

## The Effect of Foaming Firewood on Incision Wound Healing in Female White Rats (*Rattus Norvegicus*) Wistar Strains

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### ABSTRACT

An incision is a type of wound caused by a wound from a sharp object. Wound healing through the inflammation, proliferation, and remodeling phases. Alternative wound healing is to use firewood foam. The purpose of this study was to determine the effect of firewood on wound healing incision in female white rats (*rattus norvegicus* l.) Wistar strains. The experimental research design used the type of post-research. It was just a trial group with rat population of 24 samples of mice and divided into 4 groups, 6 heads per group. The first group was given 1x daily wooden firewood, firewood given 2x foam a day, firewood fashion III given 3 times a day, and IV by povidone iodine. Statistical test used one way ANOVA. Results of study group I and II recovered moderately (9-13 days), group III recovered most quickly (<9 days), and group IV recovered almost all the time (> 13 days). The statistical test data showed that the normal distribution of Asymp. Sig (2-tailed) was 0802 > 0,05 data. Results of data homogeneity sig. 0535 >  $\alpha$  0.05 was then the same population variation. One way ANOVA test result counted 130 800 with sig. 0000 <  $\alpha$  0:05 so H0 was rejected. It can be concluded that the group of mice healing process 3x a day faster than the group of mice 1x 2x a day or a day and a group of povidone iodine 10% experienced the healing process is longer than most other groups. So there is the effect of firewood on the wound healing incision in female white rats (*rattus norvegicus* l.) Wistar strains.

**KEYWORDS:** incision, wound healing, firewood, female white rats (*rattus norvegicus* l.) Wistar strains

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### INTRODUCTION

The first defense layer that protects the body from invading microorganisms is skin [1]. Skin problems that are often experienced by humans are wounds. In general, the definition of injury is the destruction of tissue structure and normal anatomical function as a result of pathological process originating from internal or external that concerns certain organs [2]. In addition, the definition of wounds is missing or damaged part of the body tissue. The wound is also defined as physical damage resulting from the opening or destruction of the skin causing an imbalance of normal skin function and anatomy [3].

Wounds can be classified by anatomical structures, properties, healing processes and length of healing. As for the nature of the wound it differed from *babras*/ abrasion, contusions, incisions, lacerations, sepsis, and others. Classification based on the skin layer structure includes: superficial, involving the epidermis; partial thickness, involving the epidermis and dermis; and full thickness involving the epidermis, dermis, fat layer, fascia and even down to the bone [4].

Public health data on Riskesdas research in 2013 from 33 provinces in Indonesia were 1,027,758 respondents, 8.2% were injured, injured or injured due to traffic accidents in Indonesia showed that there were 3 provinces that were blisters and bruises 70.9%, open wound 23.2%, and sprained 27.5% [5].

The number of traffic accidents in Tulungagung district in 2013 was still quite large, only a slight difference with last year. Until December 25, 2013 recorded 735 accidents, while last year 829 accidents. During the middle of 2012 there were 64 deaths, 31 serious injuries, and 327 minor injuries. As of December 25, 2013, the death toll of 164 people, seriously injured 11 people, and minor injuries reached 560 people [6].

Wound healing through stages: inflammatory phase, proliferation phase, remodeling phase. While factors affecting the wound healing process depend on the intrinsic factors of the wound and extrinsic conditions of the body condition [7]. Treatment of the wound should be done well because it can cause complications that include infection, hematoma, seroma, bleeding, keloid and hypertrophic scarring [8].

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The process of wound healing is a very important process in human life so it is necessary to get good and continuous attention so that healing can take place properly and ideal. Acceleration of wound healing can be done by bringing together both sides of the wound, giving drugs such as antibiotic ointment or wrapped with certain techniques such as using hydrogel. In addition to the above methods, wound healing can also be supported by using traditional medicine.

Currently some of the known alternatives to wound healing using both medicinal and herbal remedies are firewood foams. Wood-fired foam is a traditional medicine of liquid originating from the combustion process of firewood. People living in the village use these traditional remedies to aid the healing process of wounds, both to speed up the healing process and to restore the skin condition again as it was before the wound [16].

The test material (drug) to be used in humans must pass the laboratory test completely and proceed with the experimental animal study to determine its feasibility and safety. Animal experiments are required to observe and examine all the reactions and interactions of the test material provided, as well as the resulting impact as a whole and deep. The feasibility of using experimental animals in the study should be assessed by comparing the risks experienced by experimental animals with the benefits to be obtained for humans. Any study that uses animal experiments ethically should apply the general principles of health research ethics and the 3R principles of replacement, reduction, and refinement. The treatment of experimental animals needs to be detailed in the study protocol in lieu of informed consent on human subjects [9].

