College of Technology & Health Sciences
Department of Medical Laboratory Technique
Third stage
Lecture . 1

Immunology

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*Immunology

- Immunology: definition
- Classification of different types of immunity
- Innate and Acquired immunity
- Defense mechanisms
- Factors of innate and acquired immunity

*Immunity

***Definition (In General)**

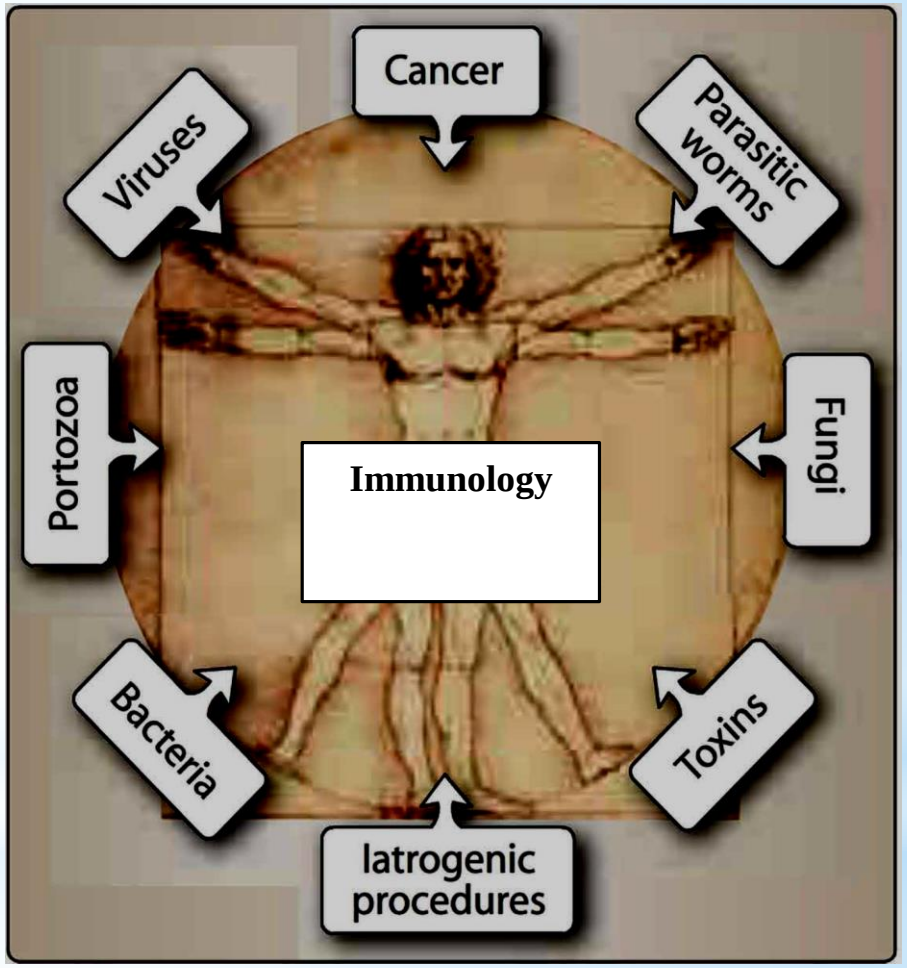
*Refers to all mechanisms used by the body as protection against environmental agents that are foreign to the body (recognition and disposal). These agents may be microorganisms or their products, foods, chemicals, drugs, pollen, or animal hair and dander. Such immunity may be innate (natural) or acquired (adaptive).

-Also the capacity of immune system to recognize and tolerate the self cells and reject foreign non-self cells.

* Immunology has its origins in the study of how the body protects itself against infectious diseases caused by microorganisms, such as bacteria, viruses, protozoa, and fungi, and also parasitic organisms, such as helminth worms.

The study of immune system or immunity the study of all aspects of host defense against infection and of adverse consequences of immune responses.

The study of the physiological mechanisms which enable the body to recognize materials as foreign and to neutralize, metabolize or eliminate them without injury to the host tissue.



