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Clinical Pharmacology Of Immunocorrector Drugs

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Abstract. The concept, strategy and principles of immunocorrection and immunomodulatory therapy, pharmacological and immunobiological characteristics, mechanisms of action of immunomodulators of various natures, indications for their use are presented.
Keywords: immune system, immunodeficiencies, immune status, immunopharmacology, immunocorrection, immunotherapy.

INTRODUCTION

One of the most important functions of the immune system is to maintain the constancy of the internal environment of the body, which is achieved by recognizing and eliminating antigens that carry signs of genetically alien information. The impact of foreign substances of an antigenic nature and unfavorable environmental factors on the body causes disturbances in the functional state of the immune system, manifested in the form of immunodeficiencies. Correction of the impaired state of the immune system is carried out with the help of immunotropic drugs (ID), the therapeutic effect of which is associated with a preferential or selective effect on the immune system of the body. They include three main groups: immunomodulators (restore impaired functions of the immune system), immunostimulants (primarily enhance immunity) and immunosuppressants (suppress the immune response). Immunomodulators have a multidirectional effect on the immune system, and therefore they are used in the complex therapy of diseases with signs of secondary immunological deficiency. Individual immunomodulators can selectively influence the corresponding link of the immune system, but the final effect is multifaceted, since the functional activity of the entire immune system changes [1].

MATERIALS AND METHODS

The main cellular targets for these drugs are antigen-presenting cells (macrophages, dendritic cells), recognition (T-lymphocytes) and effector (neutrophil phagocytes, monocytes/macrophages, natural killers, cytotoxic T-lymphocytes) cells. Therapeutic or prophylactic use of chemical or biological drugs with immunotropic activity in diseases associated with dysfunction of the immune system is called immunotherapy. There are three main groups of diseases in which the use of immunomodulators is advisable: immunodeficiencies, allergic and autoimmune processes. In recent years, since the beginning of the use of the first immunomodulators (pyrogenal, BCG vaccine), the interest of researchers and practicing veterinary specialists in the problem of immunocorrective therapy and the use of drugs in clinical practice to activate immunity and influence the immune system of animals has increased [2-4]. This is due, first of all, to the increasing environmental problems and the increasing load on the animal body of anthropogenic factors, a significant increase in immunodeficiency states and the understanding that the development of most pathological processes is due to a violation of the functions of the immune system. Interest in immunomodulators on the part of practicing doctors is also due to the increasing ineffectiveness of traditional methods of disease therapy, the growing resistance of pathogens to traditional drugs [5]. The pharmaceutical market offers a wide range of drugs, one way or another classified as immunomodulators or immunostimulants, which differ in their structure and mechanisms of action [2]. The market for these drugs is growing every day, and a practicing veterinary specialist is not always able to understand and select an effective remedy in a given situation.

RESULTS AND DISCUSSION

Classification, pharmacological and immuno-biological properties of immunomodulators. According to the chemical structure and biological properties, all immunomodulators can be divided into 7 groups: immunoactive components of the surface structures of pathogens (microbial), thymic hormones, bone marrow regulators - myelopeptides or their analogues, as well as cytokines, nucleic acids, plant and

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chemically pure [3]. In the action of immunomodulators, the principle of specificity is most important. The group of drugs that make up the immunoactive structures of pathogens includes: prodigiosan and pyrogenal (lipopolysaccharides of bacterial origin, which are rarely used due to high pyrogenicity and other side effects), salmosan (purified polysaccharide of typhoid bacteria), ribomunil (ribosomal fractions of K.pneumoniae, D.pneumoniae, S.pyogenes, H.influenzae), likopid, dostim, gramin, bioinfusin. Their target is macrophages and other antigen-presenting cells. The new generation drugs in this group include likopid (glycopin), which is a proteoglycan component of the bacterial cell wall. Second-generation microbial drugs include bacterial lysates (bronchomunal, bronchovaxom, imudon). The second group of drugs includes thymic hormones and their analogues. Thymic drugs affect mainly the T-cell component of the immune response. T-activin is the first complex drug in this group, which is a complex of peptides extracted from the thymus of cattle. Other drugs, differing in molecular weight and chemical nature, are represented by thymalin, thymoptin, thymactide, thymogen, thymulin, vilosen, thymopeptin. All drugs in this group have a similar mechanism of action, they promote differentiation of T-lymphocytes from immature precursors, increase the number of cytokine receptors on T-cells, stimulate the synthesis of cytokines, which initiate the proliferation and maturation of T- and B-lymphocytes. A synthetic analogue of the immunomodulatory region of thymopoietin is imunofan, a regulatory hexapeptide that includes 32-36 amino acid residues of the active center of thymopoietin. Immunofan has a pronounced stress-protective effect, which is of great practical importance. The third group of drugs with immunotropic activity are myelopeptides. They are obtained from pig bone marrow. The progenitor of bone marrow-derived drugs is myelopide, which is a complex of bioregulatory mediators. Drugs of this group, which include B-activin, have the ability to activate both the humoral and cellular components of immunity. Myelopeptides have a broad spectrum of action, in particular, immunoregulatory, differentiating and neurotropic biological activity. The new generation drugs from this group are seramil with an antibacterial effect and bivalen with an antitumor effect.

