



## Research Article

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## HONEY AS AN ALTERNATIVE HEALING FOR BURNS ON WHITE RATS (*RATTUS NORVEGICUS*) STRAIN SPRAQUE DAWLEY

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**ABSTRACT**

Burns is a serious health problem that can lead to morbidity, disability, and death. One of the standard treatment of burns is hydrogel. Hydrogel is good for burn but quite expensive, so it is necessary to look for the cheaper, easier with less side effects like honey. The aim of this study was to determine whether honey can act as better alternative treatment for burns than hydrogel in Sprague Dawley rat strain. This study was a comparative experimental study in anatomical pathology laboratory medical faculty of Lampung University using 15 white rats divided into 3 groups: 5 rats control group which was only given burns (group 1), 5 rats that was given burns and honey topically (group 2) and 5 rats that was given burns and hydrogel topically (group 3). The clinical healing and histopathologic picture were performed. Statistical analysis performed using One Way Anova test and Post Hoc LSD test. The test results showed no significant difference between the honey and the hydrogel group ( $p = 0.861$  and  $p = 0.502$ ). As conclusion, honey can be used as an alternative drug for treatment of burns on White rats (*Rattus norvegicus*) Sprague Dawley strain.

**Keyword:** Burns, honey and hydrogel**INTRODUCTION**

Burns is often found in daily life<sup>1</sup> and it is a serious health problem that can cause morbidity, disability and mortality.<sup>2</sup> There is more than 300,000 mortality caused by electric burns every year.<sup>3</sup> In Indonesia, there are many patients burns, especially for people who live in slum area with low economic status.<sup>4</sup> Patients of burns suffer, develop less confidence and spend a lot of money for healing the disease.<sup>5</sup> Now-a-days, one of the standard medicines of burns is hydrogel. Hydrogel works to keep the humidity of the dry burns, improve granulation tissue and epithelialization of skin quickly.<sup>6</sup> Hydrogel contains water and glycerin that give cooling effect and humidity on proliferation phase. The protein losing of burns are changed by hydrogel and hydrogel supply the protein. Now-a-days, hydrogel is still expensive for many patients. Therefore, we need an alternative treatment which is cheaper, easier and have less side effect to heal the burns. Modern medicine has revealed that honey can be used as a superior medicine.<sup>7</sup> Honey is known to contain peroxide which can be as an antibacterial substance<sup>8</sup> and it has high osmolarity so that it can absorb the water on injured skin and prevent infection.<sup>9</sup> Honey is also known to increase the collagen and granulation tissue, so that the epithelialization increase rapidly. Furthermore, honey is cheaper than standard medicine. Although honey has a lot of benefits, people still doubt to use it as a medicine especially for burns in medical professional scope. It is reasonable to expect that honey can substitute hydrogel to heal the burns. But, it still needs evidence to prove this hypothesis. Therefore, we did the experimental study to

see whether honey can substitute hydrogel to heal the burns. We used white rats SpragueDawley strain as experimental animals.

**MATERIALS AND METHODS**

This is a comparative experimental study by using controlled group design method. The subjects of this experiment were white rats (*Rattus norvegicus*) male Sprague Dawley strain 10-16 weeks old from *Balai Penelitian Veteriner* (BALITVET) in Bogor, West Java. During the experiment, white rats were placed in cages measuring 40 x 15 x 10 cm and were covered with woven metal measuring 0.5 cm. Each cage contained one rat and placed in an open room with a roof so that the air can circulate freely. During the experiment, the whole rats were fed by pellets AD2 diet. Feed was given as much as 10 % of body weight of rat, which is about 10-15 grams/head/day. The white rats were divided randomly into 3 groups: 5 rats control group which was only given burns (group 1), 5 rats that was given burns and honey topically (group 2) and 5 rats that was given burns and hydrogel topically (group 3). Firstly, researchers removed the hair of the back skin area of the rat and injected 0, 2 cc lidocaine diluted by 2 cc of distilled water, then burns were made by attaching 1 cm of diameter of electrical solder for 2 seconds. These formed burns on the backside of rat with 1 cm of diameter and the thickness to the dermis. The treatment for burns was honey and hydrogel that was used topically. Honey which was used in this study was pure from acacia flowers and there was no additional substance in this honey. Hydrogel is a gel that

