

Immunology

Introduction

- 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. (foreign challenges)
 - ✓ Immune system
 - ✓ Immunity
 - ✓ Immunology
 - ✓ Immune response

Definitions

- 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

Immunity

```
graph TD; Immunity --> InnateImmunity; Immunity --> AdaptiveImmunity;
```

Innate Immunity

Native/natural immunity

- Present since birth
- Relatively nonspecific
- Provides first line of defence
- No memory

Adaptive Immunity

Specific/aquired immunity

- Antigen specificity
- Immunologic memory
- diversity
- Self and non self recognition

Innate immunity refers to nonspecific defense mechanisms that come into play immediately or within hours of an antigen's appearance in the body.

The **adaptive immune** system, also referred as the **acquired immune** system, is a subsystem of the **immune** system that is composed of specialized, systemic cells and processes that eliminates pathogens by preventing their growth.

Innate immunity

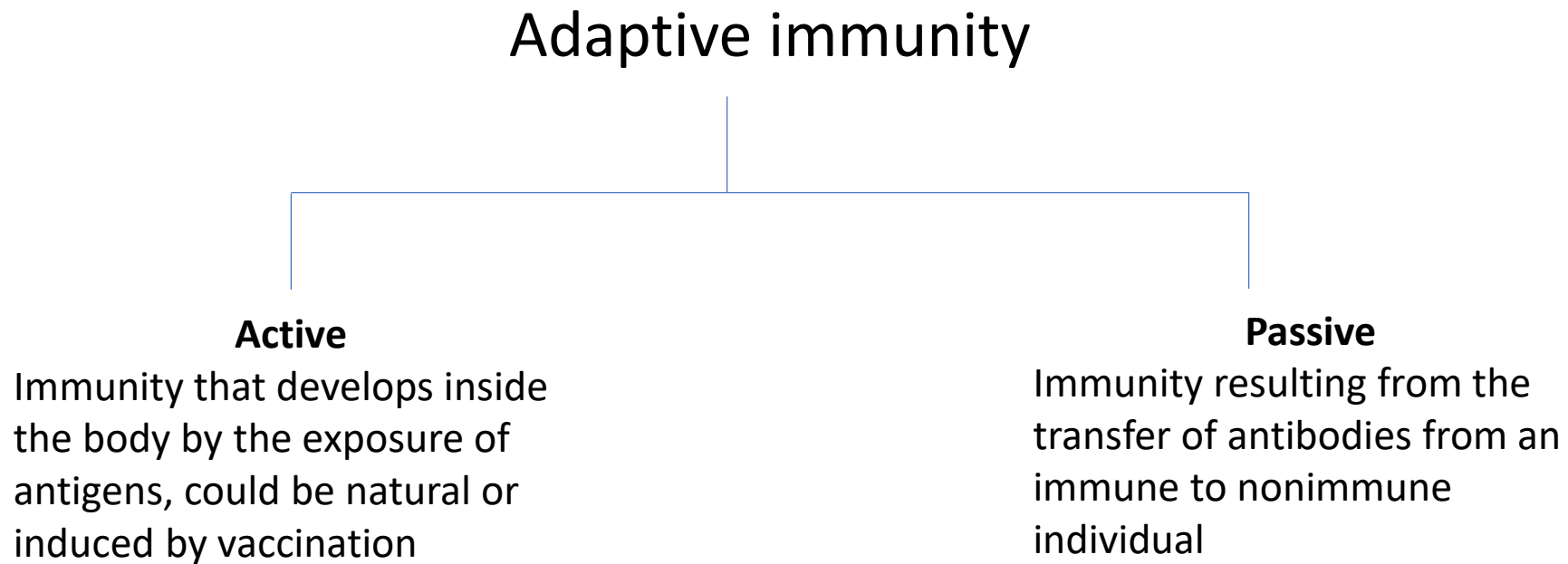
- First line of defence
- Elements of innate immunity includes
- Physical barriers- skin, mucous, sweat, lysozyme, sebaceous secretions.....

