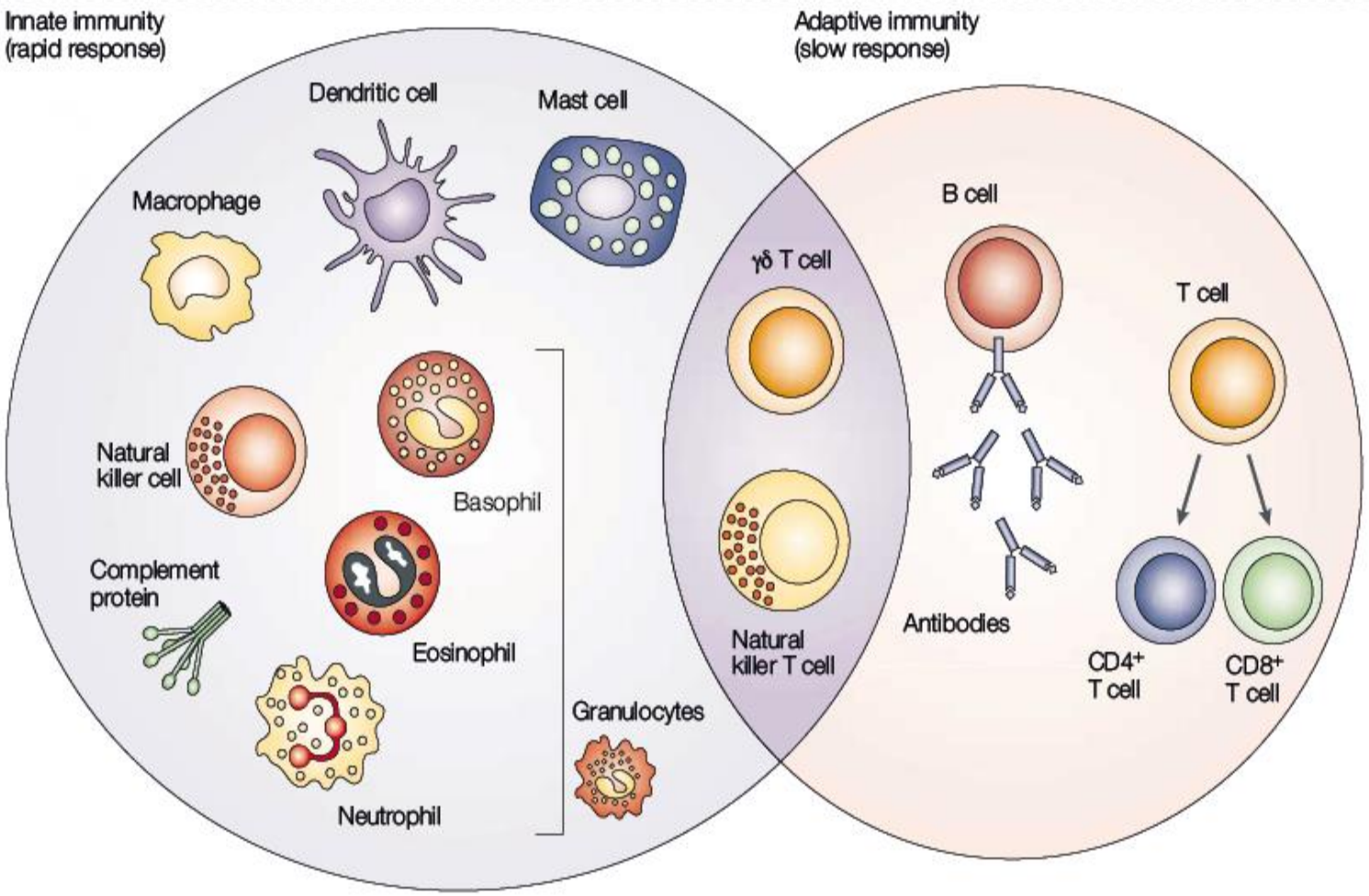
Functions of the immune system

1. Defense against the growth of tumor cells kills the growth of tumor cells.
2. Protect humans from pathogenic microorganisms.
3. Control of tissue regeneration and scarring.
4. The immune system can injure cells and induce pathologic inflammation.
5. The immune system recognizes and responds to tissue grafts and newly introduced proteins.

