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PHARMACEUTICAL AND BIOMEDICAL ASPECTS OF SOFT MEDICINES IN MULTIPLE INJURIES

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In the course of the research conducted using systematic and surveillance, as well as bibliographic methods of analysis the main trends of modern development of manufacturing soft medicines for patients with multiple injuries associated with creation of new effective combined soft medicines, new combinations of carriers that exhibit a prolonged multi-purpose effect on the pathological inflammatory process in multiple injuries and meet current biomedical requirements have been identified.

One of the main directions of biopharmaceutics is the optimal choice of the type and composition of medicinal forms to ensure high safety and therapeutic efficacy. At present soft medicines is one of the most common dosage forms. They account for about 10% of the total volume of the finished products. Soft medicines are used in various fields of medicine for treatment, diagnosis and prevention of diseases [6, 10]. They are characterized by a relative simplicity and safety of application, efficiency and adaptability [7].

Materials and Methods

To achieve the goal set systematic and surveillance, as well as bibliographic methods of analysis are used.

Results and Discussion

The search active and auxiliary substances and methods of manufacturing technology based on physiological characteristics of the wound surface is the main areas of development and expansion of the assortment of domestic soft medicines in polytrauma. Regulating pharmaceutical variable factors the properties of the medicine for local application can be specifically affected, namely the kinetic properties of active substances can be changed, their distribution on the surface of the wound can be facilitated, prolongation of the therapeutic action can be provided, etc. [13].

The application method of using soft medicines for treatment of inflammatory processes in polytrauma allows to provide the maximum drug concentration directly in the site of injury.

This way of introducing soft medicines is considered to be the safest because most of the dose is on the surface of the affected area [5, 11].

The pharmacological effect of medicines for treatment of inflammatory processes in multiple trauma significantly depends on the nature, characteristics and quantitative ratios of the base components. The components of the base rationally selected can enhance the thera-

peutic activity of the active substance, promote or inhibit its release and absorption, strengthen or weaken its pharmacological effect, influence on the bioavailability, appearance of various side effects, determine the drug action (resorptive or surface). The pharmacotherapeutic effect and pharmacokinetics of the medicine depend on the base. The base impact on the state, properties and occurrence of the pathological process of the affected area, on which a soft medicine is applied. In addition, the base identifies the consumer characteristics of a soft medicine [4, 13].

Today in pharmaceutical practice there are about 200 individual and combined gel and ointment bases, which have various properties and meet one or another biomedical requirements. There is no ideal base; that is why several excipients are combined to provide the base the properties required [4, 5, 7].

As you know, ointments, creams for treatment of inflammation, particularly inflammatory processes in polytrauma, must possess a simultaneous multi-purpose effect on the basic etiopathogenetic links of inflammation, have the necessary osmotic activity, protect against secondary infection. Medical purpose of a medicine determines the use of appropriate excipients and bases of soft medicines [3].

Polyethylene oxide bases (from the mixture of macrogols) have these properties; due to bacteriostatic properties they are not subjected to microbial contamination. Besides, they release the medicines completely and prolong their effectiveness [2, 3]. The names of polyethylene oxide carriers of soft medicines are different: in the CIS countries they are macrogol bases; in the USA – carbowax, in France – scurool, in Germany – postonal, supofarm. The difference is in the diversity of compounds in the bases of polyethylene oxides characterized by different values of the molecular weight [9]. The bioavailability of active ingredients does not depend on the melting temperature of the polyethylene oxide base and is caused by the dissolution rate of the base and diffusion. From the position of technology the advantage of polyethylene oxide (PEO) bases is their great viscosity, which prevents sedimentation of insoluble medicinal substances [1].

Chemical indifference, thermal stability, the absence of polymorphous modifications and resistance to changes in pH determine the suitability of PEO-bases for production of medicinal forms for treatment of many inflammatory processes in multiple trauma. High affinity of the base to the biological fluids of the body (intercellular fluid) is able to provide a complete release of

medicinal substances from a medicine during a certain period of time [3, 4].

Taken into account the requirements for carriers of medicines with the wound healing action in multiple trauma the use of hydrophobic bases is inexpedient because they minimize the dynamic processes of absorption and, as a result, there is decrease of penetration and release of medicinal substances [8].

In the current manufacturing of soft medicines for treatment of the inflammatory processes in multiple trauma medicines on hydrophilic bases that can be applied to the wound surface without disturbing perspiration are preferred. Medicinal substances are easily absorbed from such bases [7, 8]; this contributes to the presence of hydrophilic nonaqueous solvents that affect permeability of the cell membranes and increase absorbability of the medicine in the base.

Therefore, when creating medicines for wound healing in multiple trauma the hydrophilic or combined bases providing a high effect of medicinal substances release are optimal. This is due to the fact that in order to achieve the optimal therapeutic effect in the lesion area it is necessary to mix the base and medicines with the exudate from damaged tissues [8, 9].

In pharmaceutical practice bases with elastic viscous plastic medium (emulsions of type I) are used with hydrophilic solvents and Carbopol gels based on hydrophilic surface-active agents (surfactants). The important feature when creating medicines for wound healing of multiple trauma is the fact that emulsion bases of type I (oil / water) have a good contact with the wound surface, possess a cooling effect due to evaporation of the aqueous phase of the base, and it may provide the analgesic and sedative action to some extent [3, 12].

For production of modern soft medicines the complex multi-use bases with liquid and solid components with the help of which not only therapeutic efficacy, but also consumer characteristics are formed. For this purpose excipients that act as solvents, activators of absorption, preservatives, emulsifiers, thickeners, antioxidants, etc., are used [3].