Important initial barriers to infection are physical (e.g. the **skin**), enhanced by substances secreted by the body, such as saliva and tears, that contain molecules that can neutralise bacteria. The internal **mucosal tissues** (e.g. **lungs & airways**, and the **gut**) are coated with mucus that is able to trap potential infectants. In the airways, mobile ciliate hairs work together to transport contaminants away from vulnerable areas. Tissues such as the skin, mucosal surfaces and airways also contain populations of immune cells that can respond to infectants that breach these physical defences.

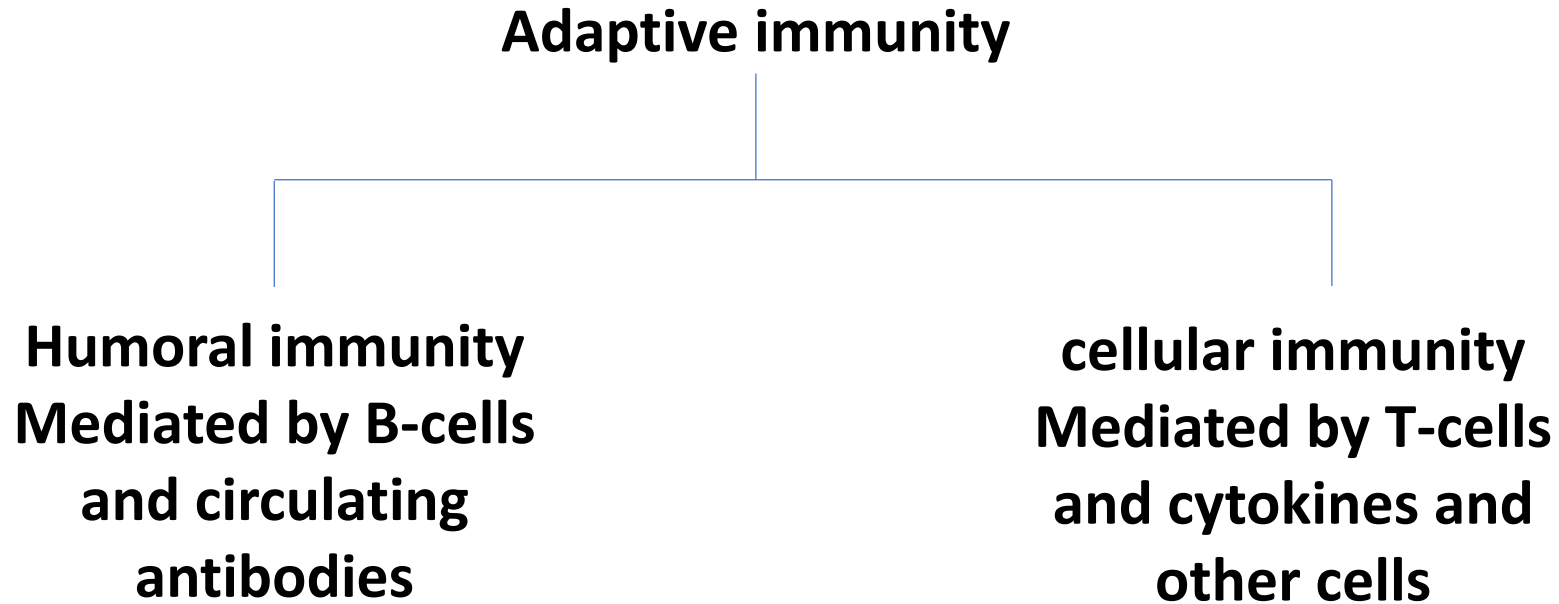
- Elements of innate immunity includes
 - Chemical mediator- a group of chemicals that protects against pathogens before adaptive immunity develops.
 - Complement proteins
 - Cytokines
 - Pattern recognition molecules
 - Toll like receptors
 - Cellular defences- neutrophils, macrophages, natural killer cells

