



## Effectiveness of Ginger Ointment (*Zingiber officinale roscoe*) on Incision Wound Healing in White Rats (*Rattus norvegicus*)

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### Abstract

*Ginger (Zingiber officinale roscoe) is one of the most popular plants to be processed into herbal medicine. This plant contains active compounds in the form of gingerols, shogaols, flavonoids and saponins, which have anti-inflammatory, anti-tumor, antioxidant and antimicrobial effects. This study aims to determine the effectiveness of ginger extract ointment on incision wound healing time in white rats (Rattus norvegicus) by observing the percentage of wound healing and changes in wound morphology. This study used a laboratory experimental method using 24 white rats as test animals which were divided into four groups, namely two treatment groups (10% and 20% ginger extract ointment) and two control groups (one negative control group (no treatment) and one positive control group (Oxyfresh Soothing Pet Gel®)). The rats were anesthetized and shaved, then an incision was made on the dorsal part of the rat. The treatment was given twice a day for 14 days. The results showed that there were differences in the comparison of the percentage of wound area between the negative control group (without treatment), the positive control (Oxyfresh Soothing Pet Gel®), the treatment groups (ginger extract ointment 10% and 20%). The conclusion of the study was that the treatment group with 10% ginger extract ointment was more effective in accelerating the wound healing process.*

**Keywords:** *Ginger extract, Incision, wound healing, ointment, white rat.*

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### Introduction

Wounds can be experienced by everyone, including animals, both large and small animals. Wound is a break in tissue continuity due to injury or surgery. Wounds can be classified based on their anatomical structure, nature, healing process, and duration of healing. Wounds cause the inside of the animal to become exposed to the outside of the body, if left untreated, infection can occur and wound healing will be hampered. The process is divided into four main phases, namely the acute inflammatory response phase to injury, the destructive phase, the proliferative phase and the maturation phase. However, in reality, phases one and the next can overlap. One of the methods used to study wound healing is by using experimental animals, namely rats. The type of mouse that is often used for experimental animals is the white mouse. White rats as experimental animals are relatively resistant to infection. Various types of drugs in the wound healing process were tested on mice, traditional medicine (herbal) and modern medicine (chemistry) (Sjamsuhidajat and De Jong, 2005; Kartika, 2015; Wombeogo and Kuubire, 2014; Fauziah, 2010).

Traditional medicine can be used as a first aid medicine for wounds because it can be found and managed easily. One example of a plant that can be managed into herbal medicine is ginger. The active substances contained in ginger include gingerol, shogaol, flavonoids and saponins. The active substances in ginger are known to have anti-inflammatory, anti-cancer, anti-tumor effects, and are able to activate the TGF- $\beta$  signal (Setyaningrum and Saporinto, 2013; Etika et al, 2017; Thorne et al, 2016).

## Materials and Methods

The materials used in this study were 24 white rats (*Rattus norvegicus*) aged two to three months, weighing 150-250 grams. Rats are kept in individual drums made of wood husks. Kendang is given husks to keep the temperature optimal. handscoon, mask, sterile gauze, tampons, aluminum foil, bedding, soap, 1 cc syringe, 3 cc syringe, syringe, label, 70% alcohol, 10% povidone iodine, 96% ethanol, adeps lanae, vaseline album, tissue, anesthesia (ketamine), hypafix®, hansaplast® rolls, liquid NaCl, filter paper, undepad, ginger (*Zingiber officinale roscoe*) and Oxyfresh Soothing Pet Gel®.

The equipment used in this study were lab coat, mouse cage, food and drink container, minor surgical tools (scalpel, blade, stainless still tray, anatomical tweezers, and scissors), thermometer, ruler, clipper, cloth, scale, camera, jar. glass, ointment tube, spoon horn / spatula, petri dish, mortar, glass funnel, thick gloves, pocket scale, hair dryer, blender, elizabethan collar, large tray, knife, camera and stationery.

### *Preparation of Ginger Extract Ointment Formulation*

The ginger extract was made using the maceration method, which is mixing ethanol to dissolve ginger simplicia powder. The mixture is left to stand for  $\pm$  3 days and then filtered to obtain a thick extract from the ginger. The ginger extract ointment preparation was made 10 grams in multilevel concentrations, namely 10% and 20%. The ointment base used 85% vaseline album and 15% adeps lanae, then mixed with each other by mixing method and crushed in a mortar until homogeneous. The ginger extract that has been weighed is then added to each ointment base then crushed back in the mortar until homogeneous. Then put in a tube and labeled.

