JOURNAL LA MEDIHEALTICO

VOL. 05, ISSUE 01 (124-138), 2024
DOI: 10.37899/journallamedihealtico.v5i1.1093

Test of the Effectiveness of Giving Salmon DNA Serum with Virgin Coconut Oil Extract on the Growth of Skin Tissue from Cut Scars on the Skin of Female Wistar Rats (Rattus Norvegicus)

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Article Info

Article history:
Received 2 January 2024
Received in revised form 27 January 2024
Accepted 19 February 2024

Keywords:
Jicama Extract, Egg White, Healing Burns, Collagen Density, Skin

Abstract

Various treatments can cure pockmarks. First, you have to know the cause of the pockmarks and the strength of the pockmarked skin, making it easier to choose the treatment, one of which is dermapen, which uses plasma from platelets. Test and compare the effectiveness of the derma pen action using platelet plasma with the derma pen action on the pockmarked skin surface of female Wistar rats (Rattus novergicus). This research is a laboratory experiment to compare the effectiveness of the dermapen action using plasma from platelets with the dermapen action on the pockmarked skin surface of female Wistar rats (Rattus novergicus) using a post-test with control group design or control samples based on treatment groups to analyze the dermapen action using plasma from platelets with dermapenic action on the surface of rat skin pockmarks. The results showed that the dermapen treatment group with plasma from platelets at a dose of 10% was more effective in healing cut wounds in white mice than the dermapen treatment group using plasma from platelets at doses of 2.5% and 5%. This is because, at a concentration of 10%, blood plasma metabolite compounds from platelets that are applied to wounds already affect the wound. The effect only inhibits microorganisms at small doses, making it less effective in healing wounds. It is recommended that the minimum dose be 10% so that the metabolite compounds in the plasma from platelets have a healing effect on wounds.

Introduction

Human wound healing is one of the most complicated processes. Variations in the wound healing process might cause difficulties, even when it appears simple. Individual wound healing processes vary. If appropriately treated, minor injuries recover faster than major ones. However, severe wounds or disorders like diabetes can slow wound healing (Bai et al., 2020; Liu et al., 2022).

The hemostasis, inflammation, growth, re-epithelialization, and remodelling phases of wound healing need spatial and temporal synchronization of diverse cell types. Modern single-cell technologies have revealed phenotypic and functional variation in some cell types. In addition, a rare subset of skin stem cells behaves unharmed but becomes important after skin injury. Understanding standard wound closure mechanisms requires understanding these cell types' responsibilities and interactions. Changes in mechanical pressures, oxygen levels, chemokines, extracellular matrix, and growth factor production affect cellular recruitment and activation, impairing wound healing. Single-cell technology can understand cellular changes in chronic

ISSN 2721-1215 (Print), ISSN 2721-1231 (Online)

wounds and hypertrophic scarring to design effective wound-healing therapies (Che Soh et al., 2020; Valizadeh et al., 2021).

Human skin is the largest organ by surface area. Skin shields internal tissues from mechanical damage, microbial infections, UV radiation, and severe temperatures. This leaves them vulnerable to serious injuries for individual and economic healthcare patients (Goldie et al., 2021). Surgical incisions and trauma scars cost approximately $12 billion in 2018, and burns cost $7.5 billion. Elderly diabetics and genetic illnesses like sickle cell disease are prone to improper wound healing with long-term complications. Despite interventions, the situation has not improved. Many wound-healing methods are only somewhat effective. Therefore, wound healing therapy must improve (Rodrigues et al., 2019).

According to the 2018 North Sumatra Province Riskesdas Report, 23.92% of injuries (stabs, cuts, and lacerations) occurred for all characters analyzed—Residing), where 21.27% of injuries occurred in cities and 26.93% in rural areas. Burn injuries occurred in 1.04% of all characters analyzed. This data demonstrates that North Sumatra Province has a higher injury rate than the national average of 20.01% (Riskesdas, 2019).

