

Introduction

The immune system is:

Defense body mechanism and involves:
an interacting set of specialized cells and

Proteins, designed to identify and destroy
foreign invader.

Introduction

- The immune system must be able to: differentiate between material that is a **normal component of the body** ("self") and material that is not native to the body **"non-self"**
- Highly specialized receptors **present for discriminating between "self" and "nonself" body components**

Introduction

***The discrimination between "self" and "non-self" and the subsequent destruction and removal of foreign material is accomplished by two arms of the immune system.**

1) The innate (natural or nonspecific) immune system

2) The adaptive (acquired or specific) immune system

***These two systems perform many of their functions by cooperative interactions**

Immunity

Innate immunity



Components

Macrophages
Granulocytes
Natural killer cells
Complement
Other chemicals: HCL, lysozyme

Characteristics

- * Action is immediate
- * Response is non-specific
- * Response is not enhanced on repeated exposure to pathogen

Adaptive immunity



Humoral

Cell-mediated

Components

antigen presenting cells
T-cells
B-cells
Antibodies
Complement

Characteristics

- * Action requires days to develop
- * Response is specific
- * Response is enhanced on repeated exposure to pathogen

Overview of the innate immune system

- * It is the first line of defense
- * It is active at the time of infection
- It consists of:
 - a- protective cellular component (WBCs and derivatives)
 - b- chemical components.

The response of the innate immune system

It is divided into two stages:

1- non-inflammatory reaction (body's static defenses): skin, gastric pH, lysozyme in tears, saliva, mucous

2- local inflammation promotes migration of phagocytes and plasma protein into infected tissues.

The phagocytes respond to surface structures present in large groups of microorganisms (peptidoglycan, mannose moieties).

Role of external body surfaces

- * The skin consists of sheets of dry, cornified epithelial cells.
Intact skin act as barrier to bacteria and viruses
- * Hair follicles and sebaceous glands produce: Antibacterial substances (fatty acids and enzymes)
- * Normal microbial flora compete with potential pathogens

Role of internal body surfaces

The normal movement of fluids and mucous act as mechanical factors for cleaning internal surfaces of:

Respiratory tract

Gastrointestinal tract

Genitourinary tract

Acute Inflammation Resulting From Infection

Inflammation is a nonspecific response of living tissue to localize and eliminate the injurious agent.

The injury may be:
physical, chemical or biological

The Inflammatory Response

Involves **specialized** cells and **serum proteins**

These move from plasma to interstitial spaces to provide an immediate defense

The Inflammatory Response

The inflammatory cells include:

- **Phagocytes** which destroy the invading organisms by phagocytosis followed by intracellular digestion.
- **Natural killer cells** which limit infection by releasing compounds toxic to organisms.

The Inflammatory Response

* Serum components:

Acute phase proteins (e.g. C-reactive protein)

- **C-reactive protein** is produced by liver in response to tissue damage
 - **C-reactive protein** binds to the cell walls of bacteria and activates the complement system resulting in the opsonization and lyses of pathogenic organisms.

Role of Phagocytosis

1- Chemotaxis & attachment

- a- Attraction by chemotactic substances
- b- Attachment by receptors on surfaces of phagocytes

2- Ingestion

- * Phagocytes have pseudopodia which surround organism forming phagosome
- * Opsonins and co factors enhance phagocytosis
- * Fusion with phagocytic granules and release digestive ,toxic contents

3- Killing (two microbicidal routes)

a- Oxygen dependent system (powerful microbicidal agents)

Oxygen converted to superoxide, anion, hydrogen peroxide, activated oxygen and hydroxyl radicals.

b- Oxygen-independent system (anaerobic conditions)

Digestion and killing by lysozyme, Lactoferrin, low pH, cationic proteins and hydrolytic and proteolytic enzymes