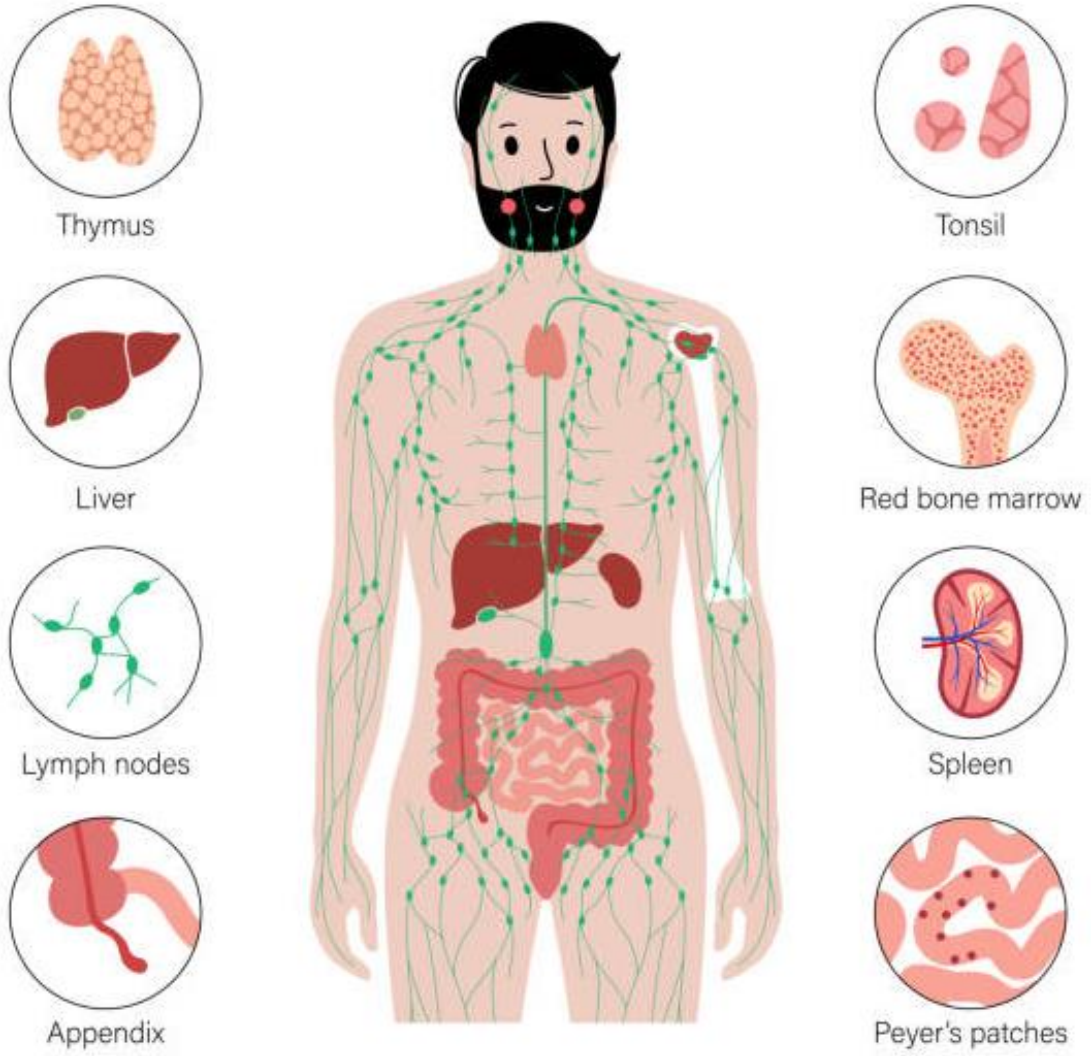
Components of the Immune System



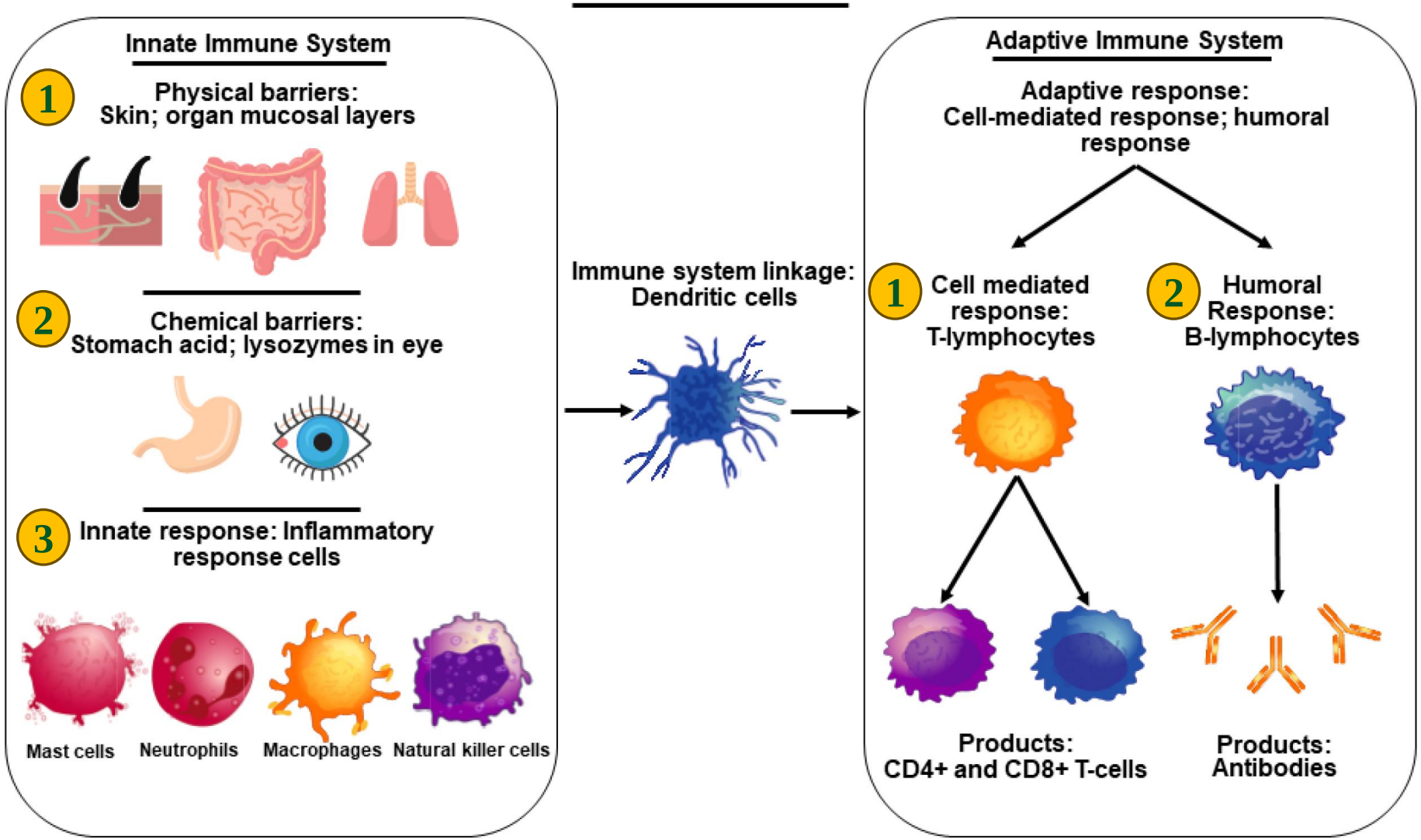
