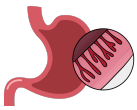
CONCEPT: BODY'S DEFENSE SYSTEM

Physical and Chemical Barriers

◆ The body defends itself against infections in two ways:

- **Physical** & **Chemical** **Barriers:** Stop, trap, and directly kill pathogens.
- **Immune System:** Fights to kill pathogens _____ they have bypassed physical and chemical barriers.

Physical and Chemical Barriers Against Infections

1. Skin & Hair 	• Skin prevents _____ of pathogens. • Hair can trap particles (e.g. nose hair).	**4. Sweat & Tears** 	• Contain _____ that can kill pathogens. • Tears can wash microorganisms away.
2. Eyelids & Eyelashes 	• Eyelids prevent entry of pathogens into eyes.	**5. Stomach Acid** 	• _____ kills many pathogens.
3. Mucous Linings 	• Mucous lining in the stomach protects tissue _____ it.	**6. Gut Microbiome** 	• Keeps invaders in check.

EXAMPLE

Identify the incorrect statement from the following:

a) Bacteria and viruses can enter the body through cut/broken skin.

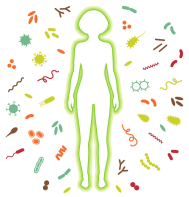
b) Stomach acid can kill many bacteria and prevent them from entering the intestines.

c) Sweat contains chemicals that can kill many pathogens on the skin.

d) Pathogens trapped in the mucous lining increase the likelihood of a localized infection.

CONCEPT: BODY'S DEFENSE SYSTEM

Intro to the Immune System



◆ A complex set of _____, substances, and processes that activates when pathogens enter the body.

- Two branches of the immune system: **Innate** and **Adaptive.**
  - Use different types of _____ blood cells.

Branches of the Immune System	
Innate Immune System	**Adaptive Immune System**
• Everyone is born with innate immunity.	• Keeps developing throughout life.
• ____-specific response to catch, destroy, and dispose of pathogens.	• _____ response against specific pathogens.
• Uses neutrophils, macrophages, natural killer cells, etc.	• Uses ___ and ___ cells (lymphocytes).

◆ When infected, both immune systems can cause inflammation.

- ___ blood flow to the affected tissue.
- **Signs:** redness, swelling, pain, and heat (fever).
- Fever stimulates the production of white blood cells.

EXAMPLE

Which of the following statements is incorrect about the immune system?

a) Fever helps the immune system to increase the number of white blood cells.

b) The innate immune system provides a fast and non-specific response against pathogens.

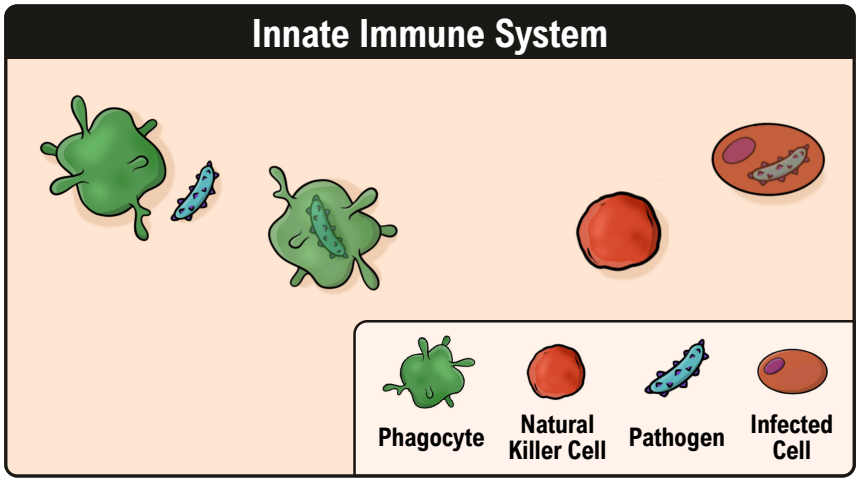
c) The immune system uses white blood cells to enable other cells to respond against pathogens.

d) Adaptive immune system mainly uses B and T cells against specific pathogens.

CONCEPT: BODY'S DEFENSE SYSTEM

Innate Immune System

- First line of defense against pathogens, initiates a _____ when it identifies anything as foreign.
- **Neutrophils and macrophages** (phagocytes): engulf pathogens and damaged/dead cells.
- **Natural killer cells:** rapidly identify and destroy _____ cells.