Table 1. Ginger extract ointment Formulations 10 g

Treatment Group	ginger extract (g)	<i>Vaselin Album</i> (g)	<i>Adeps Lanae</i> (g)
10%	1	7,65	1,35
20%	2	6,8	1,2

### *Treatment*

The research was conducted using simple random sampling method. Rats were divided into four treatment groups, namely the K- treatment (negative control) was the group of rats that were not given any injuries, the K + treatment (positive control) was the group of rats that were given injuries by giving Oxyfresh Soothing Pet Gel® ointment, the 10% SEJ treatment was a group The rats treated with 10% ginger ointment and 20% SEJ treatment were a group of rats treated with ginger ointment with a 20% concentration

## Observation of Anatomical Pathology

Observations were made on each treatment by descriptive scoring method for all rats. The wound condition was observed every day for 14 days by comparing the rate of wound healing by looking at the percentage of wound healing and changes in the macroscopic anatomy of the wound between treatment groups.

## Results and Discussions

### Wound Healing Percentage

The percentage of wound healing performed during 14 days of observation can be calculated using the Morton formula:

$$\text{Wound Healing Percentage (WH\%)} = \frac{L_1 - L_x}{L_1} \times 100\%$$

Note:

WH % = Wound Healing Percentage

L<sub>1</sub> = Average wound area on day 1

L<sub>x</sub> = Average wound area on day x

Tabel 2. Wound healing percentage

Treatment	days- (%)			
	1	5	10	14
K (-)	0	32	49,41	73,88
K (+)	0	33,65	65,64	90,28
SEJ 10%	0	33,88	71,06	92,70
SEJ 20%	0	30,09	52,37	80,78

Information : K(-) : Negative Control  
 K(+) : Positive Control  
 SEJ 10% : Ginger extract ointment 10%  
 SEJ 20% : Ginger extract ointment 20%

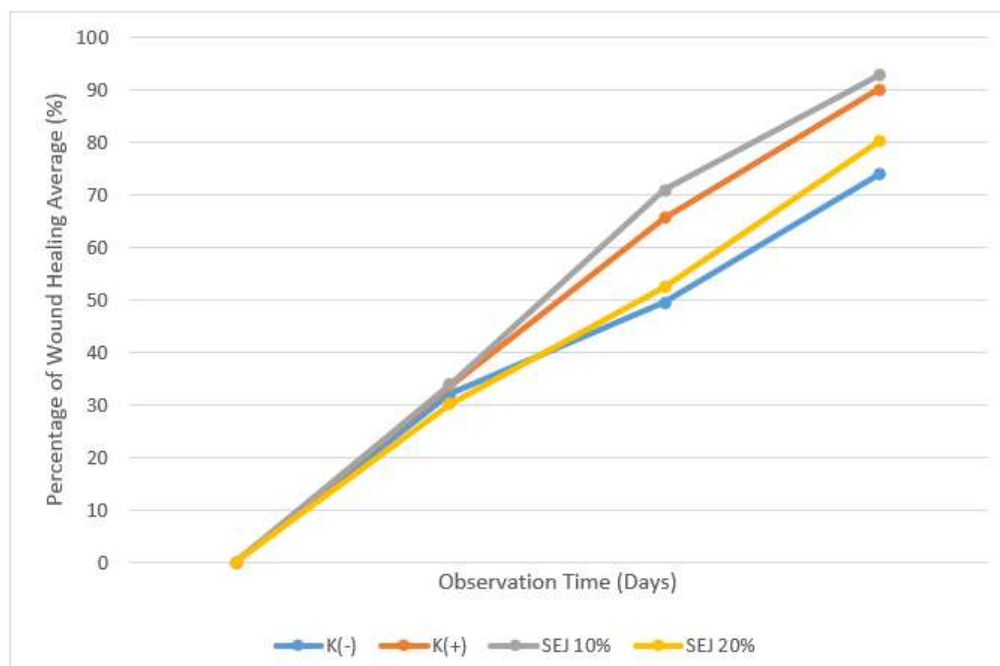


















Figure 1. Graph of wound healing percentage

Observation of the mean percentage of wound healing in Table 2 and Figure 1 was started on day 1 to day 14. The results from Table 2 and Figure 1 show that the average wound healing time in control and treatment was quite different, even though the wound was not completely closed within 14 days, it had progressed quite well.

The results of the K (-) group observation or without treatment showed a fairly slow progress, namely on the last observation day on the 14th day the percentage was only 73.88%. On K (+) or by giving Oxyfresh Soothing Pet Gel® on day 14, the healing progress was good with wound healing percentage of 90.28%. On the 14th day of observation with the treatment of ginger extract ointment 10% (SEJ 10%) had a wound healing percentage of 92.70%, while ginger extract ointment of 20% (SEJ 20%) had a wound healing percentage of 80.78%. From the observation of the percentage of wound healing, it can be seen that giving SEJ 10% has a higher percentage of wound healing compared to K (+), SEJ 20% and the lowest is for K (-) that is not given treatment, it is hoped that it will take longer. natural wound healing process.