we bought from drug store. The topical treatment for burns was given with a 2 mm thickness that cover the entire surface of the wound. We observed the burns clinically and compared the diameter of burns in the second and fourteenth day. The measurement of these comparison was in percentage. At fourteenth day researchers took the healing tissue of the burns and staining with the Hematoxyllin-eosin was done. Histopathology assessment was done by using 400 x magnification scoring by:

Score 5 : There was epithelialization and scar tissue of the burns.

Score 4 : There was a proliferation of fibroblast and accumulation of collagen, new blood vessels and no inflammatory cells.

Score 3 : There was a proliferation of fibroblasts and accumulation of collagen and new blood vessels and inflammatory cells.

Score 2 : There was necrotic tissue, new blood vessel, lot of inflammatory cells and few fibroblast.

Score 1 : There was a lot of necrotic tissue and inflammatory cells.

**RESULT**

Clinical assesment of the healing group burns showed that the third and second group have the higher healing percentage which were found to be 83.6 % and 82 % respectively better than the control group (56.6 %) (Table 1).

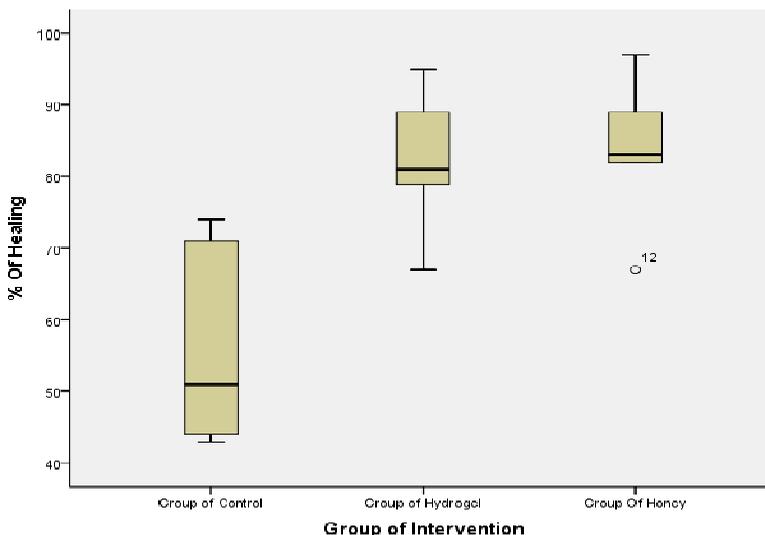
Based on One way ANOVA experimental statistic, some differences in clinical healing result were tabulated in Table 1. Then, to observe the differences among the groups, it was continued by using Post hoc LSD (Table 1). The result showed that there was no significant differences in clinical healing of burns in rats that were given by hydrogel and honey topically.

The result of histopathology assesment on skin tissue showed that the result were not different from clinical healing on the rat’s skin. In the first group, there was less epithelialization and there were many necrotic tissue and inflammatory cells. Besides that, there was no new blood vessels and collagen with similar as normal tissue (Figure 2) and it was known the score for each rat of group were 2,3,1,2,1, so the rates score was 1.8. In the second group, there was epithelialization on half of the injury, there was a proliferation of fibroblasts and collagen accumulation with proliferation new vessels and inflammatory cells on the part of injure (Figure 3). The score of the second rat group was 3,3,4,3,2 so the average score was 3. In the third group epithelialization mostly happened. There was a proliferation of fibroblasts and there was a collagen accumulation with a new blood vessels (Figure 4). The score of the third rat group was 3,2,5,4 and 4 so the rate score of this group was 3.4. The highest grade of burns healing in histopathology were in the third group (3.4) (Table 2).

