

INFLAMMATION IS A PROTECTIVE REACTION OF THE BODY

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**Annotation.** This article discusses inflammation as an important protective-adaptive reaction of the body that develops in response to harmful factors (infection, mechanical damage, chemical and physical effects). The main stages of the inflammatory process, pathophysiological mechanisms, and the role of cellular and humoral factors are analyzed. Also, the positive and negative aspects of inflammation, acute and chronic forms, and their clinical significance are considered. The article serves as a theoretical basis for medical workers and students to better understand the inflammatory process and correctly assess it.

**Keywords.** Inflammation, protective reaction, pathogenesis, acute inflammation, chronic inflammation, mediators, vascular reactions, cellular response, immune system.

**Introduction.** The body is in constant contact with the external environment and is regularly exposed to various harmful factors - microorganisms, mechanical damage, chemicals, and physical effects. These factors can disrupt the normal structure and function of cells and tissues. Therefore, a living organism activates complex and coordinated biological reactions to protect itself and maintain internal balance. One of such important protective and adaptive mechanisms is the inflammatory process. Inflammation is not only a pathological condition for the organism, but also a necessary process that serves to eliminate harmful factors, restore damaged tissues, and prevent the spread of infection [1]. This reaction is evolutionarily formed and is characteristic of all living organisms. Vessels, blood cells, biologically active substances, and elements of the immune system actively participate in the inflammatory process. However, inflammation is not always beneficial. If it persists for a long time or gets out of control, it can lead to additional tissue damage, organ dysfunction, and the development of chronic diseases [2]. Therefore, in-depth study of the mechanisms of inflammation is of great importance in clinical medicine. Thus, one of the most important biological reactions of the body in response to harmful effects is inflammation. Inflammation is a complex, multi-stage and protective pathological process that develops in the body in response to damaging factors. Inflammation is a complex biological process that occurs when tissues and cells of the body are damaged, aimed at eliminating harmful factors and restoring the damaged structure. This process can be initiated by microorganisms, mechanical injuries, chemicals or physical effects. During the inflammatory process, vessels dilate, blood flow increases, and the permeability of the vessel walls increases. As a result, fluid and blood cells enter the inflammatory focus, which serves to neutralize damaging factors. Inflammation is also accompanied by the activation of cellular and humoral factors, increasing the overall protective capabilities of the body [3]. At the same time, if the inflammatory process is too strong or prolonged, it can cause additional damage to tissues. A



correct understanding of the mechanisms of the development of the inflammatory process makes it possible to determine the causes of its occurrence, characteristics of its course and consequences. The exact factors under which inflammation begins and through what stages it develops require a thorough study of its pathogenesis. The pathogenesis of inflammation is a complex set of pathophysiological mechanisms that determine the onset, development and completion of this process. Pathogenesis begins with the initial changes that occur in cells after exposure to a damaging factor. At this stage, cell membranes are damaged, biologically active substances are released, and inflammatory mediators are activated. Vascular reactions play an important role in the pathogenesis of inflammation [4]. First, a short-term spasm of the vessels is observed, and then their expansion, which leads to increased blood flow. As a result of increased permeability of the vascular walls, fluid and leukocytes enter the inflammatory focus. This process is accompanied by exudation and cell migration. Also, the immune system is actively involved in the pathogenesis process, mechanisms aimed at phagocytosis, cytokine release, and tissue repair are activated. The features of pathogenesis determine the speed, duration, and clinical manifestations of inflammation. One of the most pronounced forms of inflammation pathogenesis is its rapid development and clear symptoms, which is characteristic of acute inflammation. Acute inflammation is a form of inflammation that develops within a short time after exposure to a damaging factor and is accompanied by clear clinical and morphological signs. It often occurs under the influence of infections, mechanical injuries, burns, or chemicals. The main symptoms of acute inflammation include redness, swelling, pain, increased local temperature, and impaired function [5]. In this form of inflammation, vascular reactions predominate, resulting in the formation of exudate due to dilation and increased permeability of blood vessels. Neutrophils actively migrate to the site of inflammation and destroy harmful factors in the process of phagocytosis. This provides a rapid protective response of the body. Acute inflammation usually ends with complete tissue repair after the harmful factor is eliminated. However, in some cases, the process may not be completely completed, may last longer, and may take on a different form. If acute inflammation is not adequately controlled or the harmful factor persists for a long time, it can gradually turn into chronic inflammation. Chronic inflammation is a form of inflammation that lasts for a long time and is accompanied by profound structural and functional changes in the tissues. It often develops as a result of incomplete resolution of acute inflammation, prolonged persistence of a harmful factor, or impaired immune system function. Chronic inflammation underlies many infectious and non-infectious diseases [6]. In this process, cellular reactions predominate, and lymphocytes, macrophages, and plasma cells multiply in the inflammatory focus. Fibrosis, sclerosis, and degenerative changes may occur in tissues. As a result, the normal function of organs gradually deteriorates. Although chronic inflammation has a protective effect on the body, its prolonged course reduces the ability of tissues to regenerate and leads to the deepening of pathological processes. Therefore, timely detection and assessment of this process is important. In the process of chronic inflammation, biologically active substances are constantly released, which ensure the continuation of inflammation, which are called mediators. Mediators are biologically active substances released from cells and tissues during inflammation and play an important role in the initiation, development and control of inflammation. They include histamine, serotonin, prostaglandins, leukotrienes, cytokines and other substances. These mediators affect the intensification or attenuation of the inflammatory response by changing the tone and permeability of blood vessels [7]. Under the influence of mediators, blood vessels dilate, the permeability of the vessel walls increases, and leukocytes are attracted to the focus of inflammation. Mediators also cause pain, fever and signs of general intoxication. In this way, they provide a complex protective response of the body against harmful factors. However,