The fourth group consists of cytokines - a complex of endogenous immunoregulatory molecules that serve as the basis for natural and recombinant immunomodulatory drugs: leukinferon, superlymph, betaleukin, roncoleukin, molgramostim, alpha-, beta- and gamma-interferons, leukomax, which affect various effector cells: macrophages, lymphocytes, NK cells. The best known in veterinary medicine is leukinferon, which is a complex of cytokines of the first phase of the immune response, which has the ability to activate the phagocytic activity of neutrophils. Superlymph, also a complex of natural cytokines, is the first cytokine drug for local immunocorrection. Roncoleukin is one of the central regulatory cytokines, which is a medicinal form of recombinant human IL-2 obtained by the method of immune biotechnology. Betaleukin is a medicinal form of recombinant IL-1β obtained by the method of immune biotechnology, plays an important role in the activation of innate immunity factors. The drugs have pronounced antiviral, immunomodulatory and antioxidant properties, stimulate natural resistance factors, which provides a wide range of indications for their use [2]. Immunocorrection is also carried out on the basis of interferon and cytokine inducers: amixin, arbidol, cycloferon, neovir, larifan, ridostin, poludan. All of them stimulate the production of α-interferon and as a result have antiviral activity. Among the immunocorrection agents from among natural preparations, the leading place in terms of the breadth of the spectrum of biological activity is occupied by nucleic acid preparations and products of their enzymatic degradation. A typical representative of this group is the sodium salt of yeast RNA (sodium nucleinate), obtained by hydrolysis and subsequent purification of yeast, does not have species specificity, is a natural component of the body and is devoid of side effects. These properties and the possibility of oral administration distinguish this drug from other immunomodulators that have an effect only on individual links of the immune system [3]. The active biological component of sodium nucleinate is nucleotides. Among the effective immunocorrective drugs for veterinary purposes, created on the basis of sodium nucleinate, should be attributed a new complex drug of natural origin ribotan. It increases the functional activity of macrophages, T- and B-lymphocytes, and also stimulates the synthesis of interferon and lymphokines. The use of ribotan is indicated for secondary immunodeficiencies of various origins. The inclusion of ribotan in the basic therapy improves the clinical and biochemical indices of humoral and cellular immunity and prevents the development of unfavorable outcomes. Clinical observations show that when prescribing antimicrobial agents for secondary immunological deficiency, it is advisable to use ribotan [2].

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Herbal preparations are also widely used to stimulate immunity, in particular various derivatives of purple echinacea, registered as immunomodulators (immunal, echinacea), which have immunomodulatory, antiseptic, antiviral, antibacterial and antioxidant properties. Carrot, calendula, rosehip and sea buckthorn essential oils have an immunostimulating effect on antibody formation; lavender, sage, savory, hyssop, rosemary, mint and lemon oils stimulate phagocytosis and the activity of natural killers and cytotoxic T-lymphocytes [4]. The immunostimulating effect of most plants is associated with the presence of biologically active substances with immunotropic properties in their composition: polyphenolic compounds, tannins, essential oils, vitamins, polysaccharides, saponins. Principles of using immunomodulators. Immunomodulators can be used both in combination therapy simultaneously with antibiotics, antiviral, antifungal or antiprotozoal agents, and as monotherapy. The use of immunomodulators alone in the treatment of diseases of various origins without etiotropic drugs cannot provide the expected effect, since they only complement the therapy adopted in each specific case.

CONCLUSION

The use of immunomodulatory drugs is justified even if immunodiagnostic studies do not reveal deviations in the immune status, since any chronic infectious and inflammatory process is based on changes in the functional state of the immune system. In cases where the use of antibiotics, antifungal, antiviral agents or other chemotherapeutic drugs is indicated, it is also necessary to prescribe immunomodulators. The emergence of immunotropic drugs in the arsenal of veterinary specialists opens up fundamentally new opportunities for the correction of immunodeficiency states of various origins in animals, increases the effectiveness of traditional therapy and disease prevention. The arsenal of drugs of natural origin is expanding, well-known drugs are offered for the treatment of diseases not associated with dysfunction of the immune system, but exhibiting the ability to stimulate or suppress them.

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