



Basics of Immunology

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IMMUNOLOGY

- ❑ Immunology is the study of the ways in which the body defend it self from infectious agents and other foreign substances in its environment .
- ❑ The immune system protect us from pathogens . It has the ability to discriminate (differentiate) between the normal and harmful cells.

Immune System

- ❖ The immune system is designed to protect the body from harmful diseases.
- ❖ The immune system begins to develop in the embryo and by the time the baby is born.
- ❖ It is a sophisticated collection of tissues that includes the blood, lymphatic system, thymus, spleen, skin, and mucosa.

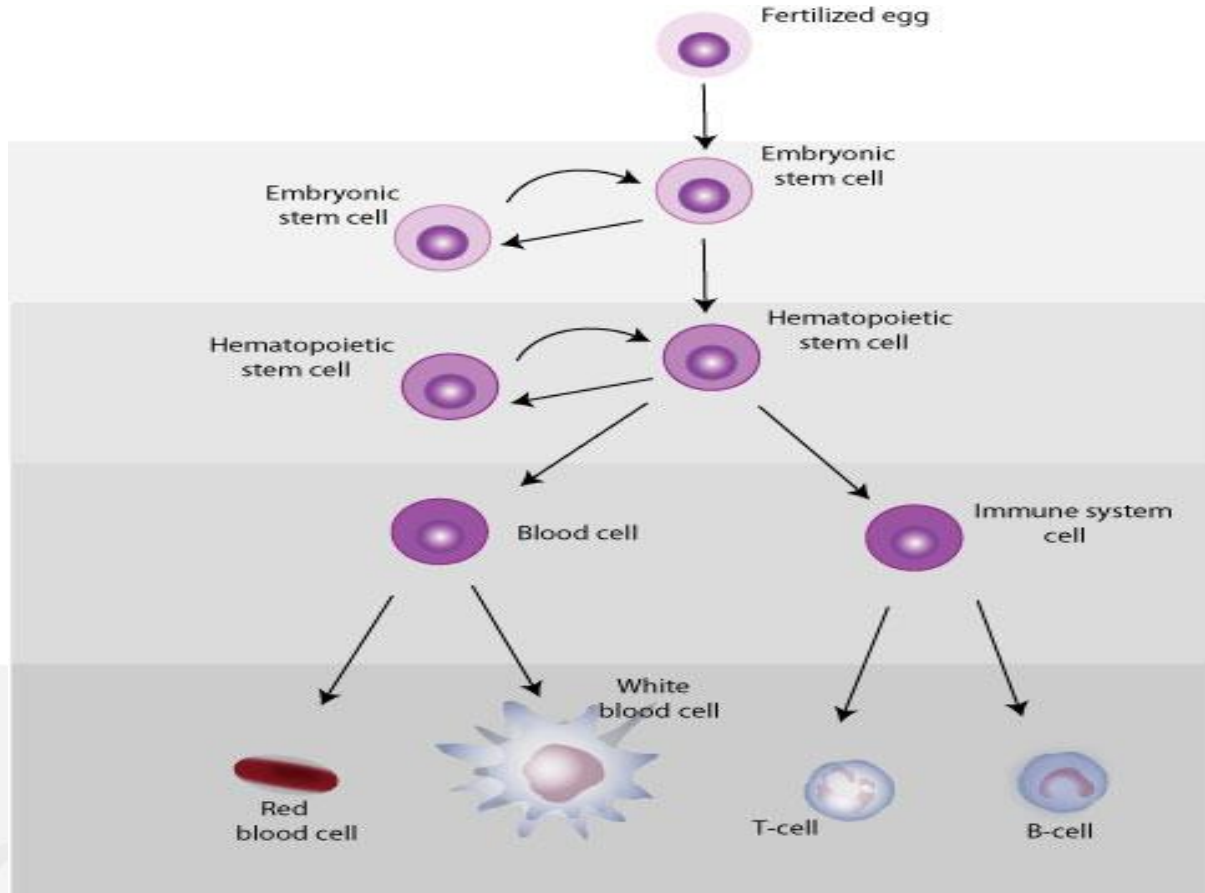
Immune System

- ❑ Immunology is the study of our protection from foreign macromolecules or invading organisms and our responses to them.
- ❑ Host – Foreign macromolecule, antigen – e.g. virus protein, worm, parasite (Everything that should not be in my body)