EXAMPLE

In autoimmune diseases, the body's immune system attacks and destroys its own cells. Type 1 diabetes is a condition when the immune system destroys the insulin-producing beta cells in the pancreas. Which of the following is the correct explanation for this?

a) The immune system identifies the beta cells as redundant due to body's insulin resistance.

b) The immune system identifies beta cells as foreign cells and attacks them.

c) The immune system attacks the beta cells in the pancreas when they are infected.

d) The immune system acts against toxic substances produced by abnormal beta cells.

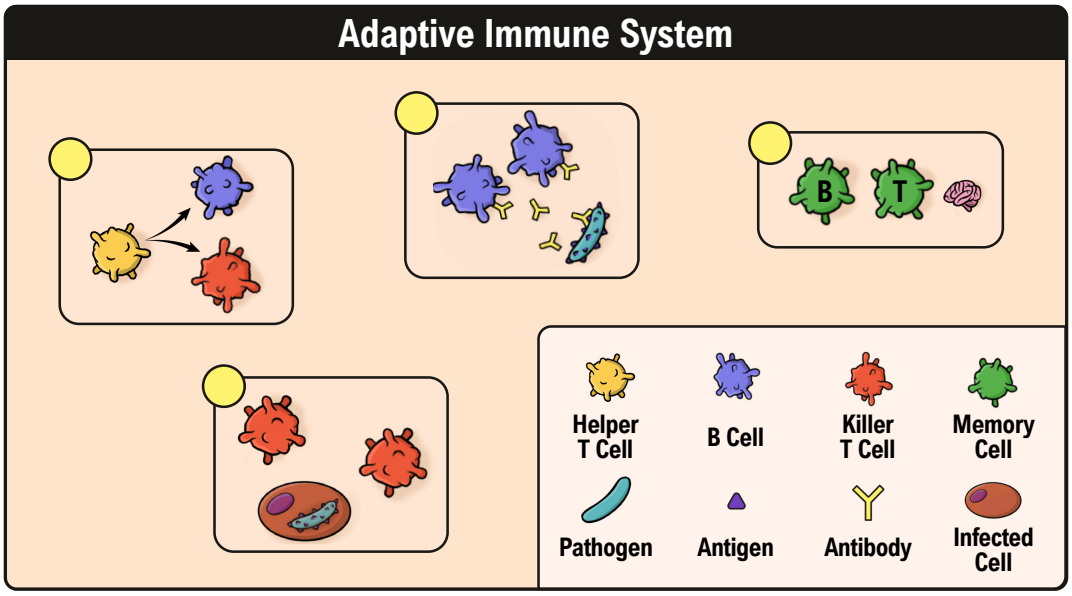
CONCEPT: BODY'S DEFENSE SYSTEM

Adaptive Immune System

Antigen
Substances on cell surfaces that the immune system uses for identification.

◆ Provides targeted immunity against _____ pathogens or abnormal cells.

1. **Helper T cells:** trigger production of ___ cells and killer ___ cells.
2. **B cells:** produce _____ that attach to *antigens* to either neutralize them or mark for destruction.
3. **Killer T cells:** attack and destroy infected cells.



4. Some B cells and T cells (both types) become _____ cells and are reserved for future immune responses.

EXAMPLE

For each of the given descriptions identify the cell type as: Helper T cells (HT), killer T cells (KT), B cells (B), or memory cells (M).

a) ____ Attach to infected cells to kill them.

b) ____ Retain information about previously encountered pathogens.

c) ____ Produce antibodies that attach to antigens.

d) ____ Trigger the production of other cells in the adaptive immune system.

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PRACTICE

Which of the following is a correct statement about the immune system?

a) Antigens are parts of pathogens that the immune system is unable to identify.

b) Inflammation is only caused when a pathogen evades the immune system.

c) The innate immune system uses B and T cells to fight and kill pathogens.

d) The adaptive immune system uses antibodies to mark pathogens for destruction.

PRACTICE

Which of the following is incorrect about the function of the immune system?

a) Phagocytes are large cells that can ingest pathogens and other infected cells.

b) All T cells can attach to infected cells and kill them.

c) B cells produce antibodies that can attach to antigens.

d) After recovering from an infection, some B and T cells become memory cells.