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Review Article

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CHANGES IN LOCAL MUSCOSAL IMMUNITY OF THE UPPER RESPIRATORY TRAINS ON THE BACKGROUND OF ACUTE RESPIRATORY VIRAL INFECTIONS

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SUMMARY

According to a number of researchers, the incidence of chronic recurrent pathology on the part of ENT organs is 30-40%. This is determined by both a decrease in local immunity and inadequate etiopathogenetic therapy. The attitude of doctors to the use of antibiotics for acute respiratory inflammatory processes in different countries of the world is not the same.

The study of the relationship in the system of micro- and macroorganisms in ARVI, with the involvement of the upper respiratory tract, the assessment of the local and systemic immune response to the infectious process is a relevant scientific and practical research that will allow the development and presentation of therapy regimens with the differentiated use of immunomodulatory agents.

KEYWORDS: local mucosal immunity, upper respiratory tract, innate immunity, nonspecific immunity, acute respiratory viral infections

Respiratory viral infections and their complications are still an urgent problem of both theoretical and practical medicine, despite serious research carried out on this pathology over the past decades. One of the most common manifestations of acute respiratory viral infections (ARVI) is damage to the JIOP organs. According to foreign researchers, during the life of an adult, 95% of people with ARVI have at least one episode of acute otitis media, and 55% have three or more episodes.[2,5] According to Russian authors, the prevalence of acute otitis media among adults ranges from 20 to 75%.[7,13]

The importance of viral infection in the occurrence of inflammation in the upper respiratory tract was first expressed by Bergland and Salmivalli in 1967, later this point of view was confirmed and it was found that adenoviruses and influenza A and B viruses are significant.[6,11] It is believed that viruses are important only at the initial stage of the disease, then the bacterial flora causes the infectious process. The main causative agents of acute ENT pathology are S. pneumoniae and H. influezae in 40-60% of cases, enterobacteriaceae - 27%, M. catarrhalis, S. pyogenes, S. aureus (10-30%), etc.[5,7,9,10]

It is known that the protection of the human body from viral and bacterial infections is provided by various immune factors that can limit or suppress the reproduction of the pathogen. The high incidence of complications in respiratory viral pathology in children is due to the low immunoreactivity of the mucous membranes.

The immune system of the mucous membranes forms a protective barrier that protects the host organism from the effects of various microflora. The activation of the immune system proceeds against the background of minimal inflammatory reactions and is not accompanied by tissue damage.[9,10] In the immunological defense of mucous membranes, three components of the mechanism are considered: immune exclusion, immune regulation, and immune clearance or clearance. Immune exclusion limits the colonization of the epithelium by microorganisms and inhibits the penetration of foreign soluble antigens. Immune regulation is determined by mucosal function (production of mucin, lysozyme, lactoferrin, electrokinetic activity of epithelial cell nuclei) and antigen-presenting cells (macrophages, dendritic cells, epithelial cells, T and B lymphocytes). Immune cleansing performs the task of recognizing, inactivating, destroying and removing foreign antigenic material that has penetrated the epithelium. The formation of humoral and cell-mediated defense mechanisms is supported by biological enhancement factors (amplification), which include cytokines, complement, natural killer cells, eosinophils, neutrophils, monocytes / macrophages. Biological amplification

mechanisms are triggered when antigen removal within the mucous membrane is unsuccessful and can acquire immunopathological significance, forming delayed-type hypersensitivity or the development of a protracted recurrent infectious process.[1,3,6,7,12]

According to a number of researchers, the incidence of chronic recurrent pathology from the ENT organs is 30–40%.[9] This is determined by both a decrease in local immunity and inadequate etiopathogenetic therapy. The attitude of doctors to the use of antibiotics in acute respiratory inflammatory processes in different countries of the world is not the same.[8,10,11]

The study of the relationship in the system of micro- and macroorganisms in ARVI, with the involvement of the upper respiratory tract, the assessment of the local and systemic immune response to the infectious process is a relevant scientific and practical research that will allow the development and presentation of therapy regimens with the differentiated use of immunomodulatory agents.

