

Multifloral honey wound healing evaluation on Class IIB depth burns induced in rats of the Wistar strain

Abstract

Introduction: The use of local natural products, such as honey, are empirically prescribed in the treatment of burns and several medical conditions.

Aim: Burns are frequent. Can wound care after burn be done using honeys available in our context? This is why this study was conducted to evaluate the burn wound healing activity of three types of local types of honey on rats.

Materials and methods: This was a comparative experimental study held at the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I. We used 3 varieties of honey designated by their cities of origin: Ngaoundal, Okuh, and Yaounde. Brulex® (Zinc Oxide) was our reference medicine against burns. Male rats of the wistar-Wistar strain have served as animal material on which the burns were performed. There were 36 individuals divided into 4 groups of 9 rats per batch for treatment with reference medicine and 3 honey samples. We realized experimental burns under general anesthesia by a heated mass. The surface areas were calculated using Autodesk the AutoCAD 2014® software. The photos were taken using an XTIGI V10® telephone. At the various dates selected, the wound surfaces calculated for each batch were expressed in the form of the mean ± standard deviation. For their comparison, we used Fisher's ANOVA test.

Results: In the evolution of the healing process (Table I and Figure 1), the group of rats treated with Brulex® showed the largest injured surfaces on day 0 ($8.83 \pm 2.34 \text{ cm}^2$), the least extensive being those of the Okuh group ($6.83 \pm 0.66 \text{ cm}^2$). On the 24th day, the smallest areas were in order those of the Ngaoundal, Yaounde, and Okuh lots. While the rats in the Brulex® and negative control lots were not yet completely cured.

Conclusion: The three honey types are effective in burn wound care

Key-words: Burns – Wound healing - Honey

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INTRODUCTION

According to the World Health Organisation (WHO), the International Society for Burn Injuries (ISI), and the WHO Emergency Medical Teams Technical Working Group on Burns (WHO TWGB), burns are a global public problem [1-3]. Burnings are-is responsible for 180,000 deaths per year worldwide, the vast majority occurring in low and middle middle-income countries [1]. In Cameroon, a study by the major burns center in Douala showed that domestic accidents are the most frequent causes (63.13%), followed by work accidents (22.50%) [4]. Different methods of burns wound are-exist [5]. However, the use of many products is often limited because of their unavailability and their high price, especially in developing countries. An alternative is therefore the use of local natural products, which have proven their effectiveness in the treatment of burns, and are available, safe and affordable. Honey is one of these natural products. Honey is derived fromis of plant and animal origin, obtained by the transformation of flower nectar or honeydew by the bee *Apis mellifera* [6]. Some studies have already been carried out on honey and its properties, worldwide and in Africa [7-22]. In relation toOf its climatic diversity, Cameroon presents a variety and a diversity of honeys kinds of honey for such scientific experiments. This is why it seemed important for us to evaluate the healing activities of three varieties of honey from Cameroon, harvested in three localities, different both by their climate and their vegetation. The general objective was to investigate the healing properties of these three varieties of Cameroonian honey on experimental burns in rats.

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MATERIAL AND METHODS

Nature, type, and location of the study

This was a comparative experimental study related to the therapeutic efficacy of varieties of honey in Cameroon. It was held at the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I (Anatomopathology, and Animal Care Laboratories) and at the National Polytechnic School of the same university, where the manufacture of a small mass was done in the Mechanical Engineering laboratory laboratory.

Equipment

For our study, we used 3 varieties of honey designated by their cities of origin: Ngaoundal, Okuh, and Yaounde. Brulex® was our reference medicine against burns. A 100g of this topical ointment contains: 5g of Zinc Oxide; 1g of Peruvian Balsam; 0.5g of Phenazone, 30mg of phenol, 3.6mg of sodium salicylate and excipients (glycerol, sodium carbonate decahydrate, sodium benzoate, levomenthol, wool fat, and purified water, according to the 2020 version of the French Vidal reference drug book. Male rats have served as animal material on which the burns were performed.

