Anti-inflammatory activity of Bischofite gel using felt granuloma model in rats

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INTRODUCTION

Despite the wide possibilities of modern pharmaceuticals and the appearance of a large range of highly selective drugs of peptide and protein nature (monoclonal antibodies), simpler compounds do not lose their relevance - they do not have one specific target.[1-7] One of these tools is a gel based on bischofite, a natural mineral with significant reserves in the territory of the lower Volga region. For a long time, bischofite has been used in clinical practice to treat a wide range of pathologies. The pharmacological activity of this mineral, including as part of gels, has been studied in detail for several decades.[8-10] It has been shown that bischofite has anti-inflammatory and immunomodulatory activity.[11,12]

MATERIALS AND METHODS

The experiments were carried out in accordance with the requirements of GOST ISO/MEK17025-2009, GOST RISO 5725-2002, and the “laboratory practice rules” approved by Order No. 708n of the Ministry of Health and Social Development of the Russian Federation dated August 23, 2010, in compliance with the European Convention on the protection of vertebrate animals used for experiments or for other scientific purposes (Directive 2010/63/EU). The experiments were carried out in accordance with the methodological recommendations for the preclinical study of drugs (2012).

After preliminary depilation (70 × 40 mm) and treatment with a 70% solution of ethyl alcohol in the back of a male rat (n = 40) weighing 200–220 under anesthesia (chloral hydrate 300 mg/kg), a sterilized roller of 15 mg was implanted under the skin of the back. Evaluation of the severity of exudative and proliferative reactions was performed on the 8th day by weighing the extracted implants immediately after removal, as well as after 48 h of drying in a thermostat at 37°C. Results: In the control group, the average mass of tissues that emigrated to the roller before drying was 262.50 ± 12.32 mg, and after drying - 35.75 ± 2.32 mg. In the group that received the gel with bischofite, the average weight of the tissues that emigrated to the roller was significantly lower and amounted to 235.00 ± 18.11 mg and after drying - 29.55 ± 2.85. In the group treated with vulnuzan, where the average weight of the emigrated tissue was 183.25 ± 14.20 mg, of which the dry residue was 21.01 ± 2.42 mg. The use of Contractubex, in turn, led to a pronounced pro-inflammatory effect, which was manifested in a significant increase in edema to 300.50 ± 19.40 mg (dry residue - 44.75 ± 3.12 mg). Conclusion: Bischofite had a pronounced anti-inflammatory effect, significantly different from the control, but showed less efficacy than vulnuzan. The use of Contractubex in this model has led to an increase in the size of the granuloma.

KEY WORDS: Anti-inflammatory, Bischofite, Felt granuloma model

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the back. After suturing the skin access length of 20 mm by imposing two sterile sutures, the animals were divided into four equal groups.

**Control Group**

Imitation of rubbing the drug on the area of implantation of felt and the surrounding tissue 10 min after the intervention and the next 6 days (1 time/day)

**Bischofite**

Rubbing 500 mg of gel with bischofite on the area of implantation of felt and surrounding tissue 10 min after the intervention and for the next 6 days (1 time/day)

**Vulnuzan**

Rubbing 500 mg of gel onto a region of felt implantation and adjacent tissues 10 min after the intervention and for the next 6 days (1 time/day)

**Contractubex**

Rubbing 500 mg of Contractubex gel onto the area of implantation of felt and the surrounding tissue 10 min after the intervention and for the next 6 days (1 time/day)

After natural drying, the application areas of the animals were placed in individual cells. For the next 6 days, photofixation of the area of felt implantation, weighing of animals, as well as evaluation of the clinical condition, physical activity, and feed and food consumption were daily made.

On the 8th day, the animals were taken out of the experiment by cranial dislocation under anesthesia, after which the implanted felt rollers were removed. Evaluation of the severity of exudative and proliferative reactions was carried out by weighing the extracted implants immediately after removal, as well as after 48 h of drying in a thermostat at 37°C.

**RESULTS**

After awakening and on further days of the study, the animals were active; the consumption of feed and food was within the normal range. Signs of purulent inflammation, excoriation, hyperemia, and other undesirable phenomena from the skin were not observed. Within 7 days of regular differences in the cumulative clinical evaluation of the studied groups were not observed.

On the 8th day during the extraction of implants, visual examination of pus, necrotic masses, and other signs of infection was not found [Figure 1a and b].

The results of bischofite anti-inflammatory activity using felt granuloma model are presented in Table 1.
When weighing the withdrawn felt rollers, it was found that in the control group, the average weight of tissue that emigrated to the roller (without mass of roller) before drying was 262.50 ± 12.32 mg and after drying - 35.75 ± 2.32 mg. In the group receiving the gel with bischofite, the average weight of the tissues that emigrated to the roller was significantly lower \((P < 0.05)\) and amounted to 235.00 ± 18.11 mg and after drying - 29.55 ± 2.85 mg. The smallest degree of edema \((P < 0.05\) compared with control and bischofite) was observed in the group receiving Vulnuzan, where the average weight of the emigrated tissue was 183.25 ± 14.20 mg, of which 21.01 ± 2.42 mg. The use of Contractubex, in turn, led to a pronounced pro-inflammatory effect, which manifested itself in a significant \((P < 0.05)\) increase in edema to 300.50 ± 19.40 mg (dry residue - 44.75 ± 3.12 mg) [Figure 2].

**CONCLUSION**

The study showed that when modeling a felt granuloma, the most pronounced anti-inflammatory effect was demonstrated by vulnuzan ointment. The use of a gel with bischofite also had a significant anti-inflammatory effect, manifested in the reduction of both exudative and proliferative reactions. On the contrary, when applying Contractubex, the samples under study showed an increase in the total mass and an increase in the proportion of dry residue, which indicates not only a pronounced phlogogenic effect but also a shift in the inflammatory process toward proliferation.

**REFERENCES**