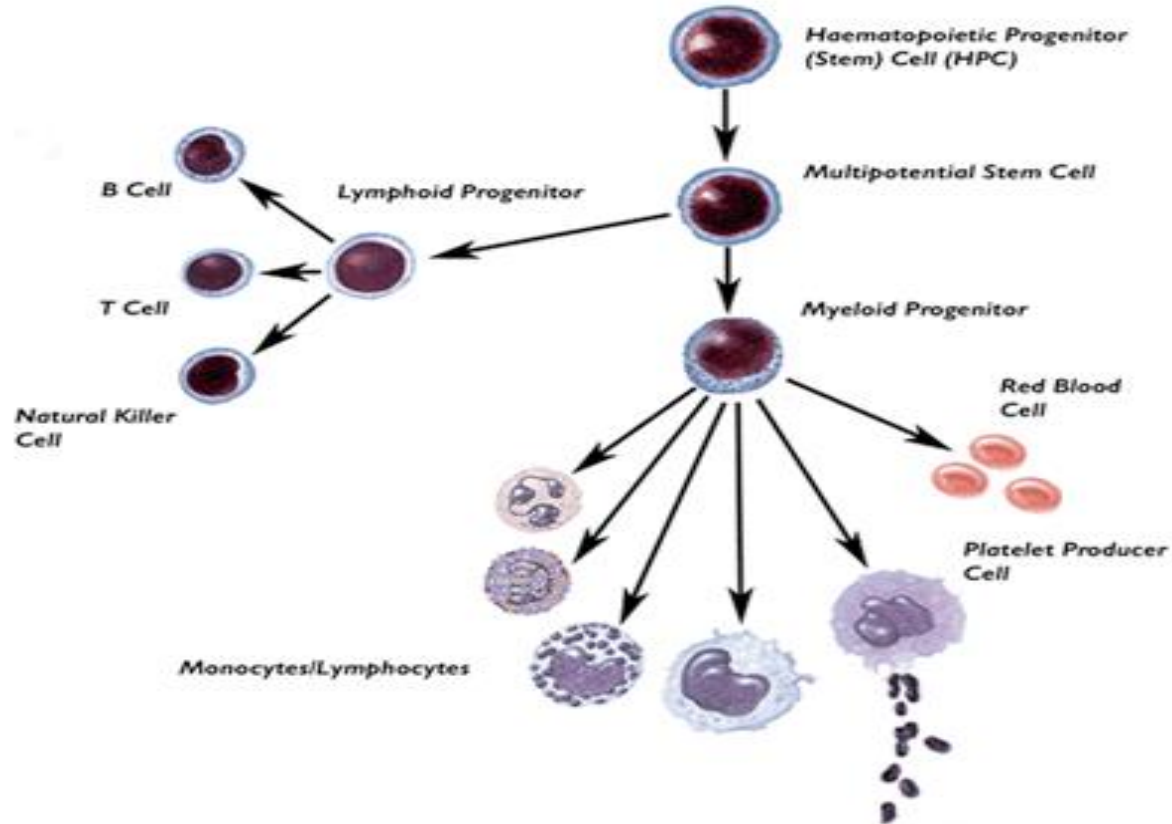
Beware the attack!

- The immune system responds to any antigen, whether is it harmless, like grass pollen, or harmful, such as a virus or bacterial infection.
- Everyone's immune system is different, and reacts differently to every antigen.

Outline of Immune system cells



Immune System layout



In your blood, there is a hierarchy of blood cells and substances which relate to your immune system

❖ Blood:

- plasma (the yellow liquid component of blood in which blood cells are suspended)
- hematocrit (proportion of blood volume that is occupied by red blood cells)

❖ White Blood Cells

- monocytes
- granulocytes
- leukocytes -- activate immune
 - T cells - time
 - B cells - antibodies
 - Natural Killer cells - nonspecific