*Classification of different types of immunity

- **Immune system**

Organs, tissues, cells & molecules involved in the defense mechanism

- **Immunity**

From the Latin word Immunis, meaning **“free from burden”**, which is the ability of an organism to protect itself from disease

- **Innate immunity**

Natural defenses against any pathogen

- **Adaptive immunity**

Acquired defenses against a specific pathogen

Types of Immunity

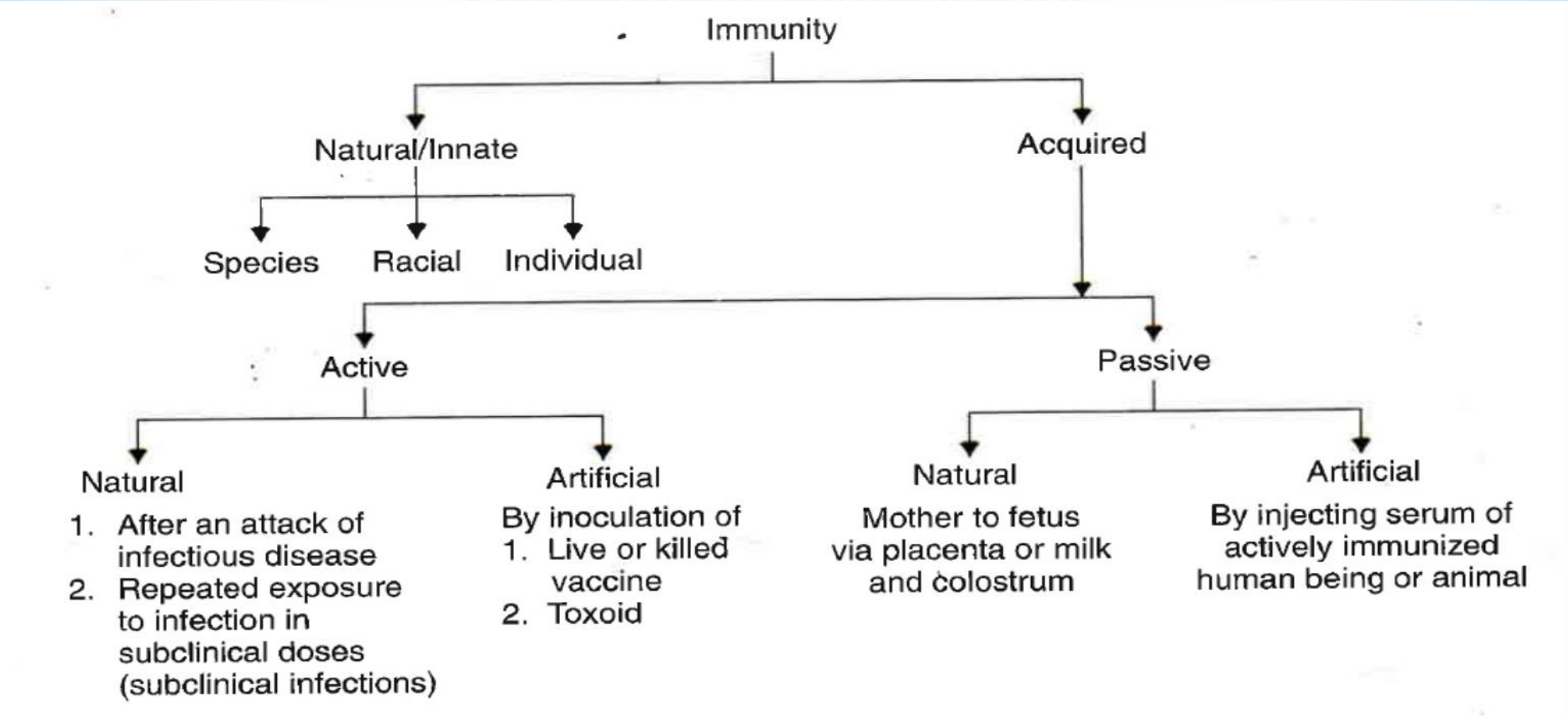
1. **Innate immunity** or **“nonspecific”**

   - Defenses against **any pathogen**.
   - Refers to defenses that are **present at birth**.
   - **Rapid** response.