Cells of the immune system



Organs of the Immune System



Types of the Immune System

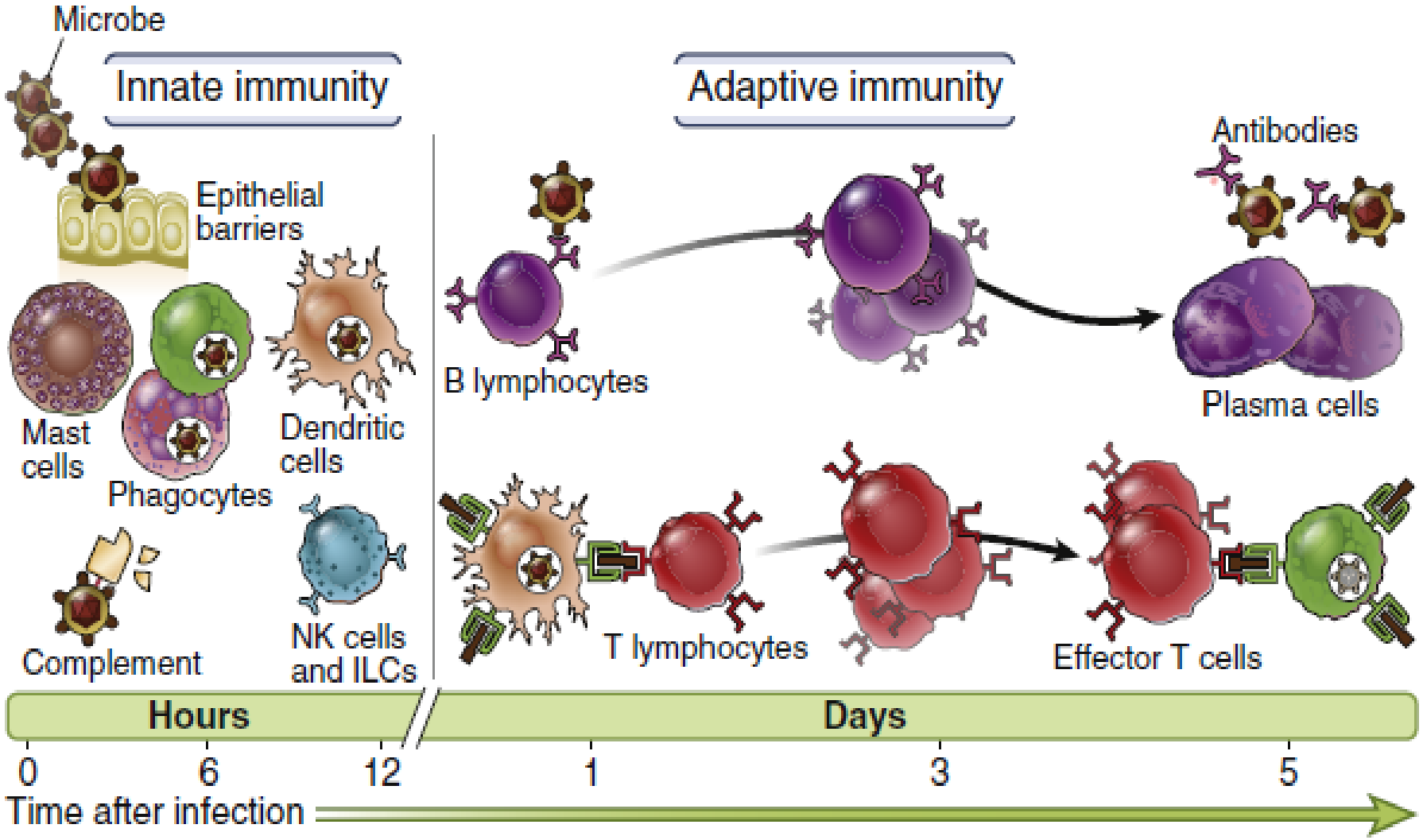


Innate Immunity (Non- Specific Immunity)

