

Inflammation

Inflammation is the first response of the immune system to infection or irritation and may be referred to as the innate cascade. Inflammation is characterized by the following quintet: redness (rubor), heat (calor), swelling (tumor), pain (dolor) and dysfunction of the organs involved (functio laesa). The first four characteristics have been known since ancient times and are attributed to Celsus; functio laesa was added to the definition of inflammation by Rudolf Virchow in 1858.

Characteristics

Inflammation has two main components - cellular and exudative. The exudative component involves the movement of fluid, usually containing many important proteins such as fibrin and immunoglobulins (antibodies). Blood vessels are dilated upstream of an infection (causing redness and heat) and constricted downstream while capillary permeability to the affected tissue is increased, resulting in a net loss of blood plasma into the tissue - giving rise to edema or swelling. The swelling distends the tissues, compresses nerve endings, and thus causes pain.

The cellular component involves the movement of white blood cells from blood vessels into the inflamed tissue. The white blood cells or leukocytes take on an important role in inflammation; they extravasate (filter out) from the capillaries into tissue, and act as phagocytes, picking up bacteria and cellular debris. They may also aid by walling off an infection and preventing its spread. If inflammation of the affected site persists, released cytokines IL-1 and TNF will activate endothelial cells to upregulate receptors VCAM-1, ICAM-1, E-selectin, and L-selectin for various immune cells. Receptor upregulation increases extravasation of neutrophils, monocytes, activated T-helper and T-cytotoxic, and memory T and B cells to the infected site.

Neutrophils are characteristic of inflammation - they are the first cells to appear in an infected area, and any section of inflamed tissue viewed under a microscope will appear packed with them. They are easily identified by their multilobed nuclei and granular cytoplasm and perform many important functions, including phagocytosis and the release of extracellular chemical messengers.

Leukocytes and cytokines

Various leukocytes are involved in the initiation and maintenance of inflammation. These cells can be further stimulated to maintain inflammation through the action of adaptive cascade through lymphocytes: T cells, B cells, and antibodies.

These inflammation cells are:

- Mast cells which release histamine and prostaglandin in response to activation of stretch receptors. This is especially important in cases of trauma.
- Macrophages which release TNF- α , IL-1 in response to activation of toll-like receptors.
 - appendicitis: appendix
 - gastritis: stomach
 - laryngitis: larynx
 - meningitis: meninges (the membrane covering the brain)
 - otitis: ear
 - pancreatitis: pancreas

Related Supplements & Accessories: Little Fish Oil, pH Kit

HealthQuest Radio Shows about Inflammation: pH I, pH II, pH III, Disease Toxicity Connection

Product Sheets: Little Fish Oil, pH Kit Handouts

Outcomes

The outcome in a particular circumstance will be determined by the tissue in which the injury has occurred, and the injurious agent that is causing it.

There are three possible results to inflammation:

Resolution, the complete reconstitution of damaged tissue, does not usually occur in the body. Connective tissue scarring. Some 24 hours after inflammation in a wound first occurs, the wound healing response will commence. This response involves the formation of connective tissue to bridge the gap caused by injury, and the process of angiogenesis, the formation of new blood vessels, to provide nutrients to the newly formed tissue. Often healing can not occur completely and a scar will form; for example after laceration to the skin, a connective tissue scar results which does not contain any specialized structures such as hair or sweat glands.

Ongoing or chronic inflammation.

If the injurious agent continues, chronic inflammation will ensue. This process, marked by inflammation lasting many days, months or even years, may lead to the formation of a chronic wound. Chronic inflammation is characterized by a dominating presence of macrophages in the injured tissue, which extravasate via the same methods discussed above (ICAM-1 VCAM-1). These cells are powerful defensive agents of the body, but the toxins they release (including reactive oxygen species) are injurious to the organism's own tissues as well as invading agents. This is why chronic inflammation is almost always accompanied by tissue destruction. Finally, an abscess, or a collection of pus, can form in chronic inflammation.

Systemic inflammation

Sepsis: When inflammation overwhelms the whole organism, systemic inflammatory response syndrome (SIRS) is diagnosed. When it is due to infection, the term sepsis is applied. Vasodilation and organ dysfunction are serious problems that may lead to septic shock and death.

Low-grade: With the discovery of interleukins, another concept of systemic inflammation developed. Although the processes involved are identical, this form of inflammation is not confined to a particular tissue but involves the endothelium (lining of blood vessels) and many other organ systems. High levels of several inflammation-related markers such as IL-6, IL-8, and TNF- α are associated with obesity [1][2]. These levels are reduced in association with increased levels of anti-inflammatory molecules within four weeks after patients begin a very low calorie diet [3]. The role of systemic inflammation as a cause and/or result of insulin resistance and atherosclerosis is the subject of intense research. It has little direct bearing on clinical care.

Inflammation examples: Inflammation is usually indicated by adding the suffix "-itis", as shown below. However, some conditions such as asthma do not follow this convention.

Tags: inflammation, pH balance, acid, alkaline, pH acidosis, urinary pH, saliva pH

NOTE: *Any recommendations are based on general conditions and are not specific to the individual. It is strongly recommended that anyone seeking the most effective treatment do so through the specific recommendations of a licensed and qualified healthcare professional.*