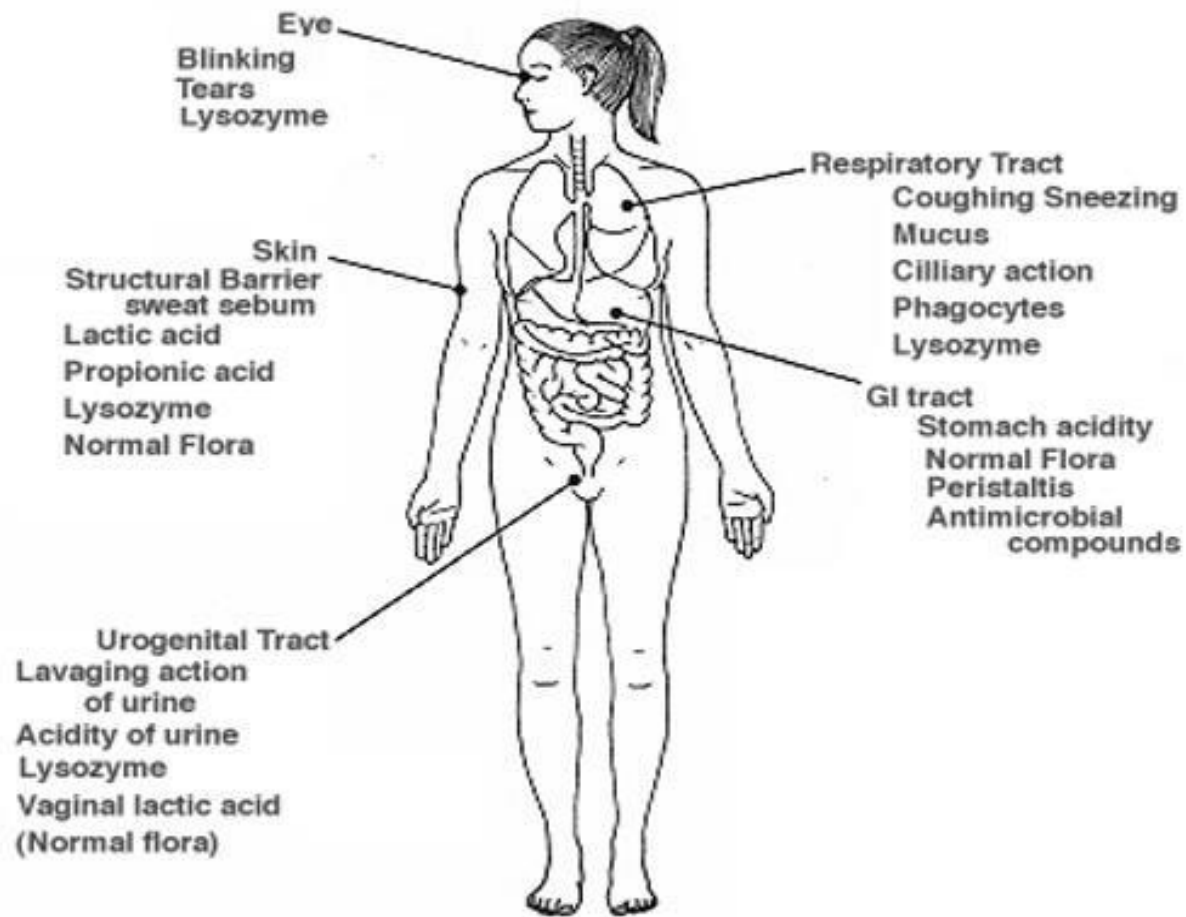
The immune system

Innate (non-specific) immunity

- Anatomic barriers (Skin, mucous membranes)
- Physiological barriers (temperature, pH)
- Phagocytic Barriers (cells that eat invaders)
- Inflammatory barriers (redness, swelling, heat and pain)