Excipients must meet the following requirements: do not have any type of toxic action, do not reveal the chemical interaction with medicinal substances and do not interfere revealing of their biological activity, have the best technological properties, be chemically indifferent to each other and to the materials used for packing medicines, their chemical and biological purity should not be lower than the standards set for medicines.

With various combinations of excipients the strength and duration of the therapeutic action of soft medicines, drug bioavailability can be adjusted, their accumulation in the tissues and the process of elimination can be affected. The main role of excipients is to modify the drug pharmacokinetics and only then to form medicines [1].

To treat inflammatory processes in multiple trauma a drug carrier should meet the following biomedical requirements [8]. It should facilitate the release of medicinal substances, their penetration into the affected tissues with creation of therapeutic concentrations there, have

a high osmotic activity and, as a result, the ability to absorb the tissue exudates for 20-24 hours in the mass of at least 300-400% without causing the osmotic shock of healthy tissues, be akin to the affected tissues, wet them well and promote filling and penetration of substances as much as possible, have a prolonged effect, which can reduce the concentration of the active ingredient, have pH close to the wound exudate (pH affects the rate and completeness of substances release), to be applied easily because of the presence of a pronounced inflammation process accompanied by pain and hyperemia, do not interact with the drug substances included and do not interfere their release and revealing of their pharmacological activity, have chemical stability and possibility of combination with medicinal substances, do not cause the irritating and sensitizing effect on the surrounding tissues, have appropriate rheological, structural and mechanical, physical and chemical properties to provide the comfort application or introduction, maintaining stability in their manufacture, storage and use, to be economically available.

Particular attention while creating medicines for treatment of inflammatory processes in multiple trauma is given to the choice of combinations of active substances [8]. Such benefits of these medicines as the ease of use for a patient (no need to use several medicines at the same time), economic factors (in most cases the price of combined medicines are less than the total price for monomedicines), the possibility of potentiation of the components' action should be mentioned.

When forming inflammatory processes in multiple trauma microbial associates as the main etiological factor of surgical infection have the leading role [12]. The most extensive tissue lesions with infectious complications of various severity and nature depending on the related factors are caused by gram-negative bacteria and bacteroids.

Therefore, to improve the efficiency of treatment of inflammatory processes in multiple trauma it is necessary to expand the range of antibiotics, which differ by the spectrum of their antimicrobial activity [7, 8].

Taking into account the above biomedical requirements when developing medicines for treatment of inflammatory processes in multiple trauma it is expedient to introduce antibacterial broad-spectrum antibiotics into their composition in combination with non-steroidal anti-inflammatory drugs that have the antibacterial, anti-inflammatory, anti-oedemateous and local anesthetic action. As you know, the use of active substances-synergists in one medicine causes the biocoordination effect, i.e. a small dose of the medicine is better absorbed by the body and does impact with extension of the pharmacotherapeutic action [9].

Investigations concerning the effect of medicinal forms on the therapeutic efficacy of drugs have found that the optimal activity of medicinal substances is achieved only when assigning it to the rational forms. Besides, in this case one can avoid many side effects of medicines on the body. Therefore, the most important task when developing and manufacturing medicinal forms is to

provide optimal conditions for release and subsequent absorption of the substance.

The release of the active substance from the soft medicines includes the mechanisms of dissolution, diffusion, absorption, osmosis and filtration. Among the factors that significantly affect these mechanisms an important place is occupied by pharmaceutical ones, namely the nature of a base-carrier, the content of a particular type of a surfactant (emulsifier), the type of a medicinal form (gel, cream, ointment), and technology [10]. The scientifically grounded choice of such factors taking into account physiological characteristics, etiology of the wound healing process in multiple trauma and the course of disease contribute to solving the problem of effective pharmacotherapy of generalized systemic inflammatory processes.

CONCLUSIONS

1. It has been found that in modern manufacture of soft medicines for treatment of inflammatory processes in multiple trauma medicines on hydrophilic bases that can be applied to the wound surface without disturbing perspiration are preferred.

2. The success of treatment of inflammatory processes in multiple trauma using soft medicines is in direct proportion to their properties, the ability to penetrate into the biological membrane, stability of physical and chemical, structural and mechanical characteristics.

3. When developing soft medicines for treatment of inflammatory processes in multiple trauma it is efficient to introduce antibacterial broad-spectrum antibiotics in their composition in combination with the anti-inflammatory drugs .

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ФАРМАЦЕВТИЧЕСКИЕ И МЕДИКО-БИОЛОГИЧЕСКИЕ АСПЕКТЫ МЯГКИХ ЛЕКАРСТВЕННЫХ СРЕДСТВ ПРИ ПОЛИТРАВМЕ

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В ходе проведенных исследований с использованием системно-обзорного, библиографического методов анализа определены основные тенденции современного развития производства мягких лекарственных средств для пострадавших с политравмой, которые связаны с созданием новых эффективных комбинированных мягких лекарственных средств, с разработкой новых комбинаций носителей, которые проявляют пролонгированное многонаправленное действие на патологический гнойно-воспалительный процесс при политравме и отвечают современным медико-биологическим требованиям.

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ФАРМАЦЕВТИЧНІ ТА МЕДИКО-БІОЛОГІЧНІ АСПЕКТИ М'ЯКИХ ЛІКАРСЬКИХ ЗАСОБІВ ПРИ ПОЛІТРАВМІ

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У ході проведених досліджень з використанням системно-оглядового, бібліографічного методів аналізу визначені основні тенденції сучасного розвитку виробництва м'яких лікарських засобів для постраждалих з політравмою, які пов'язані зі створенням нових ефективних комбінованих м'яких лікарських засобів, з розробкою нових комбінацій носіїв, що виявляють пролонговану багатоспрямовану дію на патологічний гнійно-запальний процес при політравмі і відповідають сучасним медико-біологічним вимогам.