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# Treatment of Third-Degree Thermal Burns in Dogs with Ozonated Vegetable Oil

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**ABSTRACT**

When comparing the blood indicators of the animals treated with ozonated vegetable oil with those of the animals treated with 0.2 % furacillin ointment, it becomes vivid that on all research days (3rd, 9th and 17th) the blood indicators of experimental animals recover faster than those of the control animals. Upon the experiments it has been proved that when treating the third-degree burn with ozonated vegetable oil, the burn wound is recovered 3 days earlier than in case of treating it with 0.2 % furacillin ointment. This is due to the reduction of hydration phase and active wound granulation process.

## Introduction

Thermal burns are classified in four degrees. Depending on the burns degree, different rates of purulent-necrotic changes take place in tissues. In case of deep burns necrotic and sub-necrotic zones can be identified in the burned sector (Aydogan and Gurol, 2006). In the zone of necrosis all cells are devitalized, including even nerves. In the zone near necrosis the blood capillaries are obstructed/blocked with blood coagulum/clots, as a result of which the nutrition of lesion foci becomes disturbed (Alekseev, et al., 2001, Bernat, 1975, Barret and Herndon, 2003). This circumstance leads to the prolongation of burn wound granulation. Removal of the necrotic tissues from the healthy ones is retarded, which can result in the development of purulent-necrotic inflammation; the granulated tissue growth and epidermization processes are missing causing lesions (Alekseev, et al, 1998).

Necrotic tissues gradually break down resulting in toxins generation, which getting imbibed by the organism, cause autotoxicosis, as well as violations in nerval, cardio-vascular systems and pathological, blood morphological and biological modifications (Astamirov, 2001, Babakhanyan, et al., 2002). In the field of medical science, a number of antimicrobial, sulfanilamide, antiseptic, stimulant and analgesic drugs are used to treat different degrees of burns, which, anyhow, have demonstrated low treatment efficacy. By means of the afore stated medicinal drugs the treatment process is delayed, huge economic expenses are required and the quality and quantity of livestock products decline (Browne, et al., 1985).

Throughout the process of burn treatment the bacteria are getting used to the applied medicinal drugs, as a result of which the treatment efficiency is reduced. So, there is a need to frequently alter the applied drugs during the treatment process (Aydogan and Gurol, 2006, Baskaran, et al., 2001).

**Materials and methods**

The investigations were conducted in the operation room and laboratory of the Chair of Therapy, Surgery and Obstetrics, at the Armenian National Agrarian University, while the experimental animals were kept in the barn belonging to the mentioned chair. Ten heads of 1.5-2-year-old crossbred dogs were selected upon the similarity principle weighing 7-10 kg.

The animals were divided into two groups: control and experimental, with 5 animals in each group. The selected animals were in good health. Blood was taken from the subcutaneous vein of the forelimbs in all animals. The erythrocyte and leucocyte amounts were determined through Goryaev method, hemoglobin was determined through Sahli's Haemometer, ESR (Erythrocyte Sedimentation Rate) – with Panchenkov's apparatus and the leucocyte count/leukoformula – in blood smear. These indicators were considered as those of healthy animals and were compared with sick animals.

In the external part of the animals' thighs/elbows from both groups, burns were produced. The mentioned body parts were dehaired in advance and then anesthetized via administration of local circumferential anesthesia round the elbow sector with 0.5 % novocaine solution using 5 ml for each animal. The burn was produced through touching the skin surface with heated metal. In all animals the burning area made 12 $cm^2$ (coincided with the sizes of metal object area). The following day after getting burn, the burned parts obtained grey coloring, became senseless and turned into coagulative necrosis, while the surrounding tissues were reddened and swollen. The animals of control group were treated with 0.2 % furacillin ointment and the animals of experimental group were cured through ozonated vegetable oil with the simultaneous use of Bernard's Current. The objective was to improve the blood circulation in that body part, thereby promoting the disintegration of the necrotic tissues from the healthy ones and accelerating the growth of the granulation tissues. The burns were treated in an open way without any bandage; protective collars were put round the animals' necks. Daily clinical examination was carried out in the animals of both groups, while the hematological investigations were conducted on the 3rd (third), 9th (ninth) and 17th (seventeenth) days of treatment.

**Results and discussions**

Ozonated vegetable oil is a natural, activated olive oil containing carbonic acid ozonides. A goal was set up to investigate the efficiency of the ozonated vegetable oils in the treatment process of third-degree burns and to conduct result analysis.