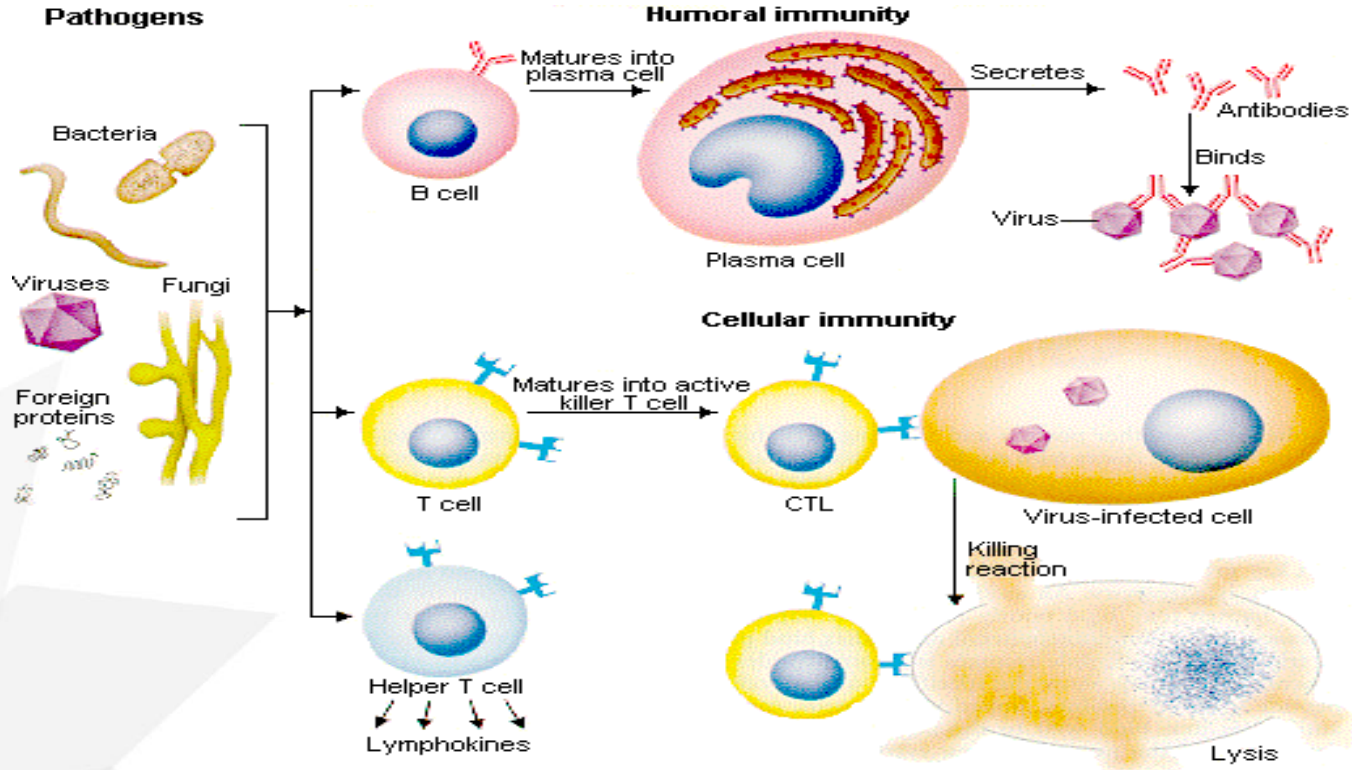
Adaptive (specific) immunity

- Antigen specificity
- Diversity
- Immunological memory
- Self/nonself recognition



Humoral and cellular immunity

(antibody mediated or cellular)



T Lymphocytes

- T- lymphocytes

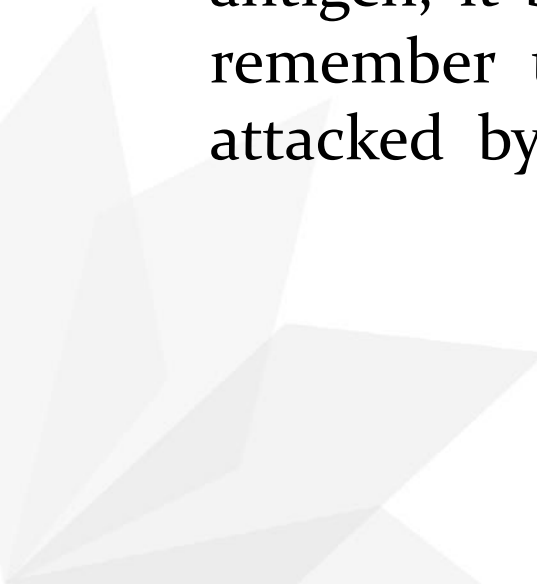
Are different from B and NK cells because they have a special receptor on their surface called a T cell receptor the T cell matures and changes into one of five things:

- A Helper T cell.
- A Cytotoxic T cell
- A Memory T cell
- A Regulatory T cell
- A Natural Killer T cell

B Lymphocytes

A decorative graphic in the top right corner consisting of several overlapping, semi-transparent geometric shapes in shades of blue, green, and purple, resembling a stylized star or flower.