Various small animals have certain characteristics that are relatively similar to humans, while other animals have in common with the physiological aspects of human metabolism. White mice are often used in assessing the quality of proteins, toxicity, carcinogenic, and pesticide content of a product of agricultural foodstuffs [10].

Currently, several strains of mice are used in research in laboratory animals in Indonesia, among others: Wistar; (originally developed at the Wistar Institute), whose derivatives can be obtained at the Center for Basic Technologies of Health and Center for Applied Health Technology and Epidemiology Clinic of National Health Research and Development Agency; and Sprague Dawley; (albino rats produced on the Sprague-Dawley farm), which can be obtained at the Laboratory of the Food and Drug Administration and the Center for Basic Health Technology of the National Institute of Health Research [11].

Based on the above background researchers wanted to know the influence of wood fireball to assist the healing process of incision wounds in female rats (*Rattus Norvegicus L.*) strains wistar. The reason for using wood firewood is that the material is easy to find in the community.

## METHODS

The research design used in this research is true experimental research design because only one of the group conducted intervention and other group is not done intervention. While the true experimental type used was posttest only group design. This subject design was placed randomly into groups and exposed as an independent variable given a post test. Posttest values were then compared to determine the effectiveness of treatment. This design was suitable for use when pre-test is not possible or pre-test had the possibility to effect on experimental treatment. This design would be more suitable in experiments related to attitude formation because in such experiments it would have an effect on the treatment [12].

In this study the existing groups were the control group and the treatment group, which were treated with 3 groups, groups with one-time firewood foam, groups with twice-daily firewood foam, and groups with wood-fired foam three times a day

### Research Ethics

Research with experimental animals should consider the humane aspects of the animals, in accordance with the principle of 5F (freedom), namely: free from hunger and thirst, free from fear and long-term stress, free to express natural behavior, given the space and appropriate facilities (appropriate enrichment of environments). All experimental animal treatments were detailed in the study protocol which was analyzed as informed consent in research using human volunteers.

### Animal care trial procedures

Rats cage size 50 cm X 50 cm X 40 cm. Rats are weighed before and after treatment, then periodically weighed. Mice adapted first by feeding 20 grams per day and put on the cage with the same conditions for 2 days. The cage is disinfected daily with the hibit. The rat killing process at the end of treatment was done with euthanasia, injecting ketamine overdose 75 mg / kgBW [13; 18]. Care of animal subjects and experimental procedure was approved by

Research Ethics Committee of STIKes Surya Mitra Husada Kediri No: 196/KEPK/XI/2016, Kediri, East Java, Indonesia.

**RESULTS**

The study was conducted on May 11, 2016. The number of samples in the study were 24 respondents divided into four groups and had homogeneous characteristics ie female white rat (*Rattus Norvegicus* L.) strain wistar, having age 8-12 weeks, no anatomic abnormalities appears, there were no signs of previous infection, and weighs 180 - 200 grams.

The procedure of wound care was in group I with the administration of firewood foam 1x a day i.e. in the morning, in group II with the provision of wood fuel foam 2x a day i.e. in the morning and afternoon, in group III with the provision of wood fuel foam 3x a day i.e. in the morning, afternoon, and in the afternoon, and in group IV was not given a firewood foam but instead with a 10% podidon iodine (bethadine) in the morning. At the beginning of the incision wound all rats should have the same incision wound between mouse one and the other.

Rat treatment was done daily by cleaning the cage 1x a day, feeding corn 2x a day (morning and evening), providing clean water for drinking rodents in the cage, recording the observations and shooting incision wounds every day until the incision wounds are declared healed.

On the observation sheet there were five kinds of criteria, namely (wound area, scent, wound secretion, granulation, and stitches) to be recovered if all criteria had to get a value of 4 or a total value of 20. Width <10mm (value 4), scent of odor (4), dry wound secretion (value 4), full wound granulation (value 4), and seam wound closure (value 4).

**A. Results of long observations of wound healing of incisions in groups not given firewood foam or povidone iodine were 10%**

**Table 1.** Distribution of incisional wound healing frequency in female white rats (*rattus norvegicus* l.) Wistar strains not given wood foam or povidone iodine was 10%

Long Healing Days	Group	
	4 (control)	
	F	%
14	3	50%
15	3	50%
<b>total</b>	6	100%

Source: research results of 2016

Based on Table 1 above it was known that 6 rats (100%) were group IV (not given wood sponge foam or given 10% povidon iodine) obtained by 3 rats (50%) on day 14, and 3 rats (50%) on day 15.

