The Human Immune System

Video
What is the immune system?

• The body’s defense against disease causing organisms, malfunctioning cells, and foreign particles
Immune System

- Made up of special cells, proteins, tissues, and organs
- **Defends** people against germs and microorganisms
- Keeps people healthy and preventing infections
Immune System

• Main Parts
  – Lymph nodes
  – White blood cells
  – Skin
  – Thymus
  – Bone marrow
  – Spleen
  – Lymphatic vessels
The First Line of Defense
~Skin~

- The dead, outer layer of skin, known as the **epidermis**, forms a shield against invaders and secretes chemicals that kill potential invaders.

- You shed between 40 – 50 thousand skin cells every day!
The First Line of Defense
~Mucus and Cilia~

- As you breathe in, foreign particles and bacteria bump into mucus throughout your respiratory system and become stuck.

- Hair-like structures called cilia sweep this mucus into the throat for coughing or swallowing.
The First Line of Defense

~Saliva~

- **Saliva** contains many chemicals that break down bacteria
- Thousands of different types of bacteria can survive these chemicals
The First Line of Defense

~Stomach Acid~

- Swallowed bacteria are broken down by incredibly strong acids in the stomach that break down your food.

- The stomach must produce a coating of special mucus or this acid would eat through the stomach!
The Second Line of Defense
~White Blood Cells~

- If invaders actually get within the body, then your white blood cells (WBCs) begin their attack.
- WBCs normally circulate throughout the blood, but will enter the body’s tissues if invaders are detected.

Video
White Blood Cells
~Phagocytes~

• These white blood cells are responsible for eating foreign particles by engulfing them.

• Once engulfed, the phagocyte breaks the foreign particles apart in organelles called **Lysosomes**.
Viruses enter body cells, hijack their organelles, and turn the cell into a virus making-factory. The cell will eventually burst, releasing thousands of viruses to infect new cells.
White Blood Cells
~T-Cells~

- **T-Cells**, often called “natural killer” cells, recognize infected human cells and cancer cells.
- T-cells will **attack** these infected cells, quickly kill them, and then continue to search for more cells to kill.
Injured body cells release chemicals called **histamines**, which begin **inflammatory response**.

- The chemicals cause blood vessels to leak fluid into the tissues causing swelling.
The Third Line of Defense

~Antibodies~

- Most infections never make it past the first and second levels of defense
- Those that do trigger the production and release of antibodies
  - Proteins that latch onto, damage, clump, and slow foreign particles
  - Each antibody binds only to one specific binding site, known as an antigen
What is immunity?

- Resistance to a disease causing organism or harmful substance
- Two types
  - Active Immunity
  - Passive Immunity
Active Immunity

- **You** produce the antibodies
  - Your body has been exposed to the antigen in the past either through:
    - Exposure to the actual disease causing antigen – You fought it, you won, you remember it
    - Planned exposure to a form of the antigen that has been killed or weakened – You detected it, eliminated it, and remember it
Vaccine

• Antigens are deliberately introduced into the immune system to produce immunity
• Because the bacteria has been killed or weakened, minimal symptoms occur
• Have eradicated or severely limited several diseases from the face of the Earth, such as polio and smallpox
Passive Immunity

• You don’t produce the antibodies
  – A mother will pass immunities on to her baby during pregnancy
  – These antibodies will protect the baby for a short period of time following birth while its immune system develops.