Induction and assessment of the burn

Quantitatively, the sampling selected albino rats of the *wistar-Wistar* strain, from the animal facility of the Faculty of Medicine and Biomedical Sciences. There were 60 of them in the test phase. While 12 rats were included in the batch of untreated burns and 12 in that of unburned specimens the 36 remainings were divided into 9 rats per batch for treatment with Brulex and the 3 honey samples. Before this distribution, a pre-test was carried out with five batches of two *02*-rats of the *wistar-Wistar* strain. The realization of experimental burns, according to the method of Cai *and et al.*, was performed under general anaesthesia by intravenous administration of ketamine® and diazepam® for 15 to 20 minutes. It used a mass of 100g and a round contact surface of 22mm in diameter. The mass was heated in boiling water (100 °C) until thermal equilibrium (reached at 5 min). After heating, it is removed from the water, quickly wiped off, and then applied without pressure for 20 seconds at the place of election. The photos were taken using an XTIGI V10 telephone; the surface areas were calculated using the *Autodesk AutoCAD 2014® software*. The evaluation of healing by digital planimetry proceeded from the calculation and the percentage of retraction, using the equation developed by Gopinath *and et al.* in 2004. We then calculated the average of the areas of the six wounds of the same batch at time t, in comparison to the area of the initial burn.

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Statistical analysis and bioethical considerations

At the various dates selected, the wound surfaces calculated for each batch were expressed in the form of the mean ± standard deviation. For their comparison, we used Fisher's ANOVA test. The data was saved as a Microsoft Office Excel® 2013 file and then analyzed using SPSS version 20.0 software. From a bioethical point of view, the experimental protocol used in this study complies with the recommendations for animal care used in research and teaching of the NRC of 1996. In addition, this work has been validated by the institutional research ethics committee of the Faculty of Medicine and Biomedical Sciences, located in Yaounde.

RESULTS

Morphological parameters and healing of burns

In the evolution of the healing process (Table I and Figure 1), the group of rats treated with Brulex® showed the largest injured surfaces on day 0 ($8.83 \pm 2.34 \text{ cm}^2$), the least extensive being those of the Okuh group ($6.83 \pm 0.66 \text{ cm}^2$). On the 24th day, the smallest areas were respectively and crescendo of the Ngaoundal, Yaounde, and Okuh lots. While the rats in the Brulex® and negative control lots were not yet completely cured. Figure 1 represents the variations in the rate of contraction of the surfaces of the wounds of the Okuh, Brulex®, and negative control groups. We observe that the rats of the Okuh batch have a faster surface contraction than that of the other two batches. Similarly, the same evolutionary pattern is observed in the comparison of two other batches with the Yaounde and Ngaoundal batches. For a comparison of the 3 therapeutic trials, it is observed that the rats of the Okuh batch were those which had a slower healing rate than that of the other two batches. But all of those rats were cured around the 22nd day. Figure 1 shows the macroscopic characteristics observed on the burns on days 0, 10, and 22. The wounds treated with honey had scabs at the start of the experiment, which ended up falling off after. Also in the negative control group, the wounds tended to dry quickly and crust, but with very slow healing.

DISCUSSION

We observed a real healing effect that was rapid and variable depending on the origin of the honey, but also in the three cases significantly better than that of Brulex®. This property of honey clinically constitutes proof of its addition as an important excipient, usable in cosmetology and pharmaceutical products for dermatological use. The efficacy of honey for the treatment of burns, already mentioned by other authors [7-22], is currently valid in our local context. Because it is biocompatible and associated with established antimicrobial and antibacterial activity, the

honey dressing of burns, wounds, and loss of skin material is being suggested as a future solution to burn wound dressing.

CONCLUSION

We can conclude that the topical treatment of degree IIB burns was effective with the varieties of honey tested. In the evaluation of the scarring process, the healing time is shorter, with a higher rate of contraction when batches of rats are treated with honey, compared to those treated with the reference drug.

Table I: Evolution of the burn surface size during experimentation for each group (in cm²)

Day	Negative control	Brulex®	Ngaoundal	Okuh	Yaounde
0	7,69 ± 0,89	8,83 ± 2,34	7,76 ± 1,3	6,83 ± 0,66	7,80 ± 0,73
4	6,99 ± 1,515	8,14 ± 1,549	6,38 ± 0,483	6,16 ± 0,483	6,34 ± 0,906
8	5,95 ± 0,097	7,61 ± 2,130	5,56 ± 0,471	5,04 ± 0,602	4,93 ± 0,416
12	5,22 ± 0,964	6,14 ± 0,850	3,34 ± 0,103	3,62 ± 1,805	3,54 ± 1,091
16	3,49 ± 0,082	3,98 ± 0,205	1,21 ± 0,131	1,95 ± 0,710	1,02 ± 0,143
20	1,67 ± 0,777	2,51 ± 0,026	0,42 ± 0,204	0,79 ± 0,024	0,42 ± 0,101
24	0,80 ± 0,062	0,74 ± 0,247	0,0 ± 0,000	0,0 ± 0,000	0,00 ± 0,000