2. **Adaptive immunity** or **“specific ”**

   - Defenses to **a specific pathogen**.
   - **Acquired** during the lifetime of an organism.
   - **Slower** to respond.
   - **Has memory** component.

*Immune response



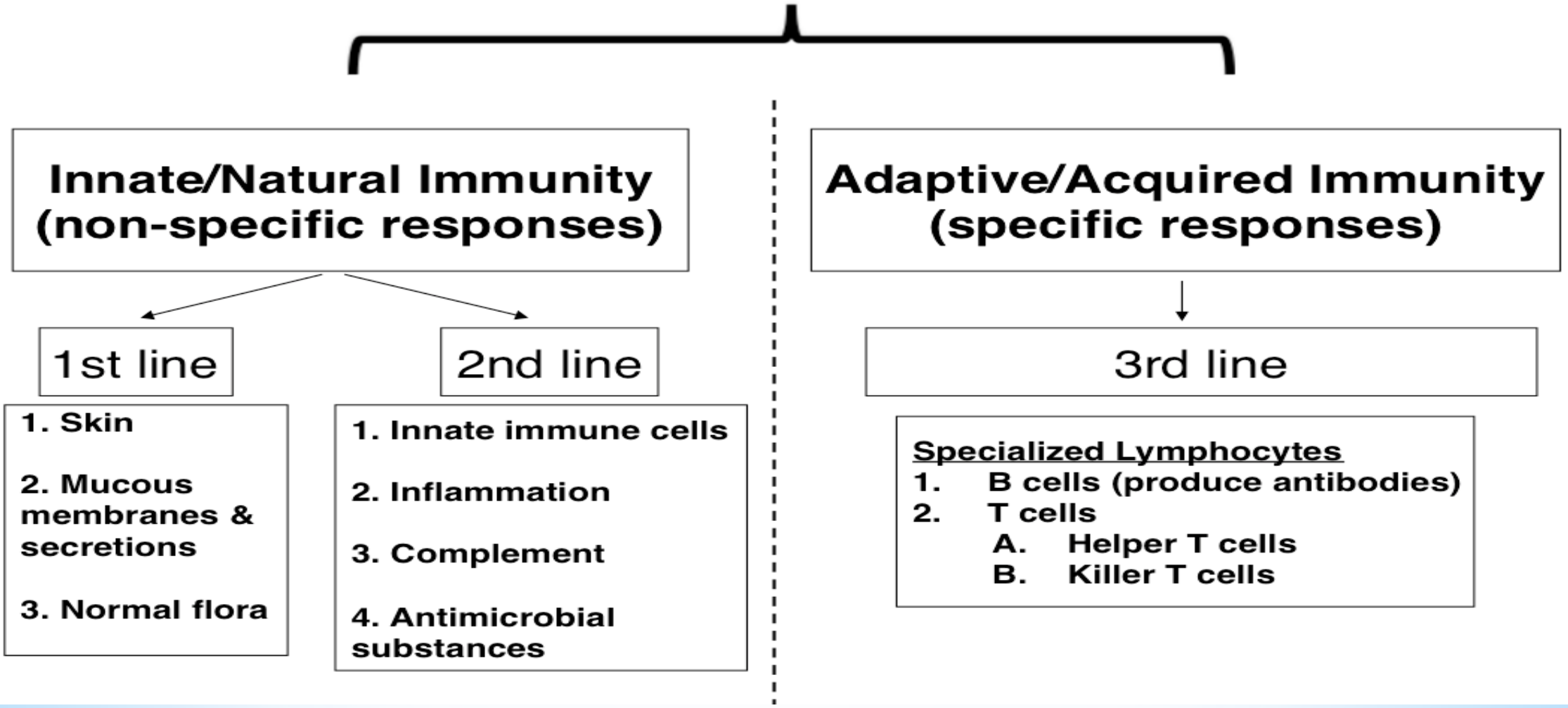
*Immune response

*The immune response is how your body recognizes and defends itself against bacteria, viruses, and substances that appear foreign and harmful.