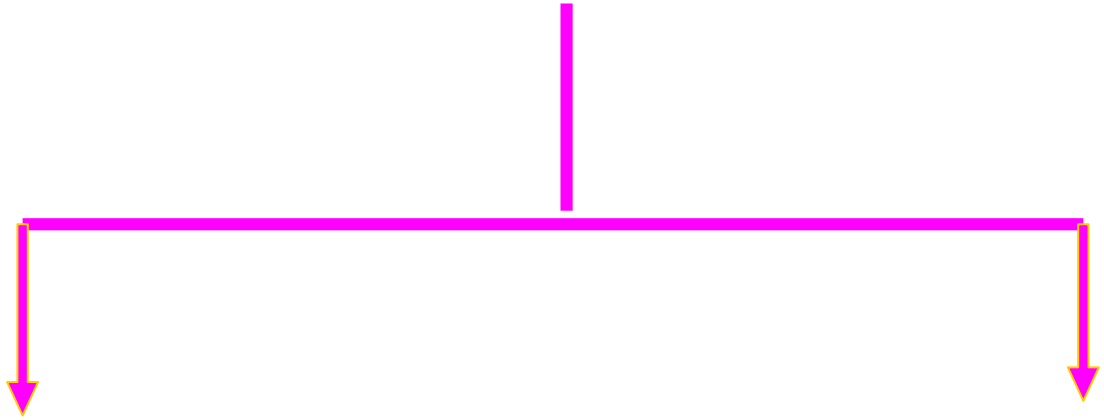
General characteristics:

- Most primitive type of immune system found in virtually all multicellular animals.
- High discrimination of host and pathogen.
- First line of defense against infection.
- No need for prolonged induction.
- Act quickly:
  - Immediate direct response (0-4 hrs.).
  - Rapid induced (4-96 hrs.).
- Antigen-independent.

Time of the Immune response



Components of Innate Immunity



First line of defense

A. Physical barriers

B. Chemical & biochemical barriers

C. Biological barriers (Normal flora)

Second line of defense

A- Cells

1. Natural killer
2. Phagocytes
3. inflammatory cells

B- Soluble factors

C- Inflammatory barriers

Factors influencing the level of Innate Immunity

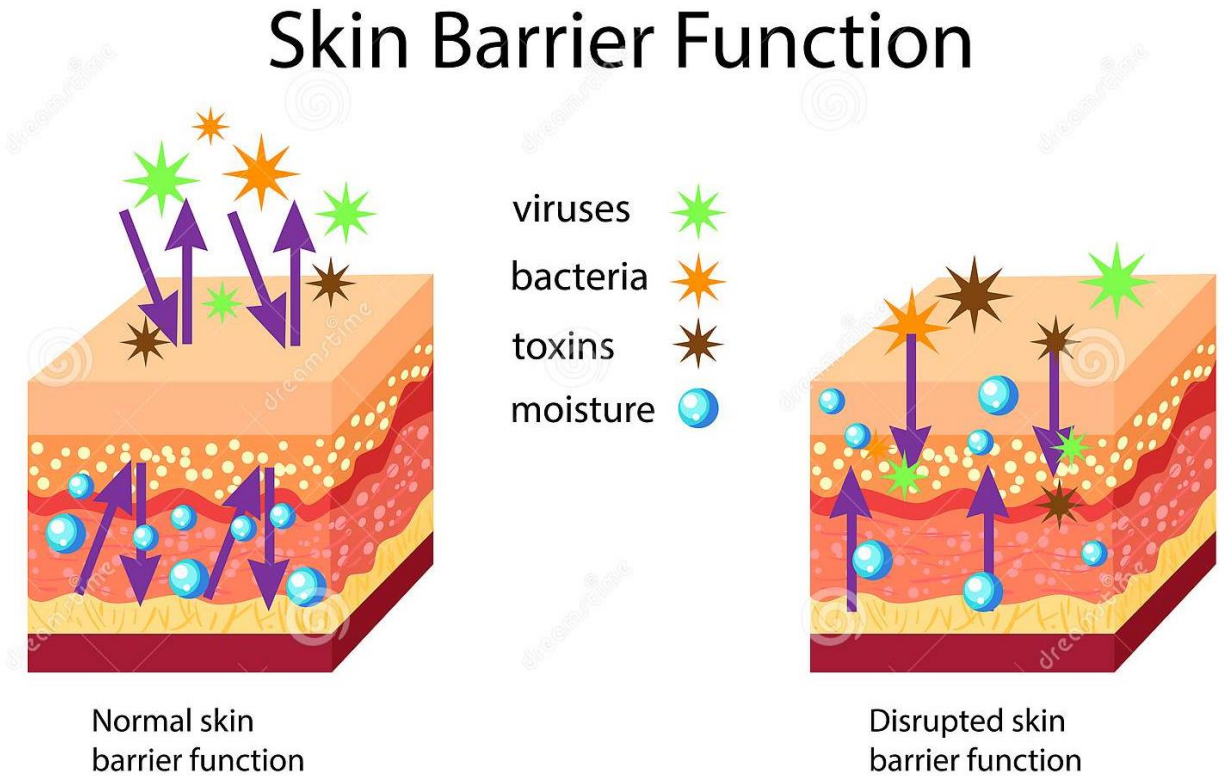
1. **Age:**
   - Very old or very young more susceptible to infectious disease.
   - Hepatitis B virus infection is asymptomatic in newborn as it lacks developed immune mechanism to express the disease.
2. **Hormones:**
   - Endocrine disorders such as **Diabetes Mellitus, hypothyroidism and adrenal dysfunctions** – enhanced susceptibility to infection
   - **Increased corticosteroid** – decreased anti-inflammatory effect.
3. **Nutrition:**
   - Immune response is reduced in malnutrition patient.