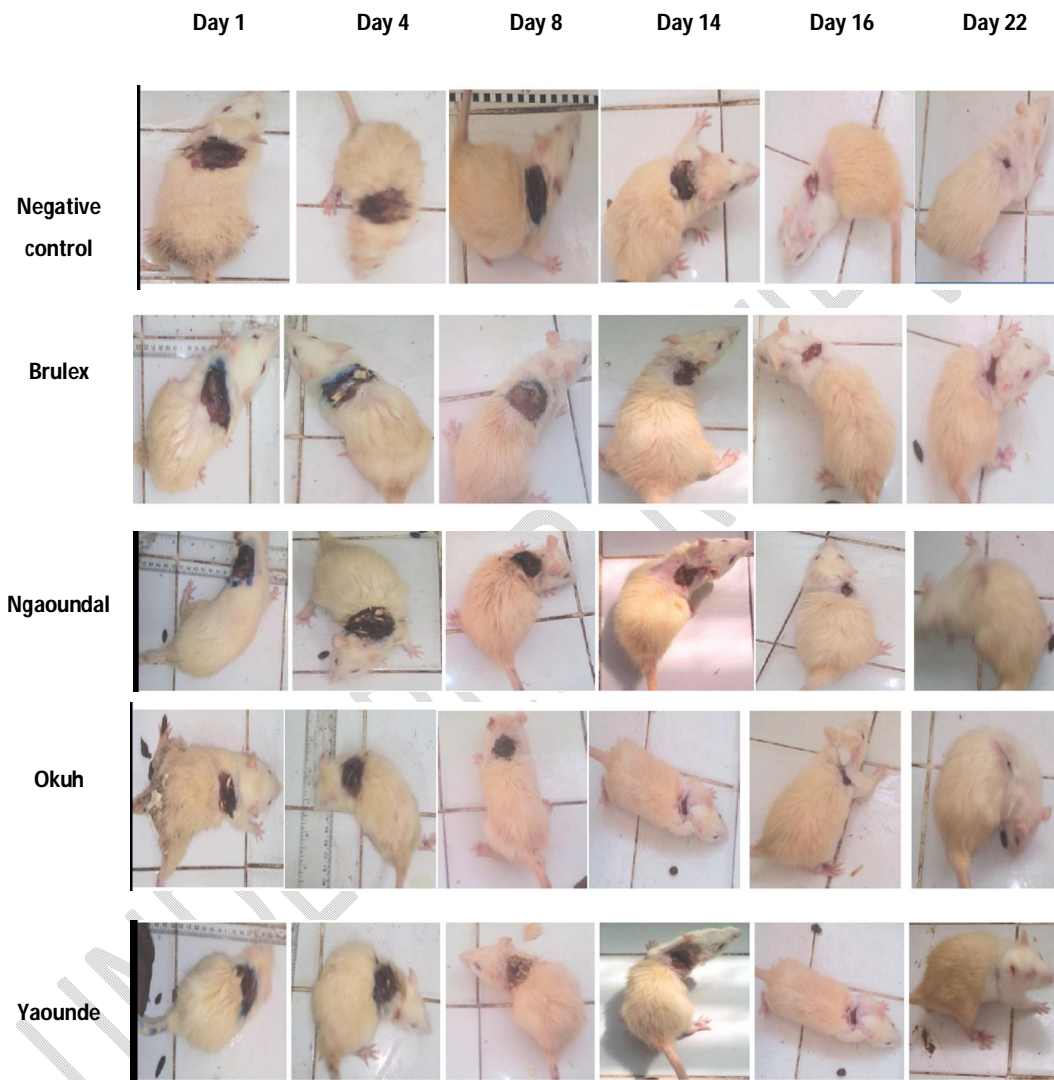


Figure 1: General clinical wound evolution for each group

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