*To defend the body against these invaders, the immune system must be able to distinguish between:

- What belongs in the body *(self)*
- What does not *(nonself or foreign)*

Immune system



Innate (Nonspecific) immunity

First line of defense

A) Physical/Mechanical	B) Chemical	C) Biological
• Skin • Mucous membranes • Lacrimal apparatus • Saliva • Earwax • Hair • Epiglottis • Coughing & sneezing • Vomiting & diarrhea • Urination • Vaginal secretions	• Sebum • Lysozyme • Perspiration salts • Gastric Juice • Vaginal Fluid • Transferrins • Mother's milk	• Microbiota

Innate (Nonspecific) immunity

Second line of defense

A) Defensive cells	B) Inflammation	C) Fever	D) Antimicrobial substances
• Defensive myeloid cells • Defensive lymphoid cells	• Acute/Chronic response • Released chemicals	• Temperature • Metabolism	• Complement system • Interferons • Iron-binding proteins • Antimicrobial peptides

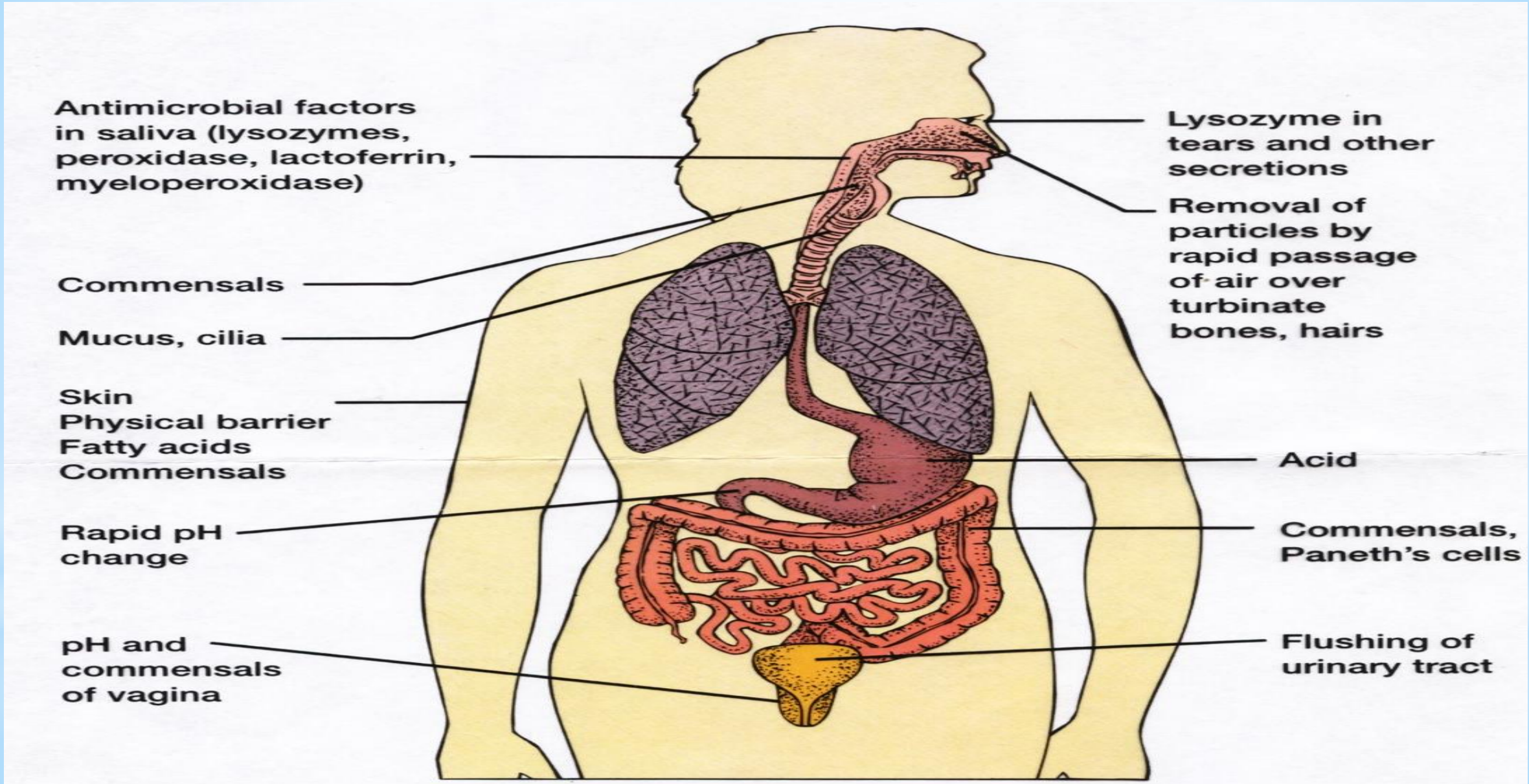

Antimicrobial factors in saliva (lysozymes, peroxidase, lactoferrin, myeloperoxidase)
