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Antimicrobial effect of the microcurrent application after burns of 2° degree induced in the skin of the back in wistar mice (*novergicus rattus*)

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ABSTRACT

Many studies are demonstrating the therapeutic use through electric incentives in countless processes of tissue repair. Initially the skin harmed by burn becomes sterile. Later, in the first 48 hours, the wound formed in the burn is colonized by microorganisms of the macrobiotic normal of the skin that are substituted progressively for Gram-negatives and some fungi. It is also known that the infection is principal death cause in burned patients, therefore it is important to research which treatments reestablish the homeostasis necessary to this skin. The objective of the present study was to verify the antimicrobial effect of the microcurrent application (MC) in the tissue repair of burns of 2° degree. *Material and methods***:** Twenty males Wistar mice were andrecipient in the number area, submitted to the burn by a metallic stem with constant temperature of 120°C and then separate in two groups with 10 animals each. The experimental group received daily application of MC (10μA/2 minutes) the control group didn't already receive any treatment. *Results:* The statistical tests indicated that there was difference significant in relation to the bacteriostatic effect of the treatment, presenting decrease of the number of present microorganisms, when agreement with MC and reducing like this, the infectious process in the place of the lesion. *Conclusion:* Therefore, the result indicated that treatment presented bacteriostatic effect, reducing amount the bacterial colonization and favoring the cicatrisation.

Key words: Microcurrent, effect antimicrobial, burn

1. INTRODUCTION

The patients with burns represent a population highly likely to the infection for microorganisms of endogenous origin and exogenous, as a result of the breaking of the normal barrier of the skin, accompanied of a depression of the immune answer. Initially the harmed skin is considered free or virtually free

from bacterium, destroyed by the heat (Erol, 2004). The burn can reach total or partially the skin and your enclosures, could take to an immunologically deficient picture due to the formation of toxins in the burned skin. The diagnosis and the establishment of the etiology of an infection in burned patient present countless difficulties (Elsayed et al. 2003). The repair tissue after offense is a process that early begins in the inflammation and it can be modified by different factors as, for instance, presence of microorganisms, types of wounds, bleeding rate, skin types and of trauma, events that will affect the remodeling, metabolism, repair and the growth. It is known although problems in the initial apprenticeships of the cicatrisation take to the increase of edemas, it reduces the vascular proliferation and it decreases figurative elements of the blood (Carvalho 2001). The cicatrisation of burns follows all the stages of an inflammatory process, causing a sequence of denominated events, respectively, initial lesion, inflammation, proliferation and remodeling (Mello et al. 2007). In the burns, besides the destruction of the barrier epithelial, the presence of degraded proteins and devitalized skin provide an excellent middle for the development and proliferation of microorganisms. Besides, other factors also collaborate for the sepsis in the burned ones, as the immunosuppressant due to the thermal lesion, the possibility of translocation gastrointestinal bacterial, the lingering internment and the use of inadequate of antibiotics, taking to the appearance of bacteria with antimicrobial multidrug (Macedo et al. 2005).

The burn is an important problem of public health and the septicemia is still considered as to principal cause death in patients that survived the initial period of treatment. According to data of the literature, about 80% of the deaths in burned patients are current of infection (Fernandes & Filho 2004). Several studies have been showing that the electric stimulation influences the migration and cellular proliferation, the closing of the wound, and the activity fibroblastic, the dermal secretion of collagen. Experiments with electric currents of low intensity demonstrated the acceleration of the cicatrisation results (Davis & Ovington 1993, Evans & Foltz 2001). That type of electric stimulation is known as therapy bioelectrical or biostimulation through the microampere, being like this, the knowledge of the cellular bioelectricity is fundamental in the understanding of several phenomena that involve the electrotherapy (Nelson et al. 2003). The stimulation of alive cells, for electric currents of low intensity affects the potentials of membranes, that are associated to changes in the gradient of concentration of ions of cellular membrane directly, that they cause, in a first moment, the increase of the synthesis of ATP, followed by the increase of the synthesis of proteins. In the literature, medicinal evidences show that the restoration of dermal connectives skin and sub dermal can have acceleration for the application of an electric current of low intensity (Valle 2008). The proposal of the present study was to investigate the antimicrobial alive effect in of the microcurrent application in burns of 2° degree in Wistars mice.