A. Anatomical / Physical/ Mechanical Barriers

System or Organ	Cell type	Mechanism
Skin	Squamous epithelium	Physical barrier (intact skin) Desquamation
Mucous Membranes	Non-ciliated epithelium (*e.g.* GI tract)	Peristalsis
	Ciliated epithelium, hairs (*e.g.* respiratory tract)	Mucociliary elevator, Coughing, sneezing
	Epithelium (*e.g.* nasopharynx)	Flushing action of tears, saliva, mucus, urine; blinking of eye lids

Intact Skin

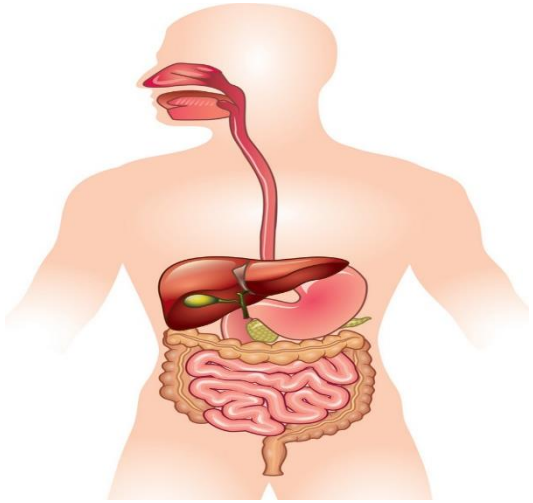
- The intact skin contributes critically to health via its role as a barrier tissue, carefully regulating passage of key substances while also providing defense against exogenous threats.



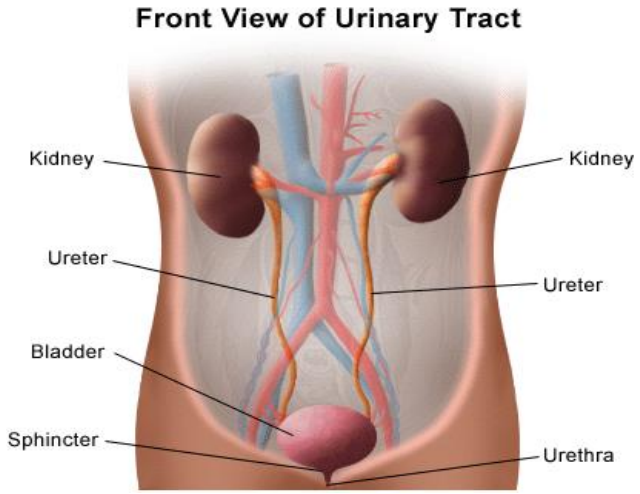
Mucus membrane

Characteristics:

- Membrane that lined the tracts and cavities on the bodies including respiratory, digestive, urinary, reproductive.
- Epithelial cells that secret mucus, which covers the surface of the mucus membranes.
- Cilia- on mucous membranes- to propel microorganisms out of the body.