Commensals
Mucus, cilia
Skin
Physical barrier
Fatty acids
Commensals
Rapid pH change
pH and commensals of vagina
Lysozyme in tears and other secretions
Removal of particles by rapid passage of air over turbinate bones, hairs
Acid
Commensals, Paneth's cells
Flushing of urinary tract

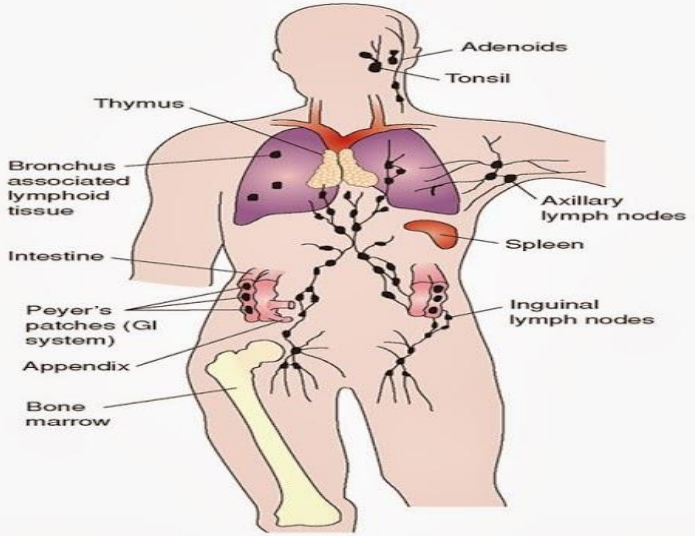
Table 1. Innate and Adaptive Immunity[3]

Innate	Adaptive
Nonspecific	Specific
Present at all times	Develops in response to infection
Immediate but general protection	Protection against specific pathogens
Activates adaptive immune response	Leverages components of the innate response
Does not improve with repeated exposure to a pathogen	Memory develops, which may provide lifelong immunity to reinfection with the same pathogen

THE ORGANS OF THE IMMUNE SYSTEM

The immune system consists of a complex network of interdependent organs, cells and molecules.

They work together to defend the body from pathogens, toxins and cancer cells.



