RESEARCH RESULTS OF REPARATIVE REGENERATION OF CHITOSAN DERIVATIVES IN EXPERIMENTAL THERMAL BURNS

Baikulov Azim Kenjaevich
Associate Professor, Department of Biological Chemistry,
Samarkand State Medical University, Samarkand, Uzbekistan.
E-mail: azimbaykulov81@mail.ru

Rakhmanov Farkhod Holbayevich
Doctoral student, Department of Animal Physiology, Biochemistry and Pathological Physiology, Samarkand State University of Veterinary Medicine,
Animal Husbandry and Biotechnology, Samarkand, Uzbekistan.
E-mail: farxod1313jon@gmail.com

Egamberdiyev Kamol Egamberdievich
Student of Samarkand State University of Veterinary Medicine,
Animal Husbandry and Biotechnology, Samarkand, Uzbekistan.
E-mail: egamberdiyevkamol1497@gmail.com

ABSTRACT

Wound healing is one of the most important biological, medical and social problems and remains relevant to this day. The modern trend in the development of bandage material is to abandon the general tools used for the entire period and to switch to a wristband specially designed for use at one or another stage of it according to a specific clinical situation.

Keywords: Regeneration, chitosan, thermal burn, speed epithelization, burn modeling,wound healing.

ENTER

At present, a number of scientific studies aimed at activating the reparative regeneration of the epithelium at the site of damage, which are used in world medicine, especially in combustiology, are being conducted (1,2). In this regard, it is important to study replication, transcription and intercellular interactions and to develop drugs that activate these processes. In the implementation of these processes, the effect of epidermal growth factor is significant, and their activity in undamaged cells in the center of the burn leads to epithelization of the focus. However, mechanisms allow the development of local drugs that activate reparative processes (2).

Natural polysaccharide chitosan and its derivatives activate fibroblast proliferation and normalize skin regeneration. On the other hand. Chitin derivatives are structurally similar to skin glucosamines and serve as a basis for the growth of keratinocytes and fibroblasts.

The aim was to evaluate the effect of chitosan gel products on the level of epithelization, regeneration coefficient and morphology in 3rd degree skin burns.

The purpose of the study: The purpose of this studyEvaluation of the effect of chitosan gel products on the level of epithelization, regeneration coefficient and morphology in 3rd degree skin burns.

Materials and methods: The burn was caused by immersing the depilated back in boiling water for 10 seconds, the wound area was 18-20 cm2 (18-20%). The mortality rate in the study was 13.6%, with uninjured animal skin used as a control.

Experiments consisted of a total of 120 sterile male rats weighing 140–160 kg, fed under standard feeding conditions. Experiments were conducted in accordance with the European Convention on the Protection of Experimental Vertebrate Animals and scientific recommendation (3,4).

Burns were caused by immersing a depilated loin in boiling water for 10 seconds, with a wound area of 18-20 cm2 (18-20%) (1). The mortality rate in the study was 13.6%, with uninjured animal skin used as a control.

Two hours after thermal injury, the rats were divided into four groups: group 1 (25 rats) - chitosan (Ss), 2% acetic acid, glutaraldehyde (GA) and furacilin (Fs) group 2 (25 rats) - chitosan (Cs), 2% acetic acid, glutaraldehyde (GA): group 3 (25 rats) - chloramphenicol ("Nijfarm"); Group 4 (25 rats) - salt water treatment (placebo). In the fifth group, intact rats were left. After two hours, the damaged lesion is washed with hydrogen peroxide, and the drugs are applied once, in the form of a local ointment to the wound, in a dose equal to 1 mg / kg of body weight. The regeneration rate was determined using the regeneration coefficient indicator (5.6).

$$\mathbf{K=S_1/S_2}$$

In this case, the K-regeneration coefficient

S_1 is an initial indicator of damaged surface area

S_2 is the next indicator of damaged surface area

To measure the area of the damaged surface, a sterile, thin polyethylene film is placed on the damaged skin, the outline of the wound surface is drawn with a marker, cut, scanned on a computer and determined using the surface. program (7,8). The regeneration coefficient was measured on days 3, 7 and 10 after treatment.

Studies were conducted on days 3, 7 and 10 of treatment. Six to seven animals from each group were decapitated under light ether anesthesia, and blood and a portion of damaged skin were collected for analysis.

Results: The highest proliferative activity was observed in animals of group 1, in which the regenerative properties of the drug were preserved for a long time. In groups 2 and 3, repair processes were slower, because the rate of completion and the coefficient of regeneration were slightly behind. Their lowest score is recorded in group 4.

Results of effective Cs+Fs exposure in experimental burn lesions are presented. On the first day after burn injury, rats showed signs of acute burn: weakness, adynamism, dyspnea, polydipsia, and polyuria. On the third day, a necrotic layer formed in the upper part of the wound. During treatment in group 1, the condition of the experimental animals slightly normalized, their activity and appetite improved. Similar results were observed in groups 2 and 3, but signs of intoxication were still present. In group 4, signs of intoxication persisted for a long time, the general condition of animals worsened, and signs of purulent-septic inflammation appeared. In the control group, with the appearance of wounds, infectious inflammation of the wound area was observed. Over time, the area of the wound expanded 1.3-1.5 times and signs of necrosis appeared. In the rats of groups 1 and 2, a gradual healing process began under the frozen layer of the wound, the spread of inflammation was not observed, in animals of group 3, signs of inflammation remained. In the studied groups, the analysis of the wrinkles of the wound area was strongly expressed in group 1.