Our understanding of wound healing has grown as we've described more phases and subphases. Chemotaxis, phagocytosis, nucleogenesis, collagen breakdown, and remodelling occur in this broad period. Wound healing also requires angiogenesis, epithelialization, and GAG and proteoglycan synthesis. This biological process is complete when fibroblastic-mediated scar tissue replaces standard skin structure (Goldie et al., 2021; Sorg et al., 2017). Scar tissue forms locally to replace traditional skin structure after wound healing. Extreme scar tissue creation can cause keloids, which protrude beyond the scar. In addition to more extensive collagen formation, this disorder produces uneven collagen structure and increased pain. Hypertrophic scars have thinner, wound-parallel collagen. All races have hypertrophic scars, but young and old persons have fewer. Hormonal changes may affect fibroblastic scarring. Keloid scars are more common in non-whites (Callender et al., 2014; Chipp et al., 2017).

Wounds cause tissue regeneration and Healing. Traumatic or pathological injuries. All stimuli that disrupt functional tissue continuity cause one impairment. External, internal, physical, chemical, electrical, or thermal stimulation can cause harm. Injuries can also damage organs or cells (Amable et al., 2013; Graça et al., 2020; Laut et al., 2019; Röhl et al., 2015). In tissue repair, growth factors generate cell proliferation, which integrates dynamic changes involving soluble mediators, blood cells, extracellular matrix synthesis, and parenchymal cell proliferation. Skin healing demonstrates tissue regeneration in most tissues.

As collagen diminishes, the scar flattens and softens during new tissue creation. This process can take 12-18 months or longer. Remember that wounds and scrapes heal nonlinearly. It can switch between phases two and three. It may take time for the wound to heal from more profound to higher layers. The deeper layers may be raw and reopen if the wound heals from the surface. Wounds need care, time, and perfect conditions to heal (Salem et al., 2018). After three weeks of wound healing, keeping the skin wet is the best way to avoid scars. Moisturizing baths and emollients can also smooth and firm skin. Spots can be reduced with emollients, moisturizers, and silicone gels. Moisturizers keep skin wet longer than bath additives or shower gels. After washing and drying, apply moisturizer (Bhatia et al., 2022; Goldie et al., 2021; Nilforoushzadeh et al., 2018).

Virgin coconut oil (VCO) extract moisturizes. VCO contains antimicrobial Medium Chain Fatty Acids (MCFA): lauric, oleic, capric, and caproic acids. VCO applied topically reacts with skin microorganisms to create sebum-like free fatty acids. Skin is protected from pathogens by sebum, which contains medium-chain fatty acids like VCO. Free fatty acids make the skin acidic to fight disease-causing microorganisms (Deen et al., 2021; Umate et al., 2022). Allergic Contact Treatment Dermatitis is spreading rapidly. Dermatitis treatment with VCO is a novel

breakthrough that is being widely discussed. Dermatitis heals faster with proper VCO treatment. VCO is beneficial because the skin quickly absorbs it and accelerates tissue repair. Additionally, virgin coconut oil (VCO) includes Lauric and Oleic Acids that soften skin. VCO is also helpful for the skin because it is quickly absorbed and provides vitamin E.

Salmon DNA supports tissue formation, repair, and restructuring. Increases collagen and elastin synthesis. Thus, problems such as sagging, loss of elasticity, dullness, dryness, and skin discolouration improve. Tissue repair is stimulated in areas with tissue damage, such as acne scars and scars (Lee et al., 2017; Sato et al., 2017; Sveen et al., 2023). Salmon DNA and pure hyaluronic acid make up salmon DNA vaccinations. Salmon DNA is most like human DNA. This makes it practical for skin regeneration, Healing, and remodelling. Hyaluronic acid, a skin component, retains water and produces collagen. Along with salmon DNA and hyaluronic acid, salmon DNA vaccines can contain vitamins, peptides, and antioxidants. Thus, salmon DNA may benefit tissue growth and wound treatment (Sato et al., 2017).

Given the background above, the researchers aim to conduct laboratory experimental research to investigate further the efficacy of administering salmon DNA serum in combination with virgin coconut oil (VCO) extract on skin tissue growth. To accomplish this, female Wistar rats (Rattus norvegicus) will be utilized as test subjects. The presence of incision scars can be observed on the skin of the rat.