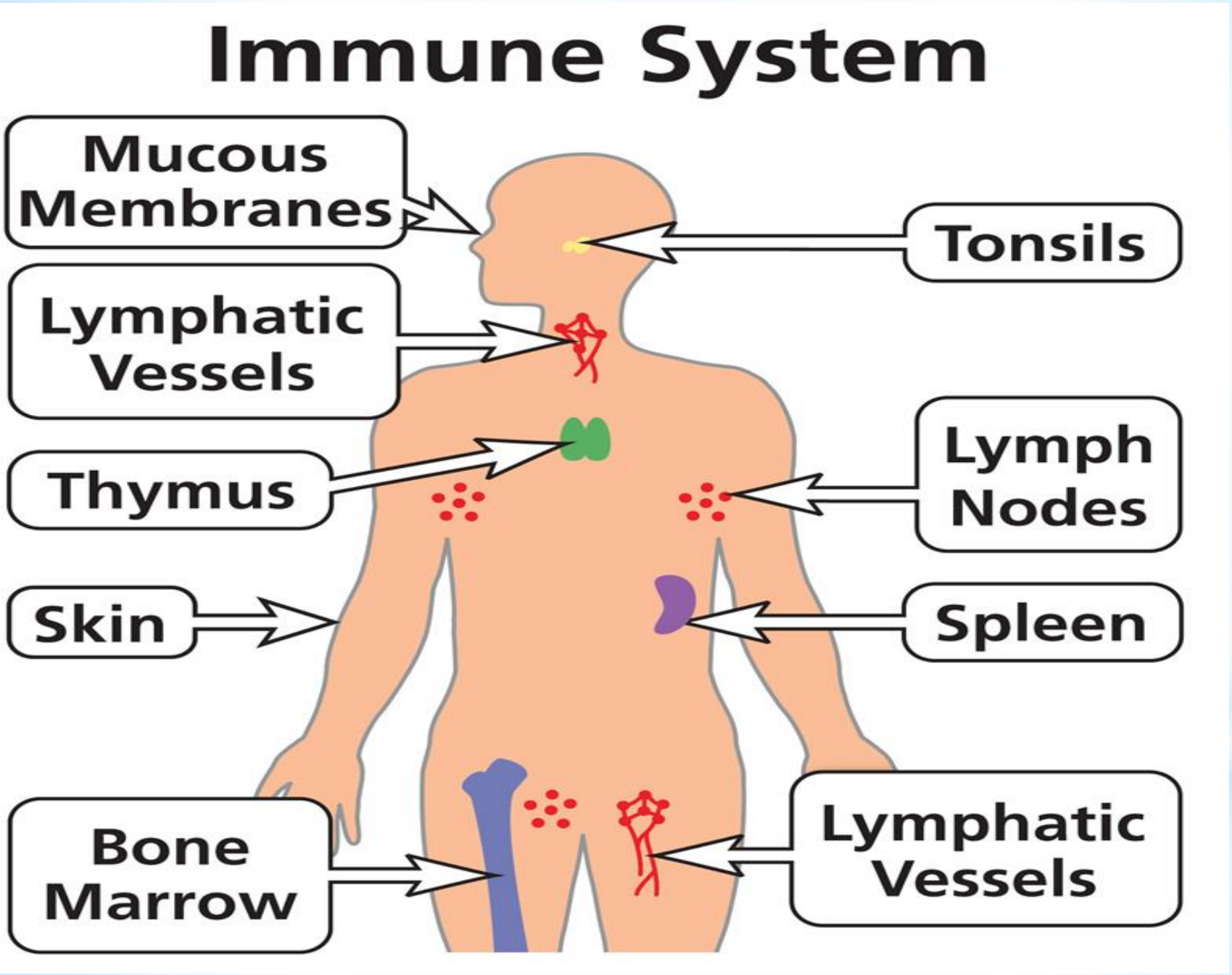
Primary lymphoid organs

– bone marrow, thymus.

Secondary lymphoid organs

–spleen, lymph nodes and lymphoid tissues.