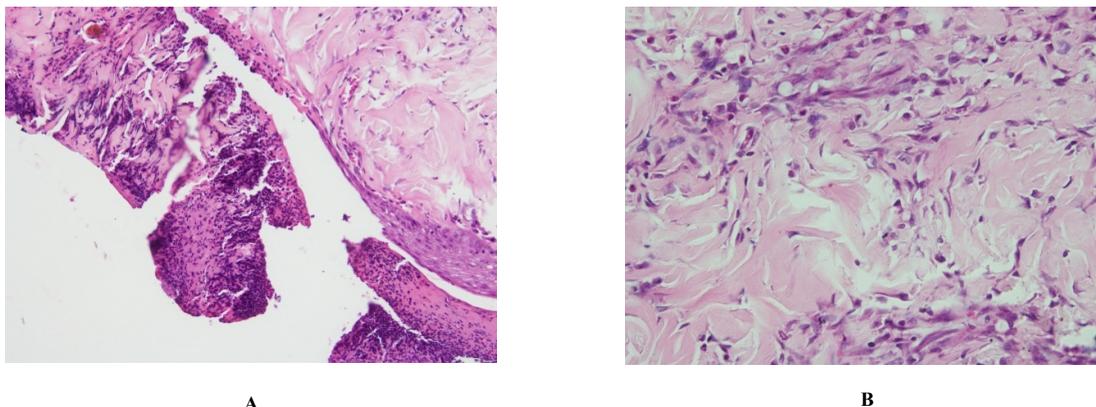
**Table 1: The Average of Clinical Healing of Burns for Each Groups**

Group of treatment	Clinical Healing of Burns (X ± SD)	P*
G1	56.6 ± 14.88	
G2	82 ± 10.64	0.007
G3	83.6 ± 11.04	

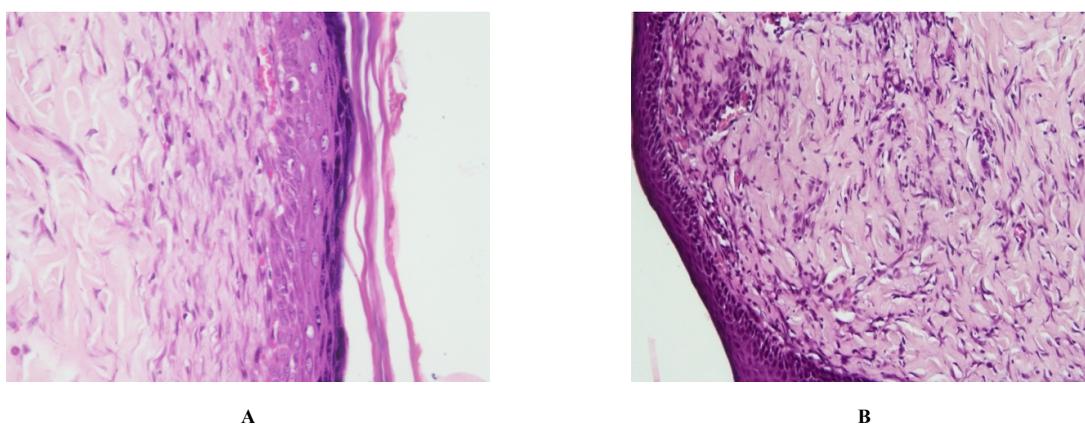
Note: G1: control group, G2: hydrogel treatment, G3: honey treatment, P\*: based on One way ANOVA. Test Post Hoc LSD: G1 vs G2 p = 0.007; G1 vs G3 p = 0.005; G2 vs G3, p = 0.861