Methods

Human wound healing is one of the most complicated processes. Variations in the wound healing process might cause difficulties, even when it appears simple. Individual wound healing processes vary. If appropriately treated, minor injuries recover faster than major ones. However, severe wounds or disorders like diabetes can slow wound healing (Bai et al., 2020; Liu et al., 2022).

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virgin coconut oil (VCO) extract on skin tissue growth. To accomplish this, female Wistar rats (Rattus norvegicus) will be utilized as test subjects. The presence of incision scars can be observed on the skin of the rat.

Result and Discussion

Phytochemical Test Results of Virgin Coconut Oil Extract

At the University of North Sumatra Faculty of Mathematics and Natural Sciences, the content and phytochemical tests of virgin coconut oil (VCO) extract were studied. Bali Nutra pure coconut oil (VCO) was acquired online for the sample. Bali Nutra VCO is locally created (local coconut in Bali) and has EU organic certification since 2016, FDA registration, and halal and BPOM licences.

The methanol fraction of VCO must be prepared before a phytochemical test on accessible materials. VCO methanol fraction preparation prepares the sample for the necessary test. Fractionating VCO with nonpolar and polar solvents prepares it. Wallace (2019) states that a VCO study can only be done indirectly due to the vast number of fatty acids (Wallace, 2019). Based on this, this study created VCO to aid phytochemical screening test compound detection. The fractionation solvents were n-hexane and 60% methanol. Polarity differs between n-hexane and 60% methanol. Fractionating the test sample with 60% methanol can separate VCO polar molecules from fatty acids. Based on its dielectric constant, n-hexane is nonpolar, while 60% methanol is polar (Sungpud et al., 2020; Wickramasinghe Mudiyanselage & Wickramasinghe, 2023). VCO compounds are fractionated by polarity (like dissolves). Nonpolar phytochemical molecules are drawn to the n-hexane fraction, while polar compounds are drawn to methanol. The n-hexane fraction was liquid, while the methanol fraction was dry powder because the n-hexane fraction had lots of unsaturated fat.

From the results in Table 1., the VCO methanol phytochemical test, the phytochemical contents in the extract found were flavonoids and tannins. In contrast, the alkaloid and saponin contents were not found or were negative.

Table 1. VCO Methanol Phytochemical Test Results

Phytochemistry	Reactor	Result	Note
Flavonoid	Ethyl acetate, n-hexane and 60% alcohol	Yellow	+
Saponin	Aquades	No Foam forms	-
Tanin	FeCl3 5%	Blackish Green	+
Alkaloid	Wagner Reagent	The residue is yellow	-

Description of Research Results

Table 2. Length (cm) and Healing (%) of Incision Wounds

Days to-	C		P1		P2		P3		P4	
	Control group, without any cream		Salmon DNA serum		5% dose of VCO cream		10% dose of VCO cream		15% dose of VCO cream	
	cm	%	cm	%	cm	%	cm	%	cm	%
2	1.97	1.50	1.77	11.50	1.93	3.30	1.80	9.80	1.77	11.60
4	1.74	13.10	1.50	24.80	1.73	13.60	1.69	15.60	1.51	24.70
6	1.59	20.40	1.30	34.80	1.50	25.20	1.45	27.40	1.29	35.30
8	1.32	33.80	1.15	42.30	1.19	40.40	1.15	42.30	1.13	43.60
10	1.15	42.30	0.66	67.20	0.75	62.60	0.75	62.50	0.64	68.10

12	0.87	56.40	0.34	83.00	0.47	76.50	0.34	82.90	0.28	86.20
14	0.65	67.50	0.00	99.80	0.11	94.50	0.10	95.20	0.00	100.00
Mean	1.33	33.57	0.96	51.91	1.10	45.16	1.04	47.96	0.95	52.79
SD	0.47	23.70	0.64	32.27	0.68	33.89	0.66	33.22	0.66	32.80

So, based on the average percentage of Healing of cut wounds and the length of Healing of cut wounds in each group, it can be concluded that the recovery of cut wounds in group P4 or the group given VCO cream with a concentration of 15% occurred more quickly and after that followed by group P1 with results which is not much different. Healing of incision wounds was the slowest in the group.