As you know, the nasal mucosa is the area that is exposed to a wide variety of foreign particles. Allergen molecules extremely quickly cause an allergic reaction, as a result of which sneezing, itching in the nasal cavity, rhinorrhea occur within a minute after the penetration of allergens. In allergic rhinitis, the developing reactions are of the immediate type. Their mechanism consists in a sequence of stages replacing each other. The reaction is triggered by the interaction of the allergen with allergic antibodies related to IgE. The interaction of the allergen with IgE occurs on the mast cells of the connective tissue and basophils. This is followed by the release of biochemical mediators from mast cells and basophils. Histamine is the most important substance that is released from transmitter cells in allergic nasal diseases. It has a variety of effects. First, a direct effect on cellular histamine receptors, which is the main cause of edema and nasal congestion. Secondly, histamine has an indirect reflective effect that leads to sneezing. Thirdly, histamine causes increased epithelial permeability and hypersecretion. All these factors together lead to pronounced edema of the mucous membrane and blockage of the sinuses and auditory tube. The necessary prerequisites for the development of an already infectious pathological process in the ENT organs arise.[4,5,10,11]

Exhaust gases, chemical and dust irritants, tobacco smoking, unfavorable meteorological conditions can also act as other etiological factors of damage to the mucous membrane. Delicate epithelial tissue is most susceptible to adverse environmental influences. In the city, directly at the surface of the earth, the greatest concentration of all types of xenobiotics is found - free radical compounds, carcinogens, salts of heavy metals, all types of allergens, and, of course, pathogenic microorganisms. The mucous membrane of the nose, mouth and pharynx is in constant contact with the inhaled air and thus is exposed to harmful environmental factors, which leads to its edema. In any case, conditions arise under which the nasal mucosa becomes easily infected, reacting with the appearance of significant edema.[5,6,10,11]

The epithelial cover of the upper respiratory tract retains microbes and viruses from penetration. Under conditions of a normally functioning immune defense in the presence of mature inflammatory factors, pathological changes in the epithelial lining are completed by the restoration of the structural integrity of the epithelium or the formation of an immune response and the production of antibodies. With various deviations in the immune homeostasis system, various variants of protracted and chronic inflammation form, in which the structural organization of the organ itself changes.

The most important factor of nonspecific protection in the local immunity system is the normal production of mucus, which mechanically hinders the access of microbes to the epithelial cells of the upper respiratory tract. A number of compounds secreted in mucus, such as polysaccharides, can block microbial receptors responsible for adhesion. As you know, without adhesion of the microbe to the epithelial cell, the infectious process cannot begin. Nonspecific factors of natural resistance include the production of bactericidal substances by the serous glands, such as lactoferrin, lysozyme, which can lyse the cell walls of microbes. In the implementation of mucociliary transport of mucus, a certain role is played by cells of the phagocytic series, which carry out phagocytic and contact destruction of the pathogen. Nonspecific factors constitute the first "echelon", which further cooperates with specific protective factors, namely with antigen-specific reactions of the lymphoid tissue of the palatine tonsils and lymphoid formations on the posterior wall of the pharynx, pharyngeal, lingual and tubal tonsils, which is a reflection of the functioning of local immunity. An important role in providing nonspecific protection is also played by the inflammatory reaction at the site of introduction of the pathogen, accompanied by the migration of inflammatory cells into the pathological focus and the formation of various inflammatory mediators.[6,12]

The leading link in the implementation of local immunity is secretory antibodies, that is, specific immunoglobulins of classes A and M, linked to a secretory component - glycoprotein, which is secreted by the cells of the respiratory epithelium. It has been proven that secretory immunoglobulins of classes A and M are of local origin and are the aggregate product of cells that make up the mucous membrane, namely: local epithelial cells, goblet cells of the respiratory epithelium and plasma cells of the lamina propria. Class A secretory immunoglobulin differs from immunoglobulins of the same class circulating in the blood by the presence of a secretory component (SC) and a j-peptide. The main function of the j-peptide is to bind monomeric IgA molecules into

dimers and polymers. In addition, the SC-peptide protects the immunoglobulin A molecule from proteolytic degradation, i.e., from the lytic action of the local microbial flora. Secretory antibodies - sIgA and sIgM form the first line of immunological defense of the mucous membrane of the lymph accumulations included in the Waldeyer-Pirogov ring.[8,11,12,17] Their biological function is to inactivate, bind antigens by blocking the corresponding surface receptors of bacteria. Another putative mechanism associated with sIgA independent of complement is its ability to accelerate phagocytosis. The ecological niche, which is the mucous membrane that covers the upper respiratory tract, has specific features. Microorganisms can penetrate here without hindrance, therefore, there are complex associations of cohabiting microbes that form biofilms that have polyvalent resistance to antibacterial, antimycotic and antiviral drugs. There are also natural defenses against pathogens. These are integral, normally functioning border tissues - the mucous membrane, as well as the presence of representatives of normal microflora - the main antagonists of pathogenic microflora (colonization immunity).[9]

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