2. MATERIAL AND METHODS

20 Wistars mice were used in tests and after the trichotomy in the back area, the burn was done using a metallic rod with spherical tip of 20 diameter mm with constant temperature of 120° C (Figure 1). The stem was pressed on the skin of the back of the animal for 20 seconds to provoke a burn of 2° degree (Figure 2). They became separated randomly the animals in two individuals groups of 10 and in the subsequent days to the lesion they underwent the same ones the following procedure:

Group A - control
Group B - microcurrent application (10 μA for 2 minutes)

For application of the microcurrent, a stimulator electric transcutaneous was used, denominated Physiotonus Microcurrent of the mark Bioset. For the analysis microbiological it was made the collection daily of the material, before and after application of the treatment, being used a sterile Swab soaked in saline solution to 0.85% to facilitate the adherence of the formed bacterial biofilm. Soon after, under asepsis conditions, it was done the sowing in plates containing the middle of culture Brain Heart Infusion Agar (BHI-agar). The plates were incubated to 35°C by 18/24 hours and later the count of the Formed United of Colonies was accomplished (FUC). After count of FUC, it was made an average statistics of the result obtained with the treatment through the tool BioEstat, Test "t" of Student, being that criterion used to test the average of the difference before and after the application of the microcurrent and to demonstrate amount the possible existent differences. The study was approved by the Research Ethics Committee of Academical Center Hermínio Ometto, UNIARARAS (protocol 827).

3. RESULTS AND DISCUSSION

The evolution of the coetaneous wound in the mice of the Controls group and in the microcurrent application group (10 μA for 2 minutes) showed dropping and formation of delicate crusts until the 3rd day. Starting from the 4th day, there was thickening of the crust, that started to highlight spontaneously and developing in the 7th day for epithelization with growth of the hair around the

lesion. Starting from the tool of statistical analysis BioEstat, the test "t" of Student (two samples in pair for averages) accomplished showed $p < 0.0001$ when the treatment was analyzed with MC taking in consideration only the data before and after the application and, showed $p = 0.003$ when the treatment was analyzed with MC taking in consideration the data before and after the application separated by mouse, indicating as soon as there was significant difference before among the number of forming units of colonies and after the treatment (Figure 1). Experiments where animals were used indicated clearly that several forms of electric incentives promote positive effects in the growth, repair and remodeling in different skins, each one producing a variety of biological answers (Marinate 2002). Carley & Wainapel (1985) studied the repair speed in ulcerated skins and observed accelerated cicatrisation and decrease in the proliferation of microorganisms. The lesions that initially were polluted with Pseudomonas and/or Proteus were usually sterile after applications with microcurrent.

Figure 1
Metal rod used to induce burn

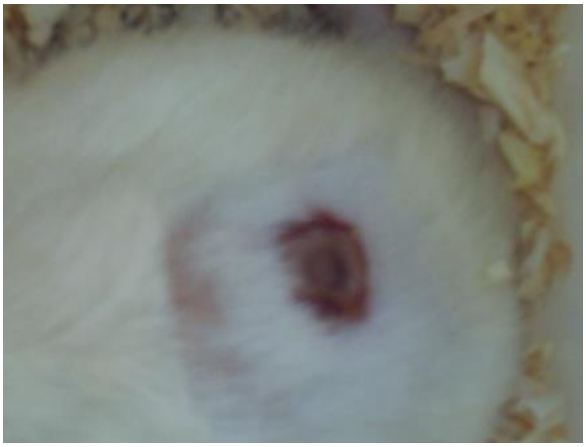

Figure 2
Burn the back of the animal

Figure 3
Formation of CFU before and after application of MC

Cheng (1982) e Kloth (2005) studied the effects of the electric stimulation of different intensities in the process of repair tissue and observed that the high electric currents (miliampere) inhibit the regeneration and the lowest (microampere) favors her. Sonnewend (2004) analyzed the effect of the long infrared radiation and microcurrents (160μA) about the process of repair of

wounds in mice and observed that in the groups submitted thus the treatment by infrared as for microcurrent, the presence of strange bodies in the lesions was smaller of the than observed in the group control, forming a barrier that reduced the risk of infections. Batassani (2007) evaluated the effects of the microcurrent (80μA) in the current lesions of burns of 3rd degree and observed that besides the quality of the cicatricial skin, in the group of treated animals, to show in a more orderly way, evidencing larger fibroblast number, the animals that were submitted to the therapy by microcurrent presented a decrease of the number of pathogenic microorganisms reducing like this the infectious process in the place of the lesion, when compared to the group controls. Through the results obtained with the analysis of this study, it was observed that the group of animals submitted to the therapy by microcurrent presented reduced number of microorganisms in relation to the group controls, suggesting like this a reduction of the infectious process in the place of the lesion. Besides, the quality of scarred skin, in the group of treated animals, was shown in a more orderly way, evidencing larger fibroblasts number that suggests better quality of the cicatricial skin.

