



جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

lecture four

Innate immunity

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Innate immunity

- Innate immunity, also known as non-specific immunity, is the first line of defense in the body against pathogens. It's the natural defense system that is present from birth and doesn't require prior exposure to a pathogen to be activated. provides long-term protection.

The Immune System

Innate Immune System

Physical barriers:
Skin; organ mucosal layers



Chemical barriers:
Stomach acid; lysozymes in eye



Innate response: Inflammatory response cells



Mast cells Neutrophils Macrophages Natural killer cells

Immune system linkage:
Dendritic cells

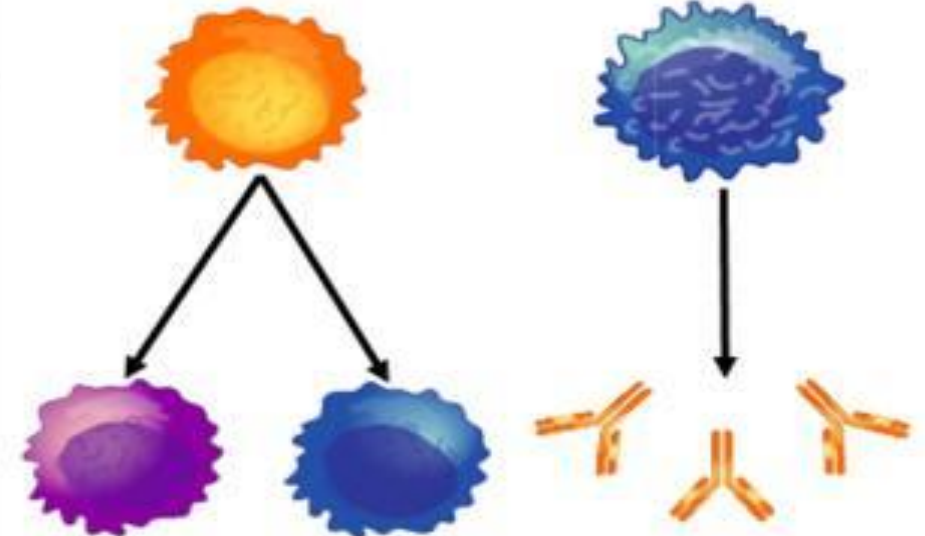


Adaptive Immune System

Adaptive response:
Cell-mediated response; humoral response

Cell mediated response:
T-lymphocytes

Humoral Response:
B-lymphocytes



Products:
CD4+ and CD8+ T-cells

Products:
Antibodies


The key characteristics of innate immunity

➤ 1. Non-specific Defense:

- Innate immunity responds to a broad range of pathogens (e.g., bacteria, viruses, fungi, parasites) but doesn't target specific pathogens.


➤ 2. Immediate Response:

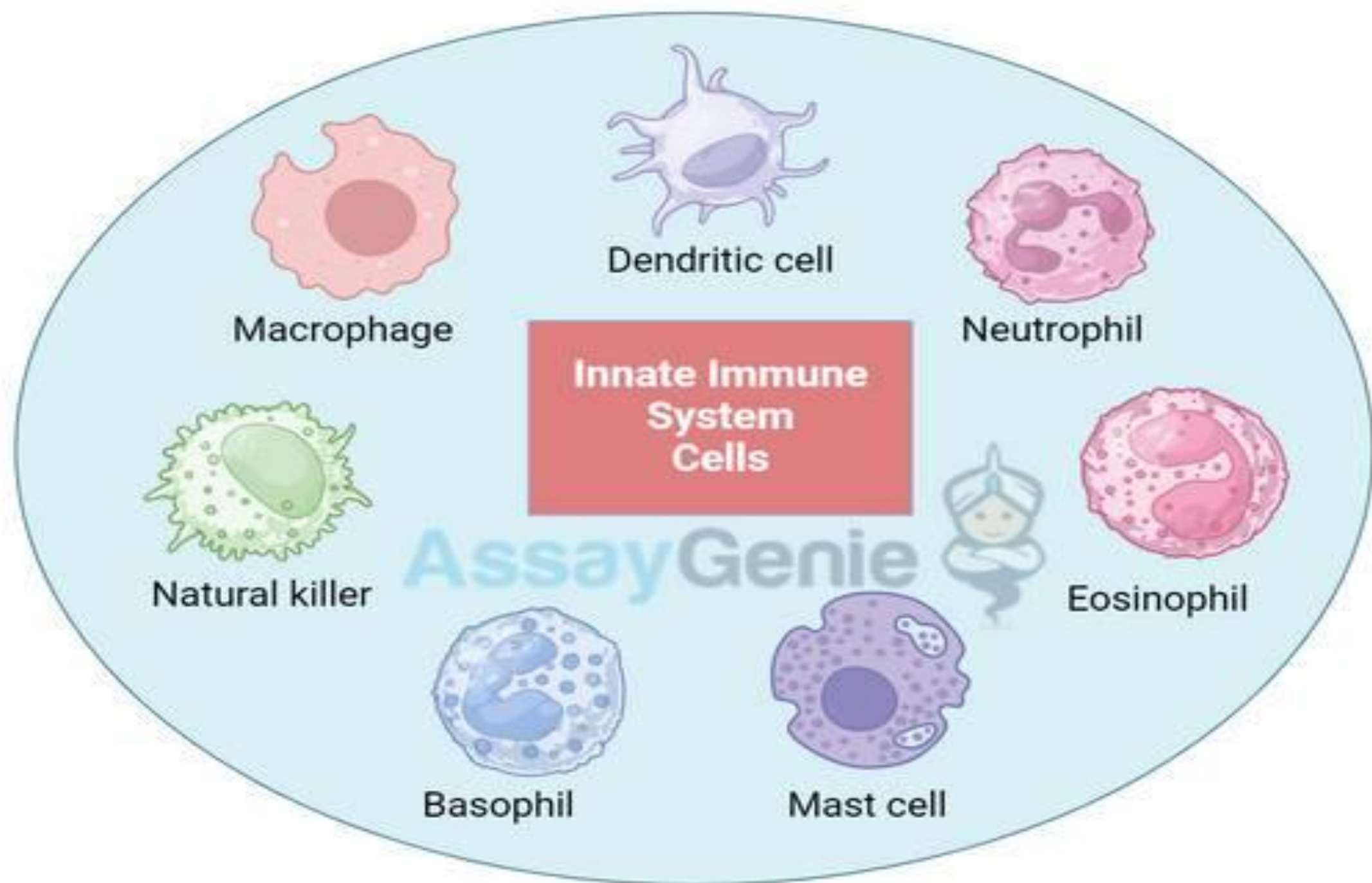
- Innate immune responses are rapid, typically occurring within hours of infection. This is in contrast to adaptive immunity, which takes longer to develop but provides long-term protection.






