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Perspective

Note on Innate Immune System

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DESCRIPTION

Microorganisms or toxins successfully attack an organism; they come into contact with the innate immune system's cells and mechanisms. When pattern recognition receptors recognise components that are conserved across wide groups of bacteria, or when damaged, injured, or stressed cells send out alarm signals, many of which are recognised by the same receptors that recognise pathogens, the innate response is frequently initiated. Innate immune defences are non-specific, which means they react to infections in a generic manner. This system does not provide long-term protection against a disease. In most species, the innate immune system is the major system of host protection, and in plants, it is the only one.

Innate immune cells

The second branch of the innate immune system is leukocytes (white blood cells), which behave as independent, single-celled organisms. The "professional" phagocytes are among the innate leukocytes (macrophages, neutrophils, and dendritic cells). These cells discover and kill infections by engulfing and killing bacteria or by attacking larger pathogens *via* contact. Innate lymphoid cells, mast cells, eosinophils, basophils, and natural killer cells are among the additional cells involved in the innate response.

Phagocytosis is a type of cellular innate immunity in which pathogens or particles are engulfed by cells called phagocytes. Phagocytes normally patrol the body looking for pathogens, but cytokines can direct them to specific places. When a pathogen is absorbed by a phagocyte, it is confined in an intracellular vesicle termed a phagosome, which then fuses with a lysosome to produce a phagolysosome. The pathogen is destroyed by digesting enzymes or by releasing free radicals into the phagolysosome after a respiratory burst. Phagocytosis began as a technique of obtaining nutrition, but in phagocytes, it has developed to incorporate pathogen engulfment as a defence mechanism. Because phagocytes have been found in both vertebrate and invertebrate creatures, phagocytosis is likely the oldest method of host defence.

Neutrophils and macrophages are phagocytes that hunt out invading germs throughout the body. Neutrophils are the most common form of phagocyte found in the bloodstream, accounting for 50% to 60% of all circulating leukocytes. Neutrophils travel toward the site of inflammation in a process known as chemo taxis during the acute phase of inflammation, and they are frequently the first cells to arrive at the infection site. Macrophages are multifunctional cells that live inside tissues and produce a variety of chemicals such as enzymes, complement proteins, and cytokines. They can also act as scavengers, removing worn-out cells and other debris from the body, and as Antigen-Presenting Cells (APC), triggering the adaptive immune system.

Dendritic cells are phagocytes that live in tissues that come into contact with the outside world, such as the skin, nose, lungs, stomach, and intestines. They get their name from their similarity to neuronal dendrites, which feature numerous spine-like extensions. Dendritic cells act as a link between the body's tissues and the innate and adaptive immune systems, presenting antigens to T cells, one of the adaptive immune system's most important cell types.

Leukocytes with granules in their cytoplasm are known as granulocytes. Neutrophils, mast cells, basophils, and eosinophil's all fall within this category. Mast cells govern the inflammatory response and are found in connective tissues and mucous membranes. They're most commonly linked to allergies and anaphylaxis. Neutrophils are related to basophils and eosinophils. They produce chemical mediators that help the body fight parasites and have a role in allergic reactions like asthma.

ILCs (Innate Lymphoid Cells) are a type of innate immune cell that develops from a common lymphoid progenitor and belongs to the lymphoid lineage. Because of the lack of a recombination activating gene, these cells lack an antigen specific B or T Cell Receptor (TCR). Myeloid and dendritic cell markers are not expressed by ILCs. Natural Killer cells (NK) are lymphocytes that are part of the innate immune system that do not fight invading microorganisms directly. NK cells, on the other hand, eliminate compromised host cells, such as tumour cells or virus-infected

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cells, by detecting them as "missing self." This phrase refers to cells that have low amounts of MHC I (Major Histocompatibility Complex), a condition that can occur during viral infections of host cells. Because normal body cells express intact self MHC antigens, NK cells do not detect them and destroy them. Killer cell immunoglobulin receptors detect such MHC antigens, thereby shutting off NK cells.

Inflammation

Inflammation is one of the immune system's earliest responses to infection. Increased blood flow into tissue causes inflammation, which manifests as redness, swelling, heat, and pain. Eicosanoids and cytokines, which are secreted by wounded or infected cells, cause inflammation. Prostaglandins, which cause fever and the dilatation of blood vessels associated with inflammation, and leukotriene's, which attract specific white blood cells, are examples of eicosanoids (leukocytes). Interleukins, which are important for communication between white blood cells; chemokine's, which facilitate chemo taxis; and interferon's, which have antiviral effects such as shutting down protein synthesis in the host cell, are all examples of common cytokines. It's also possible that growth factors and cytotoxic factors will be released. These cytokines and other chemicals recruit immune cells to the site of infection and promote healing of any damaged tissue following the removal of pathogens. The pattern-recognition receptors called inflammasomes are multiprotein complexes (consisting of an NLR, the adaptor protein ASC, and the effector molecule pro-caspase-1) that form in response to cytosolic PAMPs and DAMPs, whose function is to generate active forms of the inflammatory cytokines IL-1β and IL-18.