**B. Long observation of incision wound healing in groups given firewood foam**

**Table 2** Distribution of incisional wound healing frequency in female white rats (*rattus norvegicus* l.) Wistar strains fed wood firewood

Long Healing Days	Group					
	I (1x daily)		II (2x daily)		III (3x daily)	
	F	%	F	%	F	%
7					3	50%
8					3	50%
9			2	33,33%		
10			4	66,67%		
11	2	33,33%				
12	2	33,33%				
13	2	33,33%				
<b>Total</b>	6	100%	6	100%	6	100%

Source: research results of 2016

Based on the above Table 2 it was known that group I (given 1 fungus wood sponge) there were 6 mice (100%) obtained by 2 rats (33,33%) on day 11, 2 rats (33,33%) on day 12, and 2 rats (33,33%) on day 13. While group II (given 2x daily wooden foam) there were 6 mice (100%) obtained by 2 mice (33,33%) on day 9, and 4 mice (66,

67%) on day 10. And group III (given 3 times daily wooden foam) there were 6 mice (100%) obtained by 3 rats (50%) on day 7, and 3 rats (50%) on day 8.

### C. Statistical test results

The result of the analysis showed that the data was normally distributed with asymp. sig (2-tailed) value of 0.802 > 0.05, so the data was stated normal distribution. While the results of the homogeneity data showed that Sig. 0.535 whereas  $\alpha = 0.05$ . Thus it meant that if Sig (0.535) >  $\alpha$  (0.05) then the population variation was equal or homogeneous.

The result of influence analysis with One Way Anova test showed that P value (0.000) <  $\alpha$  (0.05), so H0 rejected H1 was accepted meaning there was influence of wood sponge foaming on incision wound healing on female white rat (*rattus norvegicus* L.) Strain wistar.

Then the data results from Duncan's Post Hoc test to see the differences of each group could be seen from the harmonic mean values generated by each group are in the same or different subset columns. In the Duncan Post Hoc test results showed the four groups were in different subset columns, so it could be concluded that the group with the fastest incision wound healing was a group given 3 x daily foam wood which has a mean value of 7.50 days, whereas the group fed 2x a day of wood foam that had a mean value of 9.67 days, and the group given 1x a day of wood burning foam having a mean value of 12.00 days experienced rapid wound healing (9-13 days), whereas the group experiencing healing of the old incision wound was a group that was not given a firewood foam that has a mean value of 14.50 days.

## DISCUSSION

### A. The duration of incision wound healing in the group that was not given wood sponge or 10% povidon iodine.

Based on the results of the data, it was found that 6 rats (100%) were group IV (not given wood sponge or 10% povidon iodine). The results obtained were 3 rats (50%) on day 14 and 3 rats (50%) on day 15. It could also be said that group IV (not fired wood foam or 10% povidon iodine) experienced healing of old incision wounds (>13 days) with a mean value of 14.50 days.

An incision wound is a type of wound caused by an incision of a sharp object can be metal or wood and so on and the type of wound is usually thin. How to handle that needs to be done is to clean and provide disinfectant if necessary given drugs if you want to speed up healing [4].

Factors affecting wound healing are: age, nutrition, infection, circulation, hematoma, foreign body, ischemia, diabetes, state of injury, and treatment [7].

Povidone iodine is bacteriostatic at 640  $\mu\text{g}/\text{ml}$  and is bactericidal at 960  $\mu\text{g}/\text{ml}$ . In 10% povidone iodine contains 1% iodine which is able to kill bacteria in 1 minute and kill spores within 15 minutes. The mechanism of action of povidone iodine begins after direct contact with the tissue then the iodine element will be released slowly with the activity inhibits the metabolism of bacterial enzymes that interfere with the multiplication of bacteria that cause the bacteria to become weak. Small amounts of iodine are absorbed into the bloodstream, thus causing systemic effects with the shock of tissue anxiety. Excessive use of iodine may inhibit the process of wound granulation. Povidone iodine commonly used in wound care is only 10% [15]. The results of a study stated that the higher concentrations of iodine used further accelerate wound healing.

Povidone iodine 10% is used in wound care as disinfection of wounds so that wounds do not become infected [15]. In accordance with the results of this study indicating a group IV who was given povidone iodine 10% experienced long wound healing (> 13 days), so the researcher believes that less effective if the incision wound is given 10% povidon iodine because povidon iodine 10% more disinfection only.