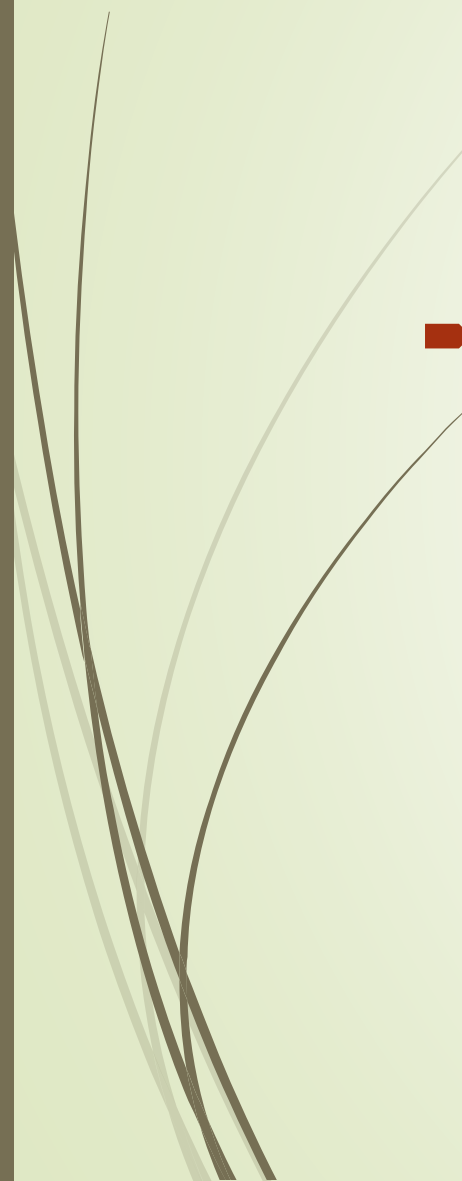
➤ **3.Physical Barriers:** The body has barriers like the skin and mucous membranes that act as walls to block pathogens from entering.

➤ **4.Key Cells:**

- **Phagocytes:** Cells that "eat" pathogens. Examples include neutrophils and macrophages.
 - **Natural Killer (NK) Cells:** These cells attack and destroy infected or abnormal body cells.
 - **Dendritic Cells:** These act as messengers, capturing pathogens and alerting the immune system.
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- **5.Inflammation:** When the body detects an infection, it triggers inflammation—swelling, redness, warmth, and pain—at the infection site to help fight off the invader.
 - **6.Complement Proteins:** These are special proteins in the blood that can destroy pathogens by puncturing their cell membranes, help attract immune cells, and assist in cleaning up infections.

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- **7.No Long-term Memory:** Unlike the adaptive immune system, which "remembers" past infections to fight them off faster next time, the innate immune system doesn't have memory. It reacts the same way each time.
 - **8.Innate immunity is essential** because it stops infections early, keeping pathogens from spreading. It also gives the adaptive immune system time to kick in for a more targeted response.

Inflammatory Response

- Inflammation is a critical component of the innate immune response, acting to contain infections and facilitate healing. Key features include:
 - **Vasodilation:** The blood vessels widen to increase blood flow to the affected area, which results in the redness and warmth seen in inflammation.
 - **Increased Permeability:** The blood vessel walls become more permeable, allowing immune cells and proteins (such as antibodies and clotting factors) to move from the bloodstream into the tissue.
 - **Cytokine Release:** Inflammatory cytokines (e.g., interleukins, tumor necrosis factor) are released by immune cells and help coordinate the immune response. They can attract other immune cells to the infection site and increase the activity of local immune cells.
 - **Fever:** Pyrogens (fever-inducing substances) are produced by immune cells and cause the hypothalamus in the brain to increase body temperature, which may help inhibit pathogen growth and enhance immune function.

Cross-talk with Adaptive Immunity

- ➡ While innate immunity is non-specific, it works closely with adaptive immunity. For example:
 - Dendritic cells act as messengers between the innate and adaptive immune systems by presenting antigens to T cells.
 - Inflammation helps to activate adaptive immune responses.
 - The innate system can influence the strength and nature of the adaptive immune response.

A glowing blue hand is shown on the left side of the image, palm facing right. It appears to be reaching out towards a cluster of various virus particles. The viruses are depicted in different colors: green, yellow, and red. Some are spherical with spikes, while others are more complex, multi-lobed structures. The background is dark, making the glowing elements stand out. The text "Thank You" is centered in the middle of the image, overlaid on the virus cluster.

Thank You