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DYNAMICS OF DEVELOPMENT OF ENDOGENOUS INTOXICATION IN EXPERIMENTAL THERMAL BURN

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ABSTRACT: *Burn injury is the most severe of all types of injuries, causing multiple and long-term disorders of homeostasis, leading to dysfunction of organs and systems. The most important link in local treatment is the effect on the microflora. A burn wound needs antibacterial therapy from the moment of onset until its complete closure, since colonization by microorganisms with the development of purulent inflammation leads to severe intoxication, prevents the healing of epidermal and subdermal burns, leads to deepening of burn wounds, lysis and rejection of autoderm grafts, and serves as a source of generalization of infection*

Keywords: intoxication, experiment, thermal burn, epidermis, dermis, oxidants.

I. Introduction

In case of burns in the zone of thermal injury, a large amount of biologically high active substances, mediators, are formed, which are a trigger for the development of local vascular-mesenchemal changes, which is the essence of inflammation. They include biogenic amines (histamine, serotonin), kinins, oxidants, metabolites of arachidonic acid, cytokines, etc. [1].

It is known that burn injury is naturally accompanied by the activation of lipid peroxidation (LPO) in various organs and tissues. In the pathogenesis of profound disorders of cellular metabolism in burn injury, a significant role is played by the activation of LPO, accompanied by a change in the lipid component of cell membranes, and, consequently, in the permeability of the latter [2].

Among oxidants, an important role belongs to oxygen radicals - unstable oxygen metabolites that have an unpaired electron and therefore have a powerful oxidative potential. One of the main such radicals is the hydroxyl anion (-OH-). It is formed as a result of enzymatic reactions. Immediately after the burn, the formation of (-OH-) occurs in the tissues during ischemia and deterioration of their perfusion due to microcirculation disorders in the affected area. As a result of the action of xanthine oxidase on the substrates of xanthine and hypoxanthine in the presence of oxygen, oxygen superoxide (O2-) and hydrogen peroxide (H2O2) are formed. [6]

The study of the properties of polyglucosamine compounds of natural origin is an urgent task of medicine, since these substances have a wide spectrum of biological activity. In particular, chitosan

and its derivatives obtained from various natural objects are of interest. In connection with the above, the aim of the research is to study the molecular mechanisms of the antitoxic action of chitosan derivatives in thermal injury.

II. Materials and methods.

As experimental animals used white outbred rats with a body weight of 140-160 g, which under ether anesthesia reproduced a thermal burn on the depilated surface of the body, which was 20%. One hour after the burn, chitosan preparations (chitosan + 2% vinegar acid + glutaraldehyde + furacilin 1-experimental group; chitosan + 2% acetic acid + glutaraldehyde 2-experimental group), levomecol (3-experimental group) were applied , saline (4-control group). The preparations were applied once during the entire period of the experiment. On days 1, 3, 7, and 10 of the experiment, rats from each group were killed by one-stage decapitation in a cold room at a temperature of 0 - + 2 ° C. They collected the skin with the burn wound and blood. Morphological and molecular studies were carried out on skin models. In the blood serum, the intensity of lipid peroxidation, SMP and ESE was determined [7].

III. Methods for determining the intensity of LPO.

The state of LPO in blood serum and tissue homogenate was judged by the content of malondialdehyde (MDA). The principle of the method is based on the interaction of thiobarbituric acid with malondialdehyde formed during the peroxidation of unsaturated fatty acids with 2-3 diene bonds. The calculation of the content of products reacting with thiobarbituric acid was carried out taking into account the molar extinction of malonicdialdehyde, equal to 1.56 × 106 mol cm – 1 in nmol MDA / mg protein [3]

Medium molecular weight pethids (SMP) were determined by the method of N.I. Gabrielyan (2012) by detecting the supernatant freed from coarse proteins, which was carried out after preliminary dilution, in which 4.5 ml of distilled water was added to 0.5 ml of the supernatant. The measurement was carried out on a spectrophotometer in UV light at a wavelength of 254 nm. The SMP level was expressed in units that are quantitatively equal to the extinction indices [4].

The sorption capacity of erythrocytes was determined using the 0.025% methinyl blue reagent, which gives a colored diazoproduct with an absorption maximum at 630 nm. Salinewasusedas a standard [5].

Discussion of the results. The experiments showed that after 3 days of thermal injury in experimental animals was accompanied by serious shifts in the studied parameters of blood serum. Thus, the content of SSE in blood serum increased by 102.9% compared with the control group, respectively. The smallest increase of the studied parameters was observed from the side of the EMS. On the 7th day of the experiment, the studied indicators continued to increase, exceeding the values of the control rats by 113.7; 198.3 and 22.7%, respectively, to the values of the sorption capacity of erythrocytes, medium molecular peptides. Moreover, to a greater extent this was manifested in the content of average molecular peptides, the values of which increased 2.17 times compared to its level on the 3rd day of the experiment. By the end of the 10th day of reproduction of the thermal burn, there was a slight increase in the content of average molecular peptides (by 0.1%), compared with the level of these indicators observed on the 7th day of the experiment. Changes were observed on the side of the level of the sorption capacity of erythrocytes in the blood serum. However, the studied indicators significantly exceeded the standard values by 53.2; 60.2 and 472.9%, respectively, SSE, SMP [7].