Their primary role is to make antibodies to attack antigens. Once a B cell has come in contact with an antigen, it becomes a memory B cell, meaning it will remember that specific antigen if the body is ever attacked by it again.

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The Organization

What are they?



Antibodies are:

Protective agents of the immune system **Neutralize foreign agents called antigens**

Essential part of the Adaptive Immune System (AIS)

The Organization

What are they?

- **Antibodies** are:
 - "Y"-shaped Immunoglobulins (Ig)
 - Comprised of 2 heavy and 2 light chains
 - 5 different types: IgA, IgD, IgE, IgG, IgM
 - Each have a specific role
 - Contain **Variable Regions** which recognize and bind antigen via "lock and key"



The Organization

What are they?

IgM

- 1st class of circulating antibody
- found in pentameric form

IgG

- most abundant antibody

IgA

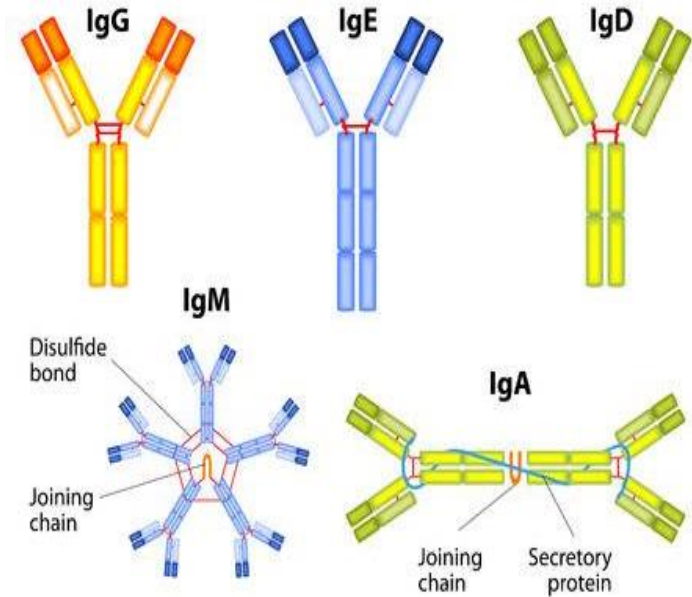
- located in the mucous membranes
- found in dimeric form

IgD

- found on surface of B-cells
- probably involved in memory cell formation

IgE

- involved in allergies, i.e. trigger release of histamine



Safety in the Laboratory

- ❖ **LABORATORY SAFETY is a vital part of any lab programme.**
- **The basic concept is the use of *common sense* within the laboratory and in the use of all techniques. There is clearly a potential risk of infection to workers who continuously come in contact with pathogenic organisms.**
- **As a basic rule, microbiological laboratories should have sufficient space, equipment, and facilities for the performance of the required volume of work with optimal accuracy, precision, efficiency and safety**

Preventive measures against laboratory-acquired infections

- Microorganisms will invariably be found in microbiology laboratories. The greatest risk of occupational infection in these laboratories is associated with the use of pathogenic microorganisms or the handling of contaminated material.
- Safety begins with the collection of the specimen.
- The approach is not only to protect the specimen from contamination, but also to protect the laboratory and other personnel. Specimens should be collected in sturdy containers with adequate closure to prevent spillage or leakage.
- The laboratory worker must treat each specimen as a potential hazard to his health and that of his colleagues in the laboratory.

- All contaminated laboratory ware and similar items to be removed from a laboratory to a sterilization site should be placed in containers and immersed in appropriate chemical disinfectant.**
- The containers should be covered during transport and autoclave staging.**
- Contaminated items too large for autoclaving or hot air sterilization should be hand wiped with disinfectant.**
- Biological waste should be clearly labeled prior to disposal and complete records should be maintained.**



Thank you

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