### B. Results of long observations of incision wound healing in groups given wood fired foams.

Based on the results of the data, it was found that group I (given 1x daily wooden foam) amounting to 6 mice (100%) obtained 2 rats (33.33%) on day 11, 2 rats (33.33%) on day 12, and 2 mice (33.33%) on day 13. It could also be said to have a mean value of 12.00 days so that healing was fast incision wounds (9-13 days), while group II (given 2x daily wooden foam) of 6 mice (100%) were obtained by 2 mice (33,33%) on day 9, and 4 mice (66,67%) on day 10. It could also be said to have mean value 9.67 (9-13 days), and group III (given 3 times daily wood foam) amounting to 6 mice (100%) obtained by 3 rats (50%) on day 7, and 3 mice (50 %) on day 8. Can also be said to have a mean value (mean) 7.50 days so that healing wounds fastest (<9 days).

An incision wound is a type of wound caused by an incision of a sharp object can be metal or wood and so on and the type of wound is usually thin. How to handle that needs to be done is to clean and provide disinfectant if necessary given drugs if you want to speed up healing [4].

Factors affecting wound healing are: age, nutrition, infection, circulation, hematoma, foreign body, ischemia, diabetes, state of injury, and treatment [7].

Lignin substances that exist in wood fuel foam have properties that can penetrate and seep into the skin, so it will withstand the loss of liquid in the skin surface. As a result, the skin does not become dry quickly. Its hydrophobic nature on the outside will help resist some form of infection that works as a protection on the outside. This lignin substance subsequently works on the remodeling phase or maturation where the lignin properties can keep the skin in a sterile state, stay moist on the inside, and dry on the outside. As a result the infection does not occur outside of the skin cells, while inside the skin keeps its moisture so that the healing process of the wound on the skin can be accelerated [13,16].

Factors affecting wound healing one of them using this treatment in accordance with the results of research that has been done by researchers that group I (given 1x daily wooden foam) has a mean value (mean) 12.00 days, while group II (given a foam firewood 2x daily) has a mean value of 9.67 days, while group III (given 3x daily wooden foam) has a mean value of 7.5 days, and group IV (not given wooden foam (mean) of 14.50 days can also be said that the group given wood foam has a mean value of longer wound healing incision faster than the group that is not given fuelwood foam [4; 7].

The lignin substance found in wood foam can accelerate wound healing as well as the research that the group IV (not given wood sponge foam or povidone iodine 10%) experienced healing of the old incision wound (> 13 days) compared with the group I (given 1x daily wooden foam) and group II (given 2x daily wood burning foam) experienced fast wound incision healing (9-13 days) while group III (given 3x daily wooden foam) experienced the quickest incision wound healing (<9 days) [13; 16].

So the authors suggest that the provision of wood foam may affect the healing of incision wounds in female white rats (*rattus norvegicus* l.) Of wistar strains. 3x a day firewood foam has faster or more effective incision wound healing compared to 2x a day or 1x daily.

## CONCLUSIONS AND SUGGESTIONS

In this chapter will be presented the conclusions of the research results of the "Influence of Foam Giving on Healing Incision Wounds in Female Rats (*Rattus Norvegicus* L.) Wistar Strain in 2016" and suggestions to consider.

### A. Conclusion

1. The duration of incision wound healing in female white rats (*rattus norvegicus* l.) Wistar strains not given firewood foam or group IV of 6 mice (100%) had mean value 14.50 days experienced wound healing old incision that is > 13 days.
2. Long days of incision wound healing in female white rats (*rattus norvegicus* l.) Wistar strains fed with firewood resulted from group I of 6 mice (100%) had mean value 12.00 days experienced wound healing rapid incision of 9-13 days, while group II of 6 mice (100%) had mean value of 9.67 days experiencing rapid wound incision healing ie 9-13 days, and group III of 6 mice ( 100%) had a mean value of 14.50 days experiencing the fastest incision wound healing was <9 days.
3. The result of analysis of the effect of wood sponge filling on incision wound healing on female white rats (*rattus norvegicus* l.) Strains wistar  $p(0.000) < \alpha(0.05)$  then  $H_0$  rejected  $H_1$  accepted which means there is influence of wood fuel foam on healing incision wounds in female white rats (*rattus norvegicus* l.) wistar strains. 3x a day firewood foil has faster or more effective incision wound healing compared with 2x daily or 1x daily.

### B. Suggestions

1. For Health Services

Health services can perform treatment by using wood fuel foam 3x a day to patients with injured incision as an alternative medicine to replace medical therapy.

2. For Educational Institutions

For educational institutions can be a reference to do other research related to the provision of wood fuel foam on wound healing incision.

3. For Further Researchers

Other researchers can conduct research related to wood fuel foam by changing the research method and type of research. Other reviewers may conduct research on the same topic with different variables other than the incision wound, so the results can be compared

4. For the Community

For the Community can gain additional knowledge and understanding of wood fuel foam that can accelerate the healing process of injured incision and can use it as an alternative medicine.

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