Thus, the experimental thermal burn is manifested by significant shifts not only in the content of molecular peptides, but also in the sorption capacity of erythrocytes. In our experiments, a 3-day thermal burn led to an increase in MDA by 196.8%, respectively. By the end of the seventh day of the experiment, the thermal burn led to an increase in the MDA content in the blood serum by 198.3%, and on the 10th day, the MDA content increased by 205.1%, respectively, with a period of seven days.

Thus, the data obtained confirm that the experimental thermal burn is accompanied by the accumulation of the final product of lipid peroxidation in the blood serum. The observed activation of LPO indicates an increase in the formation of reactive radicals. As can be seen from the results presented in Table 3, on the 1st day of the experiment and after 3 days of treatment in the first group, the content of ESE decreases by 0.89% compared to the animals of the control group after 3 days of treatment. There is a clear tendency towards normalization of their level on the 7th and 10th day of treatment. The level of ESE in the treated animals of the 1st group is 47.4% and 24.5% higher than that in the control animals. When treated for 3, 7 and 10 days of animals of the second group, the ESE indicator was 8.1 lower than that of the control group; 14.4 and 32.9%, respectively. This effect differs in animals of the comparison group - levomekol. The decrease in ESR under the influence of levomekol in treated rats on the 3rd day of treatment is 2.9%. At the same time, the sorption capacity of erythrocytes in rats treated with levomecol exceeds the level of control by 8.9 and 21.9% on the 7th and 10th days of treatment, respectively. Correction of experimental thermal injury in the 1st group showed a decrease in SMP by 10.4; 41.3 and 57.4% on the 3rd, 7th and 10th day of correction, while under the action of the drug they decreased by 2.1 in the same period; 60.6 and 82.2%, respectively. The content of SMP changed less significantly in the 2nd and 3rd study groups. Correction with drugs of the 2nd and 3rd groups on the 3rd day of treatment was lower than the indicators of the control group by 1.09 and 1.05 times, on the 7th day at 1.85, 1.12, on the 10th day of correction at 13.0 and 5.7 times, respectively. As a result of the experiments, it was found that in the first experimental group, after 3 days, the final LPO product in the blood serum decreases by 41.6%, and amounted to 10.14 ± 1.61 nmol / ml, and after 7 and 10 days of treatment it the decrease was 60.2 and 64.4% compared with the control group.

Thus, treatment of experimental thermal injury with chitosan for 10 days practically normalizes the indicators of average molecular peptides and the sorption capacity of erythrocytes, while under the action of levomekol only indicators of average molecular peptides. These data indicate that the effectiveness of the antitoxic effect of chitosan is somewhat more pronounced than that of levomekol. Along with this, in rats with experimental thermal injury of the second experimental group, it does not cause a pronounced stimulation of the content of lipid peroxidation products. On the 3rd day of its application, the MDA content in the blood serum decreases by 55.3, on the 7th day by 38.6%, and after 10 days of treatment, compared with the control group, it is reduced by 40.0%. There was a slight decrease in the MDA content on days 3 and 7 of the experiment in comparison with the control group. They reached 17.32 ± 1.74 and 13.24 ± 0.23 nmol / ml when corrected with levomecol; 7.87 ± 0.17 nmol / ml on the 10th day of correction, respectively. This indicator in the animals of the intact group was 5.85 ± 0.49 nmol / ml, and in the control group - 17.85 ± 0.51 nmol / ml. The decrease in the MDA level under the influence of the studied drugs on the 3rd, and 7th and 10th days of application was statistically significant in relation to the control group. However, the decrease in the MDA level under the action of chitosan was more significant than with levomikol, and this difference was also statistically significant.

Thus, the studies carried out show that the studied drugs contribute to the normalization of the disturbed reproduced experimental process of endogenous intoxication of the MDA content. Ten-day use of chitosan completely normalizes the content of the end product of lipid peroxidation - malondialdehyde in blood serum. The effectiveness of levomekol was less pronounced, and complete normalization of malondialdehyde was observed only on the 10th day of correction.

Conclusions.

The results showed that the correction of the experimental thermal burn in animals with the studied drugs for 3-, 7- and, especially, 10 days leads to a significant decrease in the ESE, SMP, which indicates a more pronounced antitoxic effect of the studied drugs. It should be noted that the correction of the studied pathology in the groups using chitosan is most pronounced, the studied indicators decrease in comparison with the comparison group. From the above indicators, it follows that the studied drugs most effectively affect the content of SSE, SMP when corrected within 10 days. Chitosan is superior to levomekol in its action. The data obtained indicate that chitosan and levomekol act unidirectionally on the body's LPO, but chitosan, in comparison with levomycol, has a more pronounced antitoxic effect in thermal burns, especially when treated within 10 days of its administration, and it was expressed in a decrease in the MDA content.

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