Description of Normality Test

The normality test in this study used the Shapiro-Wilk SPSS normality test. This method was used because the number of data samples for each group was less than 50. So, using the Shapiro-Wilk Technique to detect data normality in this study was the most appropriate. This test was carried out to determine whether the research data was normally distributed. Data normality is essential because, with normally distributed data, the data is considered to represent the population (Ghozali, 2018). If the p-value is > 0.05, then the data is declared customarily distributed, and conversely, if the p-value <0.05, then the data is reported as not normally distributed.

Table 3. Results of the Shapiro-Wilk Normality Test

Group	Statistics	Significance
Control (C)	0,920	0,532
Salmon Serum DNA (P1)	0,967	0,854
VCO dosage 5% (P2)	0,873	0,279
VCO dosage 10% (P3)	0,962	0,823
VCO dosage 15% (P4)	0,854	0,207

Based on Table 3, which has carried out a normality test using SPSS, data shows that the control and treatment groups in the variable percentage of average cut wound Healing from day 1 to the average cut wound healing on day 14 all show the same value. Significant. Where the significance value (p) in the Shapiro-Wilk Test is the value that exceeds the standard margin of p>0.05, namely 0.532 for the control group (C), 0.279 for the group given salmon DNA serum (P1), 0.823 for the 5% VCO dose group (P2), 0.832 for the 10% VCO dose group (P3) and 0.207 for the 15% VCO dose group (P4). So, based on the Shapiro-Wilk normality test, the average percentage data for wound healing is typically distributed.

Description of Data Homogeneity Test Between Groups

Table 4. Results of the ANOVA Test of Homogeneity of Variances

Category	Statistic Levene	Significance
Mean	0,756	0,566
Median	0,553	0,699
Trimmed Mean	0,736	0,579

From Table 4, The healing process of incision wounds in each group C, P1, P2, P3, and P4, observed after 14 days of treatment in each group, was tested for homogeneity using the One Way ANOVA Test. The results show that the variance of the research data for the variables group K, group P1, group P2, group P3, and group P4 is homogeneous or comes from a population with the same variance, namely 0.566 (p> 0.05).

Table 5. ANOVA Test Results

Comparison of wound healing percentages	Number of Comparisons	df.	S Value
Between Groups	1198,194	4	0,000
In Groups	14,019	20	
Total	1212,213	24	0,000

Using the data in Table 5, we compared the four groups that were either observed or subjected to study to see whether their average healing times for cut wounds were different. According to what's in the "Sig" column of the table. The p-value that was calculated is 0.000. Therefore, we may conclude that the five groups' average (mean) Healing of cut wounds is significantly different from one another at the basic level = 0.05, which implies that Ho is rejected.

Advanced Test Description Post Hoc Test

From the previous Anova test results, data was obtained that the test results showed that Ho was rejected (there was a difference), so it was necessary to carry out further tests (Post Hoc Test). A further test (Post Hoc Test) will be carried out to see which groups are different. To determine which additional test to use, please look at/refer to the Test of Homogeneity of Variances table, where the conclusion obtained from this test is that the test results show the same variance, so the further test used is the Bonferroni Test.

Data from further Post Hoc Bonferroni testing are shown in Table 1.6. With the exception of the comparison between groups P1 and P4, and the corresponding asterisk "*," nearly all group-to-group comparisons reveal a difference in the average percentage of wound healing in the Wistar strain of white rats (Rattus norvegicus). So, it can be concluded that the comparison between group P1 and group P4 or vice versa does not show any differences, or the values of these two groups are almost close, where no "*" stars were found from the test results. The group testing through the Bonferroni Post Hoc Test was carried out using the SPSS for Windows program.

Description of Physiological Observations of Cut Wounds

The observation stage of the cut wound healing process was carried out by observing how long each control and treatment group took to recover from the cut wound. The parameters used to keep the Healing of a cut wound are if the observation shows erythema, swelling, and the damage has closed. Observations of healed cut wounds in 5 groups were observed for 14 days based on the condition of the cut wounds by scanning the presence or absence of redness (erythema), swelling, and closing of the scars can be seen in Table 1.6.