Debate: In groups 2 and 3, the drugs had the same effect, but group 4 showed a slower recovery than the other groups. We also observed the dynamics of wound healing. In particular, the wound area in group 1 increased from 14.08±0.66 cm2 to 9.47±0.41 cm2 on day 10, and from 13.26±0.65 cm2 to 10 in group 2. It decreased by 10.90±0.52 cm2, and in groups 3 and 4 the indicator remained the same.

The highest proliferative activity was observed in animals of group 1, in which the regenerative properties of the drug were preserved for a long time. on days 3 and 7, this indicator is 4.5 ($P<0.001$) and 4 ($P<0.001$) times higher than in the control group; was 2.5 ($P<0.05$) and 1.4 ($P<0.05$) higher than the control group. In group 1 animals, the rate of wound healing increased dramatically on days 3 and 7, and decreased slightly on day 10. Ripening rate was 3-5 ($P<0.001$) times higher than the control group on day 3 and 4 ($P<0.001$) times higher on day 7. This is also proven in the regeneration coefficient analysis. This indicator was especially high in group 1 animals. In groups 2 and 3, repair processes were slower, because the rate of completion and the coefficient of regeneration were slightly behind. Their lowest score is recorded in group 4.

Morphological study of self-healing of a burn wound (group 4) revealed the formation of coagulation necrosis of the epidermis and dermis, breakdown of collagen fibers, necrosis of the epidermis, desquamation of its horny and granulation layers, and

such changes lasted for 10 days. In animals of group 1, the early recovery of the damaged focus, as well as the appearance of newly formed granulation tissue and blood vessels in all layers of the dermis, indicate that the skin is recovering well. Group 2 animals also showed accelerated regeneration of the epithelium, cell differentiation and strong vascularization in some parts of the basal layer. When Levomekol was used locally, the lesion was weaker than in groups 1 and 2, infiltration of lymphocytes, leukocytes, and histocytes was detected under the epidermis. on the 10th day of the experiment, focal peeling with active renewal of skin layers was also observed.

Summary: Natural polysaccharide chitosan and its derivatives activate fibroblast proliferation and normalize skin regeneration. On the other hand, chitin derivatives are structurally similar to skin glucosamine and serve as a basis for the growth of keratinocytes and fibroblasts.

Thus, in skin burns, chitosan gel, especially with the addition of Fc, increased the rate and coefficient of regeneration in the damaged area and led to the healing of the damaged skin surface. It is possible that the Fc contained in the drug has a bactericidal effect and accelerates regeneration due to early removal of pus from the wound. According to some scientists, the enhancement of reparative regeneration under the influence of chitosan in undamaged cells may be related to the densification of the DNA molecule in the nucleus by chitosan. Natural polysaccharide chitosan and its derivatives activate fibroblast proliferation and normalize skin regeneration. On the other hand, chitin derivatives are structurally similar to skin glucosamine and serve as a basis for the growth of keratinocytes and fibroblasts.

REFERENCES

1. F.X. Inoyatova, D.A. Kadyrova, A.K. Baikulov // The effect of chitosan on the structure and synthesis of nucleic acid in the brain // Uzbek biological journal No. 5. Tashkent-2015 p. 3-6

2. Alekseev A.A., Salakhiddinov K.Z., Dzhumabaev E.S. // Primenenie sovremennyx metodov prophylactici lecheniya infisirovannyx ojogovyx ran. Surgery. Uzbekistan 2009. No. 4 p. 33-35

3. Azim B. and others. Analysis of dressing material selection for the treatment of thermal skin burns // European Journal of Molecular and Clinical Medicine. – 2021. – T. 8. – No. 03. – S. 2021.

4. Azim B. and others. Free radical oxidation status of lipids in experimental myocardial infarction in rats // European Journal of Molecular and Clinical Medicine. – 2021. – T. 8. – No. 3. – S. 816-820.

5. Stekolnikov L.I., Shakhtmeister I.Ya., Sevastyanov B.A., Shilov G.G., Soyukov E.A. Eksperimentalnoe izuchenie rannego deystviya preparata ronidazy. Sbornik

nauch.tr. Experimental and clinical aspects of reparative procedures and stimulation methods. M. 1986. s-73-76

6. F. Kh. Inoyatova, AK Baykulov // Study of chitosan binding with specific DNA sites in the treatment of thermal burns. // Abstracts 9th international symposium on the chemistry of natural compounds. October 16-19, 2011 Urumqi Xinjiang China. P- 72-73.

7. Inoyatova F.Kh., Baykulov AK Preclinical study of drug forms based on chitosan // European science review. - Austria. – 2017. - No. 9-10. - P.31-33

8. Yunusov OT, Baikulov AK, Rakhmonov F. Nakhalbayev The effect of plasma therapy on the general circulation of blood in patients with extensive deep burns. Novateur publications international journal of innovations in engineering research and technology [IJIERT] ISSN 2020. 2394-2408.