

Innate Immune System

Innate immune system, also known as non-specific, natural or native immunity, is the kind of immunity that operates constitutively in healthy person. They function by preventing entrance of microbe and in the case when microbes do succeed entering, by rapidly eliminating them.

Components of Innate Immune System and Their Roles

Epithelial Barrier

Common routes of entry of microbes (skin, GIT, respiratory tract) are lined by continuous epithelia, providing physical barriers from infection.

They also harbor intraepithelial lymphocytes that can kill pathogens and infected cells.

Inflammation

Started by the release of chemical mediators by injured cells, inflammation allows for the creation of a site in which the infection may be contained, preventing further dissemination of the microbe.

These mediators cause vasodilation and can also act as chemoattractant for macrophage and neutrophils.

Cellular Components

- **Neutrophils and macrophage** : They identify microbes and ingest them for intracellular digestion.
- **Dendritic Cells** : Produces cytokines important in recruitment of leukocyte. In essence they are one of many bridges between innate and adaptive immune systems.
- **Natural Killer Cells** : Effector cells of innate immunity. They recognize infected cells and then kill them.
- **Other Classes of Lymphocytes** : Like other lymphocytes, their antigen receptors are somatically rearranged (like B and T cells). However, in contrast to classical lymphocytes, they have limited diversity. Examples include $\gamma\delta$ T cells and B-1 cells. These cells have characteristics of innate immunity (fast response with limited diversity) but their effector activity is like adaptive immunity (secretion of antibody).

Humoral Components

- **Complement System** : A group of proteins that defend the body against microbe. They can be circulating in blood or associated in plasma membrane.
- **Cytokines of Innate Immunity** : Products of dendritic cells, macrophage and other cells that act as mediator for cellular component of innate immunity. Examples include TNF, Interleukin-1 and IFN- γ
- **Plasma Proteins of Innate Immunity** : Acute phase proteins, for example C-reactive protein and surfactant.

Role of Innate Immunity in Stimulating Adaptive Immune System

Generally they provide second signal to cells of adaptive immune system.

Cellular Component

1. Macrophage identifies microbe. Phagocytosis occurs and macrophage do its job as *antigen presenting cell* by displaying microbial antigen on its surface.
2. It also responds to infection by producing and secreting cytokines (IL-12 recognized by cytokine receptor of T cells) and expressing costimulator (B7 protein which are recognized by CD28 receptor of T cells) on its surface.
3. Antigen recognition, costimulator (second signal) and cytokines, altogether activate T cells, leading to its proliferation and differentiation.

Humoral Component

1. Presence of microbe in circulation activates the complement system.
2. Complement proteins like C3d attach themselves to microbial surface.
3. Recognition of C3d (second signal) by complement receptor of B cells and antigen recognition by antigen receptors of B cells lead to proliferation of B cells.

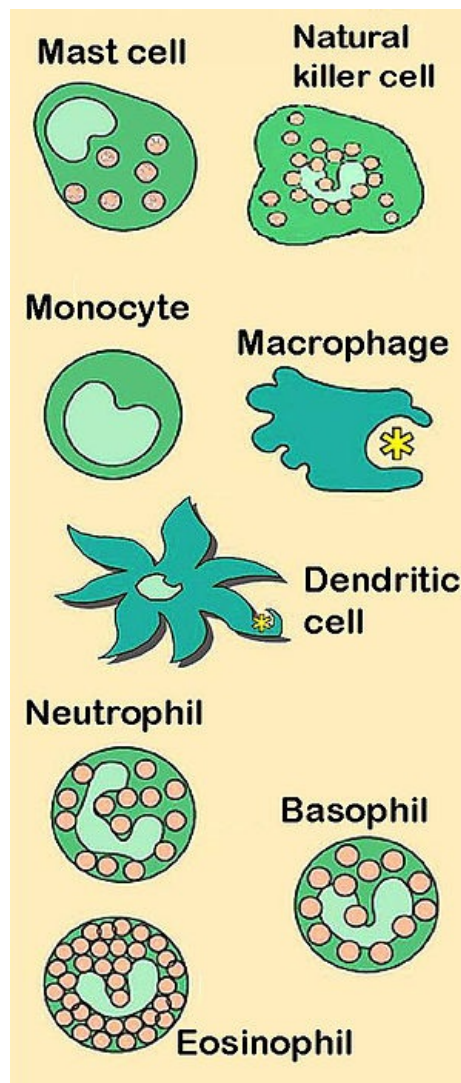
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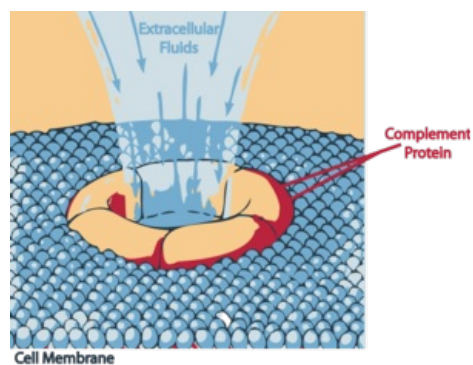
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Bibliography

- ABBAS, Abul K – LICHTMAN, Andrew H. *Basic Immunology: Functions and Disorders of Immune System*. 3rd Edition edition. 2010. ISBN 978-1-4160-5569-3.



Cells of innate immune system



Membrane attack complex (MAC) of the complement system in action