Immune System



Blood elements

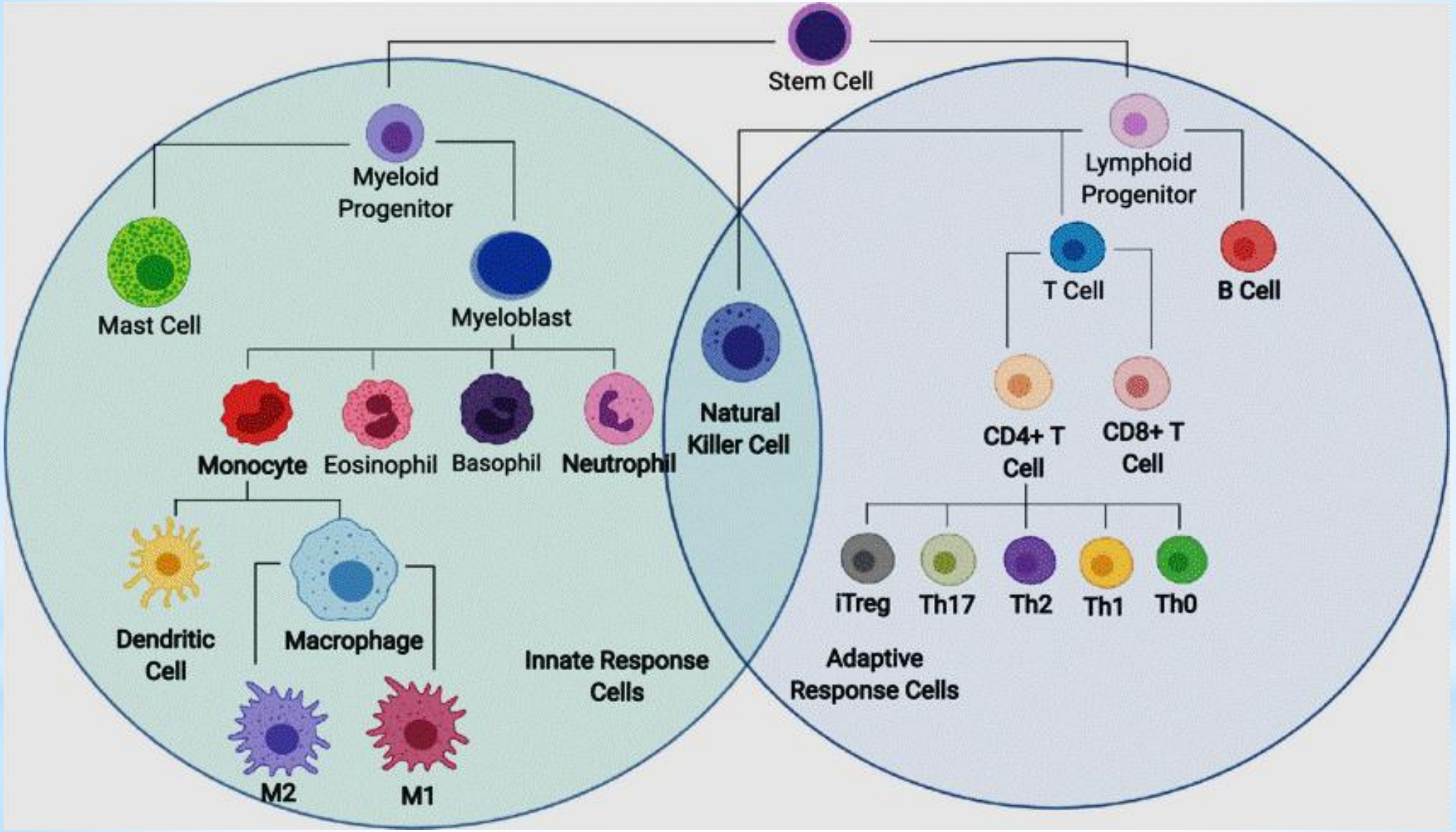
- **Blood consists of:**

- Plasma (fluid).
- Cells & cell fragments suspended in plasma.

- **Blood cells:**

- Erythrocytes (red blood cells).
- Leukocytes (white blood cells).
- Thrombocytes (platelets).

Blood elements

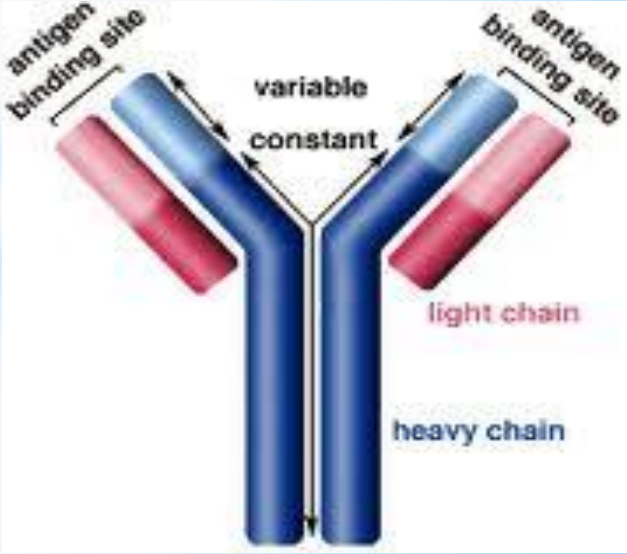


*Antigens and Antibodies

* ***Antigens:*** any agent (microorganism, molecule, protein…etc) that can stimulate the production of antibodies.
* ***Antibodies*** Specific glycoprotiens produced by ***lymphocytes*** in response to the presence of an antigen.

➢ *All antibodies are in a class of proteins called* ***Immunoglobulins.***

➢ ***Each antibody is specific to the antigen that stimulates its production.***



*Thank you