During the clinical investigations 2 days after burn creation, swelling and redness round the produced burns in the animals of both groups, as well as increase in the local temperature, pain and necrotic tissues in the burned sector encompassing all dermal layers were observed.

The burn of the control animals was treated as follows: the injured body part was preliminarily treated with 1:1000 potassium permanganate solution, dried out with sterile cotton balls and then oiled with 0.2 % furacillin ointment. The burned body part of the experimental animals was also treated with 1:1000 potassium permanganate, again dried out with sterile cotton balls and then oiled with ozonated vegetable oil once a day.

The blood research results have indicated that after getting burn, qualitative and quantitative changes in the blood of control animals took place. When comparing the indicators of the control animals with those of healthy ones, it is marked that on the 3rd day of treatment the hemoglobin content increased by 30 g/L, erythrocyte content – by $1.7 \cdot 10^{12}$/L, leucocytes – by $3.0 \cdot 10^{9}$/L and ESR – by 2 mm/hour.

Considerable changes were observed in the leukocyte count/leukoformula as well: basophils grew up by 2 %, eosinophils – by 3 %, out of neutrophils the young ones increased by 11 %, polymorphonuclear leukocytes/stick-nuclear – by 7 %, while the segmented /segmentonuclear neutrophils decreased by 3 % and lymphocytes – by 12 %, whereas monocytes grew up by 6 %.

In the experimental animals the following changes were recorded: on the 3rd day of treatment the hemoglobin amount increased by 20.0 g/L, erythrocyte content – by $1.1 \cdot 10^{12}$/L, leukocytes – by $2.0.10^{9}$/L (thousand), ESR – by 1 mm/hour and in leukocyte count/leukoformula again significant changes were recorded: basophils increased by 2 %, eosinophils – by 3 %, out of neutrophils the young ones grew up by 8 %, polymorphonuclear leukocytes – by 7 %, while the segmented neutrophils decreased by 4 %, lymphocytes – by 8 %, whereas monocytes grew up by 4 %. When comparing the blood research results of the experimental animals on the 9th day of treatment with the indicators recorded on the 3rd day of treatment, it becomes obvious that they are gradually approximating to the indices of healthy animals. Thus the content of hemoglobin decreased by 10 g/L, erythrocytes – by $0.2 \cdot 10^{12}$/L, leukocytes – by $1.0 \cdot 10^{9}$/L and ESR – by 1.0 mm/hour.

**Table.** Blood indicators of burn-affected dogs*

M±m

| Name of medicinal drug | Days | Hemoglobin, g/L | Erythrocytes $10^{12}$/L | Leukocytes $10^9$/L | ESR mm/hour | Leukoformula | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Basophils | Eosinophils | Neutrophils | | | Lymphocytes | Monocytes |
| | | | | | | | | Young | Stick-nuclear | Seg-nuclear | | |
| Healthy | | 120±2.5 | 5.5±0.4 | 8.0±0.7 | 2.0±0.1 | 4.0±0.01 | 1.0±0.01 | - | 5.0±1.0 | 15.0±1.8 | 72.0±3.4 | 3.0±0.2 |
| 0.2 % furacillin ointment | 3 | 150±3.1 | 7.2±0.6 | 11.0±1.1 | 4.0±0.5 | 6.0±0.8 | 4.0±0.5 | 11.0±1.4 | 12.0±1.8 | 12.0±2.2 | 60.0±2.6 | 9.0±1.5 |
| | 9 | 140±2.8 | 7.0±1.1 | 9.5±1.0 | 3.5±0.7 | 5.0±0.9 | 3.0±0.1 | 9.0±1.3 | 11.0±1.9 | 8.0±2.0 | 65.0±3.3 | 5.0±1.2 |
| | 17 | 120±1.9 | 6.0±0.8 | 8.8±1.1 | 2.5±0.4 | 5.0±1.0 | 2.0±0.1 | 6.0±1.1 | 7.0±1.6 | 10.0±2.3 | 70.0±3.1 | 4.0±0.8 |
| Ozonated vegetable oil | 3 | 140±1.7 | 6.6±0.6 | 10.0±0.9 | 3.0±0.4 | 6.0±0.7 | 4.0±0.6 | 8.0±1.7 | 12.0±1.4 | 11.0±1.9 | 64.0±3.0 | 7.0±0.9 |
| | 9 | 130±0.9 | 6.4±0.7 | 9.0±1.0 | 2.0±0.5 | 5.0±0.8 | 2.0±0.3 | 8.0±1.8 | 9.0±1.2 | 9.0±2.0 | 68.0±2.4 | 5.0±0.7 |
| | 17 | 120±1.0 | 5.7±0.4 | 8.2±1.1 | 1.0±0.2 | 4.0±0.3 | 1.0±0.2 | 4.0±0.3 | 6.0±0.7 | 16.0±2.6 | 72.0±3.1 | 4.0±0.8 |