4. CONCLUSION

Through this study, it is concluded that the application of microcurrent in burns of 2 degrees induced in the skin of the back of rats (*Rattus novergicus*) was effective in reducing microorganisms in the party. Therefore, this treatment had a satisfactory effect on the bacteriostatic effect.

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Conflict of Interest:
The authors declare that there are no conflicts of interests.

Data and materials availability:
All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Carley PJ, Wainapel SF. Electhrotherapy for acceleration of wound healing: low intensity direct current. *Arch Phys Rehabil*. 1985, 66(7), 443-6
2. Carvalho PTC. Analysis of cutaneous scarring by means of spectrophotometry: Experimental study in diabetic rats, Tese de Mestrado, Escola de Engenharia de São Carlos/Faculdade de Medicina Ribeirão Preto/Instituto de Química de São Carlos/USP, 2001, 84 pp
3. Cheng N, Vanhoff H, Bockx E. The effect of electric current on ATP generation protein synthesis, and membrane transport in tar skin. *Clin. Orthop* 1982, 171, 264-272
4. Davis SC, Ovington LG. Electrical stimulation and ultrasound in wound healing. *Dermatol Clin*. 1993, 11(4), 775-81
5. Elsayed S et al. Utility of Gram stain for the microbiological analysis of burn wound surfaces. *Arch Pathol Lab Med*, 2003, 127(11), 1485-8
6. Erol S et al. Changes of microbial flora and wound colonization in burned patients. Burns, 2004, 30(4), 357-61
7. Evans RD, Foltz D, Foltz K. Electrical stimulation with bone and wound healing. *Clin Podiatr Med Surg*. 2001, 18(1), 79-95
8. Fernandes VOM, Filho RN. Infecção em Queimados. In Infecção Hospitalar e suas Interfaces na Área da Saúde, Atheneu, Rio de Janeiro, 2004, 657-669
9. Kloth LC. Electrical Stimulation for wound Healing: A Review of evidence from In Vitro Studies, Animal Experiment, and clinical Trials. Lower Extremity Wounds, 2005, 4, 23-44
10. Macedo LSM, TCBC-DF, Rosa CS, Macedo SCK, Castro C. Risk factors of sepsis in burned patients. *Rev. Col. Bras. Cir*. 2005, 12, 1-7
11. Marino SR et al. Measurement of day and night neutrino energy spectra at SNO and constraints on neutrino mixing parameters. *Phys. Rev. Lett*. 2002, v.1
12. Mello BP, Sampedro FMR, Piccinini MA. Effects of the HeNe laser and of the application mode on healing burns in rats. *Fisioterapia e Pesquisa*, 2007, 14, 6-13
13. Nelson RM et al. Eletroterapia Clínica. 3nd ed. São Paulo: Manole. 2003, 221-236
14. Sonnewend D, Oliveira JLR, Nicolau RA, Magalhães RG, Conrado LA, Zângaro RA, Pacheco MTT. O Efeito da radiação infravermelho longo e microcorrentes sobre o processo de reparação de feridas em ratos. Revista do 19° Congresso Brasileiro de Engenharia Biomédica, 2004
15. Valle RKK, Reis LL, Bonvent JJ, Shida SC. Efeito da aplicação de microcorrente elétrica na restauração da pele de ratos exposta à ação de radicais livres. Revista do 21º

Congresso Brasileiro de Engenharia Biomédica, 2008, 01, 247-250

16. Who's Certified [database on the Internet]. Batassani (S): Avaliação dos efeitos das microcorrentes nas lesões decorrentes de queimaduras de 3° grau (cited 2019), Avaliable from: http://www.digitalsub.com.br/doutorbusca/artigos/questionview.asp?key=Avalia%E7%E3o+dos+efeitos+das+microcorrentes+nas+leses+decorrentes+e+queimaduras+de+3+grau

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