Digestive system



Urinary system

Respiratory system

B. Chemical Barriers

(At surfaces and in body cavities)

System or Organ	Component	Mechanism
Skin	Sweat	Anti-microbial fatty acids, high salt conc.
Mucous Membranes	HCl (parietal cells) Tears and saliva	Low pH Lysozyme and phospholipase A
	Defensins (respiratory & GI tract)	Antimicrobial
	Sufactants (lung)	Opsonin

C. Biological Barriers

System or Organ	Component	Mechanism
Skin and mucous membranes	Normal microflora	1. Antimicrobial substances
		2. Competition for nutrients and colonization

References

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3. **Abbas, A. K., Lichtman, A. H., Pillai, S., & Baker, D. L. (. i. (2020).** Basic immunology: Functions and disorders of the immune system (Sixth edition.).
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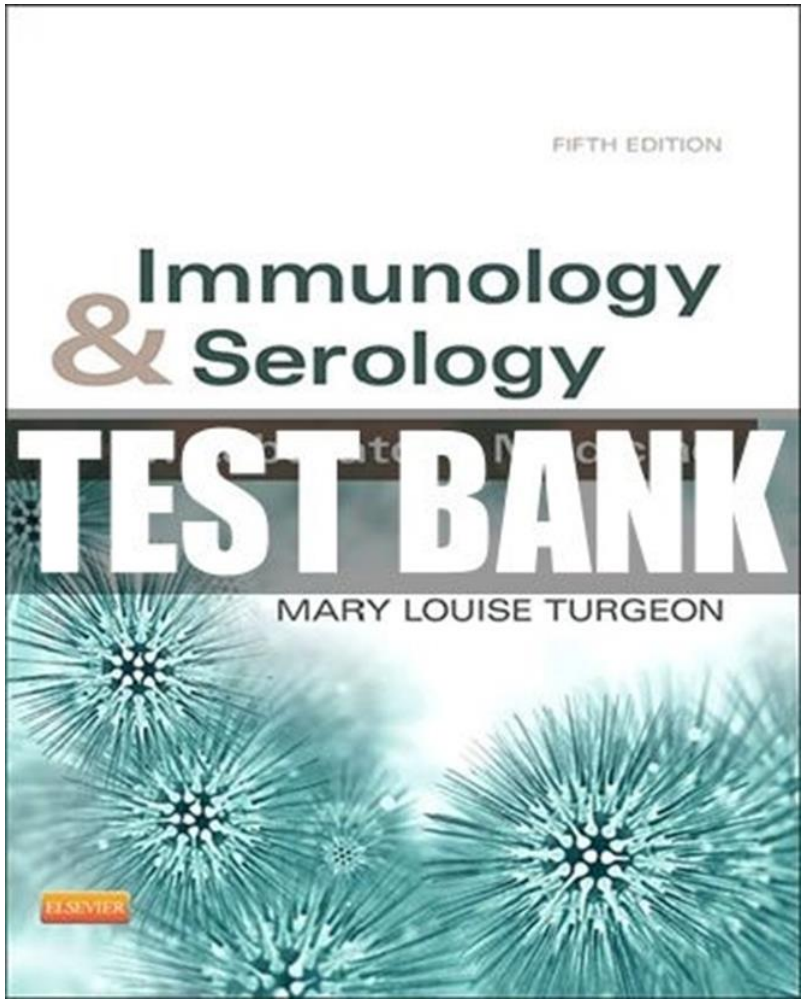
5. British society for Immunology_ What is immunology? https://www.immunology.org/public-information/what-is-immunology#:~:text=Immunology%20is%20the%20study%20of,as%20autoimmunity%2C%20allergy%20and%20cancer



Here is the required reading for this lecture