excessive or prolonged activity of mediators can lead to uncontrolled progression of the inflammatory process. Therefore, regulating the activity of mediators is important in the treatment process. The main functional changes that occur as a result of the action of mediators are manifested, first of all, by vascular reactions. Vascular reactions are one of the most important and initial stages of the inflammatory process and include functional and structural changes that occur in blood vessels in response to the action of a damaging factor. These reactions develop under the influence of inflammatory mediators and serve to increase blood flow to the focus of inflammation. At first, a short-term vascular spasm is observed, and then the vessels dilate. As a result, redness and an increase in local temperature appear in the area of inflammation. Increased permeability of the vascular walls leads to the release of fluid and plasma proteins into the tissues, which causes the formation of edema [8]. Vascular reactions deliver not only fluid, but also protective cells to the focus of inflammation. This ensures an effective response of the body to harmful factors. As a result of vascular reactions, active migration of leukocytes to the focus of inflammation begins, which triggers processes associated with the cellular response. The cellular response is the active participation of blood cells and tissue cells in the inflammatory process, directed to the damaged area. At this stage, leukocytes, especially neutrophils and macrophages, migrate to the focus of inflammation and carry out the process of phagocytosis. Through this, microorganisms and damaged cell parts are destroyed. During the cellular response, cytokines and other biologically active substances are released by the cells, which ensure the continuation and control of the inflammatory process [9]. At the same time, lymphocytes play an important role in the formation of the immune response and enhance the body's defense capabilities. The effectiveness of the cellular response determines the final outcome of the inflammatory process. If this stage proceeds correctly and in a coordinated manner, damaged tissues can be fully restored. The cellular response is closely related to the active participation of the immune system in the inflammatory process. The immune system is a complex biological system that protects the body from harmful microorganisms, toxins, and damaged cells. The immune system actively participates in the inflammatory process through cellular and humoral components. Neurons, macrophages, lymphocytes, and plasma cells migrate to the site of inflammation, destroy microbes, and support the process of cell repair. The interaction of the immune system with mediators determines the speed and effectiveness of the inflammatory process. At the same time, an excess or violation of the immune response can lead to the development of chronic inflammation and autoimmune diseases [10]. The immune system, through its activity in the inflammatory process, helps to initiate the processes of repair and tissue repair, providing the body's protective reaction. Repair is the process of restoring damaged cells and tissues after the inflammatory process and is the final stage of the body's natural defense and adaptation mechanisms. In this process, cells multiply, new tissue elements are formed, and normal tissue function is restored. The repair process is ensured by the coordinated work of mediators, cellular responses, and elements of the immune system. If the repair process is effective, the damage caused by acute inflammation is completely repaired and the body's defenses are maintained. However, if inflammation persists for a long time or becomes chronic, the repair process may not be effective enough, and fibrosis and pathological changes in the tissues may occur. The success of the repair process depends on the harmonious functioning of all mechanisms in the inflammatory process, which at the same time determines the effectiveness of the overall protective response of the organism.

**Conclusion.** Inflammation is a complex and protective biological process of the organism that develops against harmful factors. Through the effective course of this process, harmful microorganisms and damaged cells are eliminated, tissues are restored, and the overall protective capabilities of the organism are maintained. The inflammatory process occurs in several stages:



vascular reactions occur through the activity of mediators, a cellular response is triggered, and the immune system manifests its activity. Together, these mechanisms provide an effective protective response that protects the organism from harmful effects. While acute inflammation is a rapid response to a damaging factor, chronic inflammation can last a long time and cause pathological changes in tissues. Therefore, a deep study of the inflammatory process and a correct assessment of its mechanisms are of great importance in clinical medicine, in the treatment and prevention of diseases. As a result, inflammation is a key component of the body's natural defense response, and its effective functioning is important for human health and normal life activities.

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