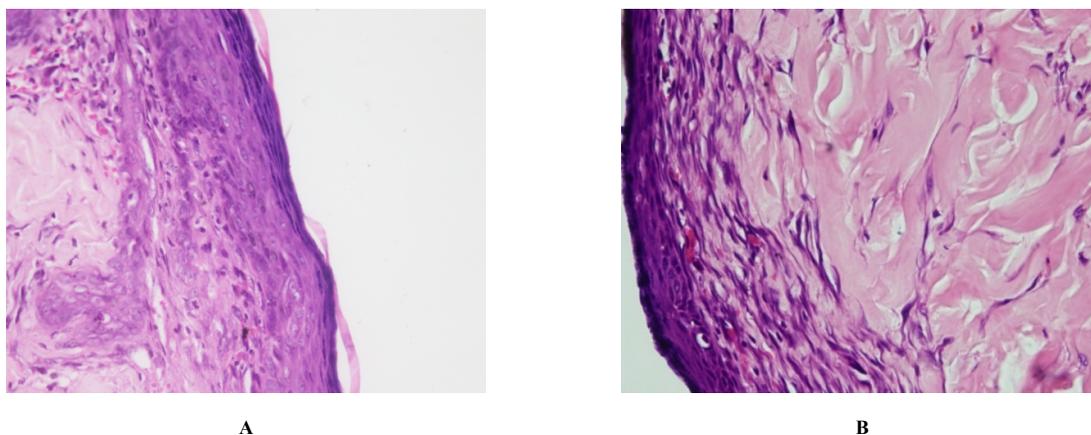
**Figure 1: The rate of clinical healing in three groups of rats**



**A** **B**  
**Figure 2: The rats skin histology in group 1 (A). HE-100X; (B) HE-400X**



**A** **B**  
**Figure 3: The rats skin histology in group 2 (A). HE-100X; (A) HE-400X**



**A** **B**  
**Figure 4: The rats skin histology in group 3 (A). HE-100X; (B) HE-400X**

**Table 2: The average score of healing skin histology percentage on the third group**

Treatment group	The average of rats healing skin (X ± SD)	P*
K1	1.8 ± 0.84	
K2	3 ± 0.7	0.042
K3	3.4 ± 1.1	

Note : K1: control group, K2: hydrogel treatment, K3: honey treatment, P\*: based on One way ANOVA. Uji Post Hoc LSD: K1 vs K2 p = 0.017; K1 vs K3 p = 0.060; K2 vs K3 p = 0.502

Based on the result of One way ANOVA statistic, there was a difference in healing score of rats skin, histologically as cited in Table 2. To know the differences among them, it could be continued by using Post LSD (Table 2). This observation showed that, there was no the difference in healing score of rats skin histology among the groups which were given hydrogel and honey.

## DISCUSSION

Honey has been used by many people as a medicine. It is used to heal injury.<sup>10</sup> Some of researcher had revealed that honey contains antioxidants and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) as neutralizing free radicals. Besides that, honey is also able to absorb water on injury which prevent infection and repair skin tissue quickly.<sup>9</sup> Based the result of the research, we knew that the rats burns which were given honey topically twice a week scavage got the better healing than the nontreated group. It showed that honey is able to heal the burns faster. Besides that, the result of the research found that honey didn't have the significant difference in healing level statistically with hydrogel (Table 1 and 2). Honey is better in healing burns than hydrogel in general (Table 1 and 2). Honey not only can keep the injury humid such as hydrogel, but also can inhibit bacterial growth and can inhibit bacteria through some component which contain inside it.<sup>11</sup> It also can activate fagosit and monosit to clean necrotic tissue upinside.<sup>12</sup> High nutrition of honey can increase substrate supply in skin tissue so it could stimulate epithelialization and angiogenesis in healing the injury and make process to be faster.<sup>13</sup> Honey is well-known to contain flavonoid which can catch free radicals<sup>14</sup> and can decrease inflammation responds.<sup>15</sup>

## CONCLUSION

Honey can be used as a hydrogel replacement in healing burns on white rats (*Rattus norvegicus*) Strain Spraque Dawley.

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