Adaptive immunity

- Capable of recognizing and selectively eliminate foreign antigens
- May be active or passive:



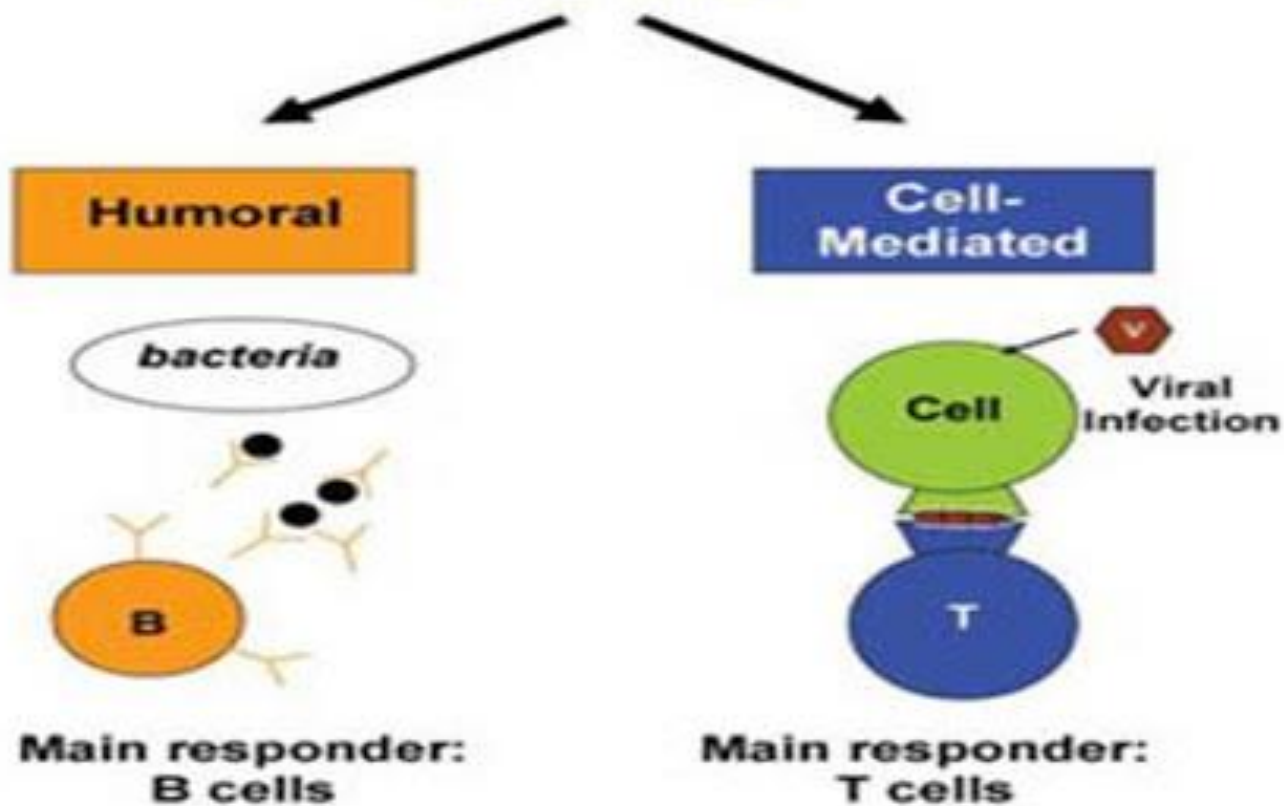
Immune response of adaptive immunity





The Immune System

SPECIFIC



Humoral immunity

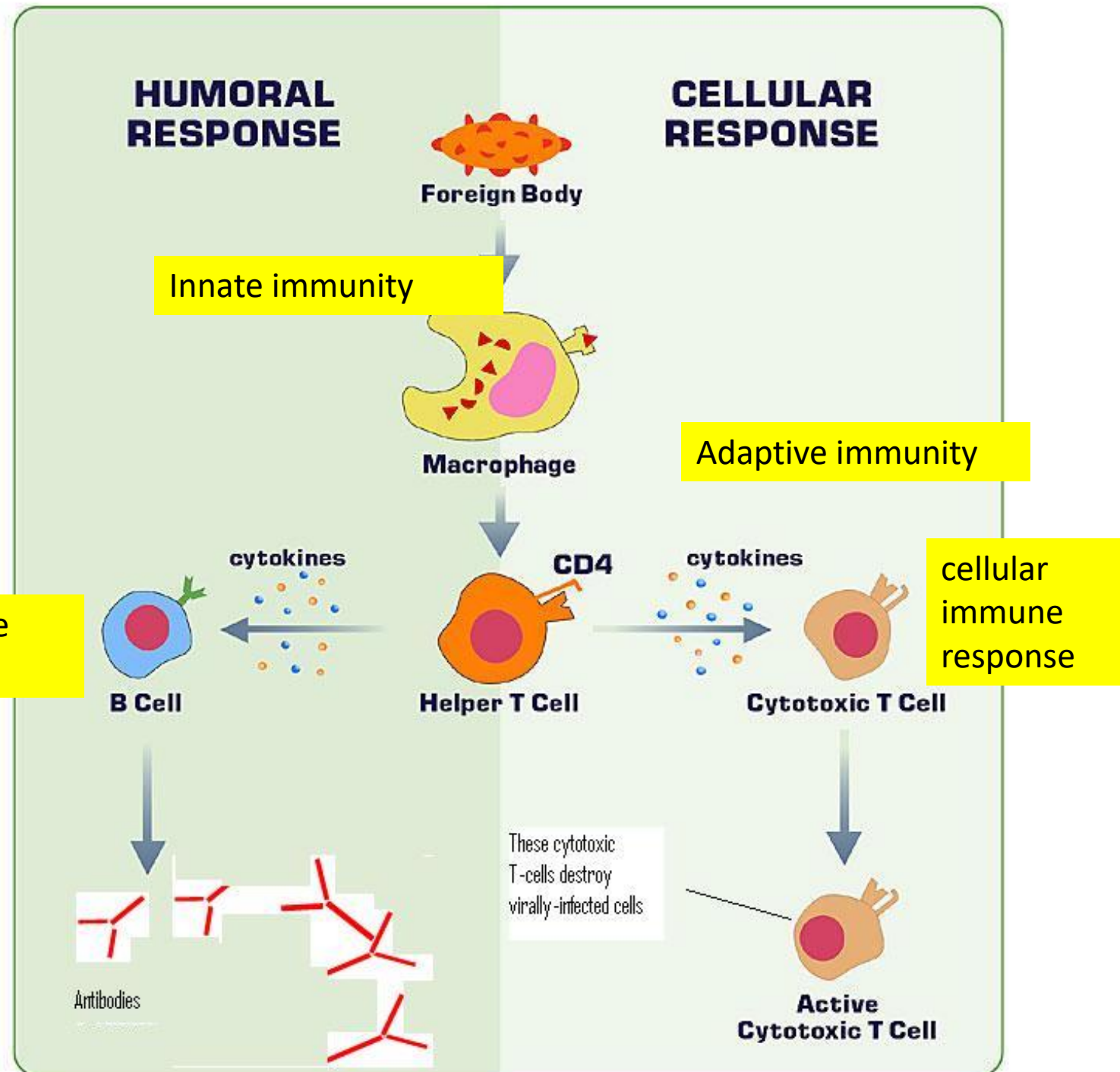
- antibodies produced by B cells cause the destruction of extracellular microorganisms and prevent the spread of intracellular infections

cellular immunity

- performs various effector functions when antigen presenting cells brings antigens to secondary lymphoid organs

Coordination of innate and adaptive immunity

Humoral immune response



Overview of immune system

