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PROTECTIVE PROPERTIES OF THE ORGANISM AND MODERN CONCEPTS OF THE IMMUNE SYSTEM

Akhmadalieva N. O.
Tashkent Medical Academy

The human body is capable of protecting itself from the emergence and development of diseases, primarily infectious and tumorous ones. One of the main protective structures of the body is the immune system - a complex network of cells and organs that, when functioning normally, provide protection to the body from the introduction of "foreign" [21-22].

Until the mid- 20th century, the term "immunity" meant the body's resistance to infectious disease pathogens (microbes, viruses, protozoa). Half a century ago, the term acquired a broader meaning, denoting an active reaction aimed at eliminating any genetically foreign substance ("foreign" cells, tissues, organs) from the body. Immunity is based on the recognition of "self" and "foreign" and the displacement of "foreign" with the help of special mechanisms that maintain the constancy of the body's internal environment (homeostasis) [6].

It is known that 98.5% of multicellular animals do not have an immune system; only 1.5% of species, starting with jawed fish, have one. However, in any organism, in addition to the immune system, there are more ancient mechanisms of protection against infection - integumentary tissues, humoral bactericidal secretions, endogenous antibiotics, phagocytes, i.e. factors of natural resistance [7-8]. Nevertheless, only the immune system ensures the synthesis of antibodies in the body - specifically programmable molecules capable of recognizing and protecting the body from "aliens" [21].

According to modern concepts, there are several types of immunity. The most ancient form is innate (natural) immunity, which does not require preliminary activation for its development. The main components of innate immunity in humans are:

- phagocytosis provided by cells of the mono-macrophage series;
- complement, which is a system of plasma proteins that facilitate the interaction of an antigen with a phagocytic cell or act independently;
- a system of natural killers that provide antitumor and antiviral protection by cytolysis of the target object.

A later link in evolution is acquired (or specific) immunity, the characteristics of which are high specificity in relation to each antigen and the presence of immunological memory. There are two main types of acquired immunity: humoral, associated with B-lymphocytes, and cellular, associated with T-lymphocytes [6].

Many cells take part in the implementation of immune reactions and the destruction of antigens entering the body – monocytes, macrophages, dendritic cells [7, 10, 21], but the immune response itself is associated mainly with lymphocytes.

The immune system as an anatomical structure is a lymphoid system, the main and special cells of which are lymphocytes. Therefore, immunity is "a set of properties and interactions of lymphocytes" [8]. Lymphocytes determine the immune response to antigens, immunological tolerance, immunological memory and allergy; play the role of auxiliary helper cells [1, 14], regulate the monooxygenase system of the body [9]. But the main specificity of lymphocytes is that during their differentiation from precursor cells, their DNA is reorganized and specialized receptors for antigens are formed. The number of these receptors is unprecedentedly large (about 10^{18}), their main function is the recognition of destruction products on the membranes of cells throughout the body. Lymphocyte receptors form complexes with the decay products of cells and tissues and, together with them, are subject to biochemical utilization with the excretion of decay products through the kidneys and gastrointestinal tract. Therefore, the immune system is primarily a "cleaner" of the internal environment of the body from the decay products of its own cells [8]. In the absence of infectious agents or tissue damage, the described processes are the norm. In the case of the introduction of microbes, foreign proteins into the body, with injuries and other tissue damage, the volume of lymphocyte reactions increases accordingly, the immune response goes beyond the norm and manifests itself in signs of immune inflammation.

In addition to specific antibodies, immune system cells produce many biologically active molecules that play a major role in the development of the immune response and can be considered as an integral part of biotherapy aimed at restoring or enhancing the functions of the immune system. These are the so-called MBRs: interferons, interleukins, colony-stimulating factors, monoclonal antibodies, etc. [21].

In general, the immune response in the body is a sequential development of 4 main processes - primary recognition of “foreign” by pre-immune inflammatory cells (integumentary tissues, phagocytes, dendrites) with the formation of peptide complexes (PC) → recognition of PC by T-lymphocytes → proliferation of lymphocytes and their production of cytokines and antibodies → migration of immune lymphocytes to damaged tissues, their destruction, development of immune inflammation [7].

The immune response in the body can be stimulated by influencing each of these links, however, G.A. Ignatyeva [8] warns that any of the interventions can be risky and is only justified when using vaccines. Since the immune system is closely connected with all organs and tissues, non-specific effects on the body (e.g., hardening, physical training, inhibition of the proliferation of pathogenic microbes) can effectively help the immune system [8].

An important aspect of such an impact may be the normalization of the body's microflora. It has been found that normal microflora, including that of the gastrointestinal tract, ensures the activation of the immune system: by participating in the synthesis of immunoglobulins , lysozyme, interferon and cytokines, the microflora promotes the mobilization of the macroorganism's immune reactivity [12, 18, 19, 24].

Modern humans, especially those living in hot climates, are characterized by changes in the body's microflora [2, 4, 23]. Disruption of the intestinal microflora (increase in the total number of aerobes, decrease in the number of bifido- and lactobacilli, etc.) is accompanied by dysfunction of the immune system, in particular, an increase in the number of leukocytes in the blood, a decrease in the percentage of T-, B- and N -lymphocytes, inhibition of the phagocytic activity of neutrophils, and an increase in the content of immunoglobulins G , A and M in the blood [11, 16-17]. Correction of the body's microbiocenosis has a positive effect on immunological parameters [3]. At the same time, in the process of evolution, the body has developed tolerance to its own microflora, the consequence of which is the absence of an immune response to this microflora [13].

By now, a situation has developed in which suppression of the body's protective properties is characteristic of the majority of the population. This requires searching for ways of mass immunocorrection , which is capable of neutralizing the adverse effects of environmental factors on the body and can be considered as

immunoprophylaxis or immunorehabilitation [5, 20]. Researchers working in this field believe that for such immunocorrection it is advisable to use biologically active substances of natural origin that do not have side effects and are natural metabolites, since the immune system is an extremely delicate and sensitive mechanism, thoughtless interference in the work of which can cause harm instead of benefit [1 5, 24].

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