

**The Immune System**

= the body's defense against **infection** and **disease**

**Immunity**

= the capacity of the body to **resist & defend** against foreign invaders (**pathogens**)

- There are two types of immunity:

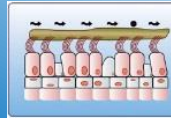
**1) Non-Specific Immunity**

- immunity that guards against all types of foreign invaders
- ie) **splinter, bacteria, fungus, foreign cells, etc.**
- provided by your innate immune system

- includes:

a) External Protection

- **skin** = physical barrier
- **mucus** = sticky substance lining body openings to trap pathogens
- **cilia** = tiny hairs that sweep that sweep pathogens away
- other **body fluids** (sweat, saliva, tears, stomach juices) = contain chemicals that destroy pathogens



b) Internal Protection

i) fever

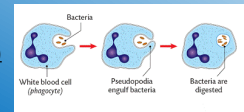
= creates an **unhospitable environment**

ii) leukocytes including:

- **Basophils (mast cells)**
- = cause **inflammatory response** by releasing histamines (swelling) & heparin (water)
- are the cause of **allergic reactions** (response to something not actually dangerous)

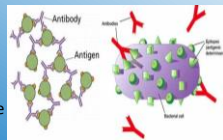


- **Phagocytes (including Natural Killer Cells)**
- **engulf and eat** pathogens



**2) Specific Immunity**

- acts against one specific type of invader
- each specific invader produces **antigens**
- **Antigens**: proteins that the body would not **recognize** present on substances that are foreign to your body (pathogens, etc)
- = stimulate the body to produce **antibodies**.



- **Antibodies**

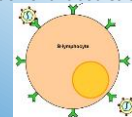
: a protein molecule produced by the immune system used to **tag & destroy** pathogens

- **Lymphocytes**

: are specific white blood cells used in the production of antibodies & destruction of pathogens

: 3 main types of lymphocytes:

- a) B cells** = Munitions Officer
- type of lymphocytes that **secrete antibodies**



- b) T cells** = Guards

- type of lymphocytes that **identify & disable** infected body cells
- stored in the Thymus



**c) Macrophage** = Infantry

- **engulf and destroy** pathogens



How do all 3 of these cells work together in an "attack?"

### 1. Identification of the Antigen

- = helper T cells begin building the army
- have special receptors that can detect when a B cell has started producing antibodies

### 2. Attack from the B cells and macrophage:

- antibodies of B cells attach to antigens of the pathogen
- after attachment, the antibodies begin to multiply, and making more antibodies on pathogens causing them to slow and clump together
- macrophage can then engulf and destroy clusters of pathogens

### 3. Attack from killer T cells:

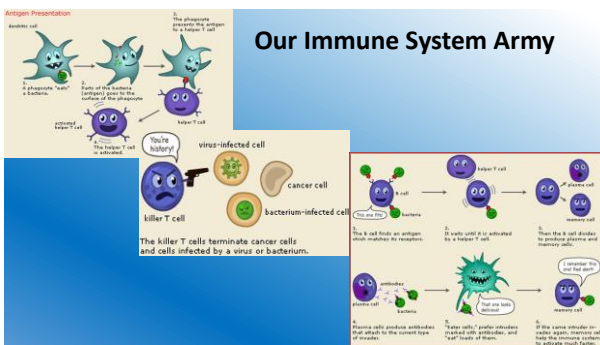
- as macrophages eat pathogens, these infected body cells display an antigen that the killer T cell recognizes triggering them to destroy the cell

### 4. Suppressor T cells

- after an attack is over, suppressor T cells release chemical to shut off B & T cell production

### 5. Memory B and T cells

- memory B & T cells are formed during the battle that containing a specific antibody that is stored in the spleen to be used if body is exposed a second time to the same antigen so that the pathogen is killed before symptoms occur



### Ways to Acquire Immunity

- Specific immunity may be developed in 1 of 2 ways:

#### a. Active Immunity

= resistance to pathogens as a result of **previous exposure** through:

- illness
- vaccination (injection containing **killed or weakened** pathogens)

- produce proteins recognized as antigens by our immune systems causing **Memory T-cells and B-cells** to remain ready to fight off the illness if it is encountered again



#### b. Passive Immunity

= immunity resulting from the **acquisition of antibodies** which have been

- : produced in another animal (by active means)
- : derived from cells grown in tissue culture (monoclonal antibodies)

- acquired via

- : **injection of immune serum** from an individual who has been previously immunized or recovered from disease
- : **placental transfer** of antibodies from mother to fetus
- : **breast milk transfer** of antibodies from mother to infant by nursing