*Composed by the authors.

In the leukoformula the following changes were observed: basophil amounts reduced by 1 % and eosinophils – by 2 %. In the neutrophils the following changes were recorded: the amount of young neutrophils declined by 2 %, the stick-nuclear neutrophils – by 3 %, segmentonuclear neutrophils – by 3 %, lymphocytes increased by 4 % and monocytes decreased by 2 %.

Whereas, when comparing the blood indicators of the experimental animals on the 17th day of treatment with those recorded on the 9th day of treatment, it turns out that they are gradually becoming even closer to the blood indices of healthy animals with the recorded indicators of 10 g/L, $0.7 \cdot 10^{12}$/L, $0.8 \cdot 10^9$/L, 1 mm/hour, 1 %, 1 %, 4 %, 3 %, 7 %, 4 % and 1 % respectively, while compared to the blood indices of healthy animals the difference is estimated as 0 g/L, $0.2 \cdot 10^{12}$/L, $0.2 \cdot 10^9$/L, 1mm/hour and in leukoformula – 0 %, 0 %, 4 %, 1 %, 1 %, 0 %, 1 % respectively. As the table data indicate, the blood indices of the control animals, recorded on the 17th day of treatment, demonstrate considerable difference, when compared to those of healthy animals, which makes 0 g/L, $0.5 \cdot 10^{12}$/L, $0.8 \cdot 10^9$/L, 0.5 mm/hour against the respective indicators, and in leukocyte formula it makes 1 %, 1 %, 6 %, 2 %, 5 %, 2 %, 1 %, respectively. This comes to prove that when using 0.2 % furacillin ointment during the treatment process, the burn wound was not recovered completely and the treating process should be continued to full recovery.

When comparing the blood research results of the experimental animals with those of the control animals, again significant differences are observed. Thus, on the 3rd treatment day the hemoglobin content declined by 10 g/L, erythrocytes – by $0.6 \cdot 10^{12}$/L, leukocytes – by $1 \cdot 10^9$/L and ESR – by 1 % and declining tendency in leukoformula indices is also observed: basophils – 0 %, eosinophils – 0 %, young neutrophils – by 3 %, stick nuclear neutrophils – by 0 %, segmentonuclear neutrophils – by 1 %, lymphocytes – by 4 % and monocytes – by 2 %. Comparing with the indices of the 9th day treatment the decline makes 10 g/L, $0.6 \cdot 10^{12}$/L, 0.5 %, 1.5 mm/hour respectively and in leukoformula it is estimated as 0 %, 1 %, 1 %, 2 %, 1 %, 3 %, 0 % respectively. The comparison of the results obtained for the 17th day of treatment induced variations with the following respective indices: 0 g/L, $0.3 \cdot 10^{12}$/L, $0.6 \cdot 10^9$/L, 1.5mm/hour, 1 %, 1 %, 2 %, 1 %, 6 %, 2 %, 0 %.

## Conclusion

Summing up the results obtained from the research work it can be surely stated that on the 17th day of treatment the animals of control group weren't completely recovered yet. Whilst, when comparing the results of the 17th day of treatment recorded for the experimental animals with those of healthy ones, it can be clearly registered that no considerable changes are observed: the hemoglobin contents are the same, the amounts of erythrocytes and leukocytes exceed only by 0.2 %, ESR is lower by

1 mm/hour, the content of basophils and eosinophils is recovered, young neutrophils exceed by 4 %, stick-nuclear and segmentonuclear neutrophils exceed only by 1 %, lymphocytes – by 0 % and monocytes – by 1 %. In the result of investigations, it was found out that on the 17th day of treatment the animals of experimental group completely recovered, while the granulation tissue growth and epidermization processes took place 3 days earlier than those recorded in the animals of control group.

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