*Observation of Wound Morphology*

Table 3. Parameters of changes in the morphology of wounds treated with ginger extract ointment and control.

Days	Group			
	K (-)	K (+)	SEJ 10%	SEJ 20%
1				
5				
10				
14				

Information : K(-) : Negative Control

K(+)	: Positive Control
SEJ 10%	: Ginger extract ointment 10%
SEJ 20%	: Ginger extract ointment 20%

Table 3 shows that K (-), K (+), SEJ 10%, and SEJ 20% on the first day both had wet wounds (+3), with a fresh red wound color (+4) and not yet a scab forms (+4). On day 5, there was a change in the wound moisture scoring from wet wounds (+3) to moist wounds (+2) at K (-), K (+), SEJ 10%, and SEJ 20%. On day 5, the scoring changes in color and the scab also changes, where previously the wound was fresh red (+4) to brownish red (+2) except for K (-) the color of the wound turned pale red (+3) and all wounds start to form a scab so that the scab scoring changes to a scab (+3).

On the 10th day the wound K (+), SEJ 10% and SEJ 20% looked dry, so that the scoring for wound moisture became dry (+1), the color of the wound remained brownish red (+2) and the scab was open (+2) but on K (-) the wound still looks moist even though a scab has formed (+3) around the wound so that the wound moisture scoring still shows the wound is moist (+2), but the color of the wound turns brownish red (+2).

On average on day 14 the wound had dried up so that the wound moisture score was given a score of +1, namely dry wounds, and the color of the wounds in all rats looked white / normal so that they were given a score of +1, but for wound scabs, K (+) and SEJ 10% has undergone closure so that it can be given a score of +1, but in SEJ 20% the scabs have opened but the wound is not closed so the score given is still +2. On K (-) on the 14th day there was a change where a new scab opened so that it was given a score of +2.

Based on the results of the observation on the percentage and morphology of wound healing, it can be seen that at a SEJ concentration of 10% it has a significant effect compared to K (+). This is because SEJ contains active compounds that play an important role in helping the wound healing process. However, when compared to the provision of SEJ 20%, SEJ 20% is much slower than SEJ 10% because the higher the concentration used, the higher the active compounds contained (Asih, 2014). The side effect of the 20% SEJ gingerol content which is much more than the 10% SEJ causes a higher antiplatelet effect, where this effect can cause blood clotting to block so that it slows down the wound healing process and the use of ginger extract applied to the skin in large quantities as well can cause irritation (Marx et al., 2015; Webmd, 2020). So that the morphological observations and the percentage of wound healing in the treatment of 20% SEJ and K (-) were almost similar / not significantly different.

Oxyfresh Soothing Pet Gel® was used as K (+) in this treatment. Oxyfresh Soothing Pet Gel® as a gel to help the wound healing process, which contains Oxygene, Aloe Vera and Chamomile. Chamomile is anti-inflammatory, antioxidant, relaxing, and sedating. Aloe Vera is anti-tumor, anti-inflammatory, skin protection, anti-diabetic, antibacterial, anti-viral, antiseptic, and healing of open wounds on the skin. Whereas Oxygene helps increase the potency of antibiotics that use oxygen as transportation to cross cell membranes (Ferreira et al., 2015; Hekmatpou et al., 2019; Bhutani and Vishwanath, 2012). With these ingredients it is able to soothe by giving a cool feeling to the wound, is analgesic, minimizes secondary infection, so that after giving it to an open wound on the skin it can improve the wound healing process. Although Oxyfresh Soothing Pet Gel® is an animal toothpaste that can clean and deodorize, provide fresh breath, and fight diseases such as gum disease but this gel is also able to heal open wounds and abrasions on the skin due to Maynard and Downes (2019) Oral mucosa also resembles skin because it is composed of a flattened layered epithelial layer.

According to the research of Mohamed and Osman (2017), in giving 12% ethanol extract of ginger given in Vivo to wistar rats which was observed on day 8 there was a reduction in

inflammatory cells, neutrophils, and macrophages due to antibacterial activity and the number of epitalization. In the observation of collagen formation on day 4, it can be observed significantly as well as the administration of fusiderm ointment, but on day 8 the ginger extract treatment showed more collagen formation than the control (+).

## Conclusion

The conclusion of this study is that the administration of ginger extract ointment concentration of 10% (SEJ 10%) is more effective in accelerating the wound healing process compared to giving Oxyfresh Soothing Pet Gel® as a positive control (+) and the required healing time is 16 days.

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