Table 6. Post Hoc Bonferroni Test Results

Multiple Comparisons							
Dependent Variable: Length Wound							
(I) Group		(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Bonferroni	Control	(P1)	-18.34400*	.52950	.000	-20.0137	-16.6743
		(P2)	-11.58400*	.52950	.000	-13.2537	-9.9143
		(P3)	-14.38600*	.52950	.000	-16.0557	-12.7163
		(P4)	-19.21200*	.52950	.000	-20.8817	-17.5423
	P1	Control	18.34400*	.52950	.000	16.6743	20.0137
		(P2)	6.76000*	.52950	.000	5.0903	8.4297
		(P3)	3.95800*	.52950	.000	2.2883	5.6277

		(P4)	-.86800	.52950	1.000	-2.5377	.8017
	P2	Control	11.58400*	.52950	.000	9.9143	13.2537
		(P1)	-6.76000*	.52950	.000	-8.4297	-5.0903
		(P3)	-2.80200*	.52950	.000	-4.4717	-1.1323
		(P4)	-7.62800*	.52950	.000	-9.2977	-5.9583
	P3	Control	14.38600*	.52950	.000	12.7163	16.0557
		(P1)	-3.95800*	.52950	.000	-5.6277	-2.2883
		(P2)	2.80200*	.52950	.000	1.1323	4.4717
		(P4)	-4.82600*	.52950	.000	-6.4957	-3.1563
	P4	Control	19.21200*	.52950	.000	17.5423	20.8817
		(P1)	.86800	.52950	1.000	-.8017	2.5377
		(P2)	7.62800*	.52950	.000	5.9583	9.2977
		(P3)	4.82600*	.52950	.000	3.1563	6.4957
*. The mean difference is significant at the 0.05 level.							

Note: Serum DNA of salmon (P1), VCO dose 5% (P2), VCO dose 10% (P3), VCO dose 15% (P4) and Control Group (C)

The redness in the control group (K) appeared on days 9 to 11, according to Table 1.6. Experimental mice 1, 4, and 5 showed the quickest redness, nevertheless. From Day 6 to Day 7, Group P1 emerged; Experimental Mouse 2 showed the quickest rate of emergence. Day 8 or 9 was the earliest for experimental mice 1, 2, and 3 in treatment group 2 (P2). It manifested first in experimental animals on day 1 and then on days 6–8 in the P3 therapy group. It happened most quickly in experimental mice 5 on days 6 and 7 in treatment group 4 (P4).

Meanwhile, observations of the disappearance of swelling based on the data in Table 9 in the control group (K) were experienced most quickly by experimental mice 1, 4, and 5 on day 7. In group P1, it occurred on day 4, which occurred most rapidly in experimental rats 2. In the P2 treatment group, the fastest occurrence occurred in experimental rats 1, 2, and 3, namely on day 6. In the P3 treatment group, experimental mice 1 experienced the most rapid on day 4. In the P4 treatment group, experimental mice 5 experienced the fastest on the 4th Day.

Table 1.7 Description of Physiological Observations of Cut Wounds

Rat Group		**Observation Day**													
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Control group (C)	1st	Mb	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt
	2nd	Mb	Mb	Mb	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt
	3rd	Mb	Mb	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt
	4th	Mb	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt
	5th	Mb	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km
Salmon DNA serum (P1)	1st	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt	Km	-
	2nd	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt	Kt	Km	-
	3rd	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km	-
	4th	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km	-
	5th	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Km	Km	Km	Km
5% dose of VCO cream (P2)	1st	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km
	2nd	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km
	3rd	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt	Km
	4th	Mb	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km
	5th	Mb	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km
10% dose of	1st	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km	-	-
	2nd	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt	Km	Km

VCO cream (P3)	3rd	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km
	4th	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt	Km
	5th	Mb	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km
15% dose of VCO cream (P4)	1st	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt	Km	-
	2nd	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Kt	Km	-
	3rd	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km	-
	4th	Mb	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km	-
	5th	Mb	Mb	Mb	M	M	Kt	Kt	Kt	Kt	Kt	Km	Km	-	-

Note: Mb (red swelling), M (red), Kt (dry open), Km (dry closed), - (wound healed/clean)

Description of Observation of Histopathology Preparations

The results of observations on histopathological preparations of collagen density in the skin tissue of mice from each group can be seen in the photos in Figure 1.

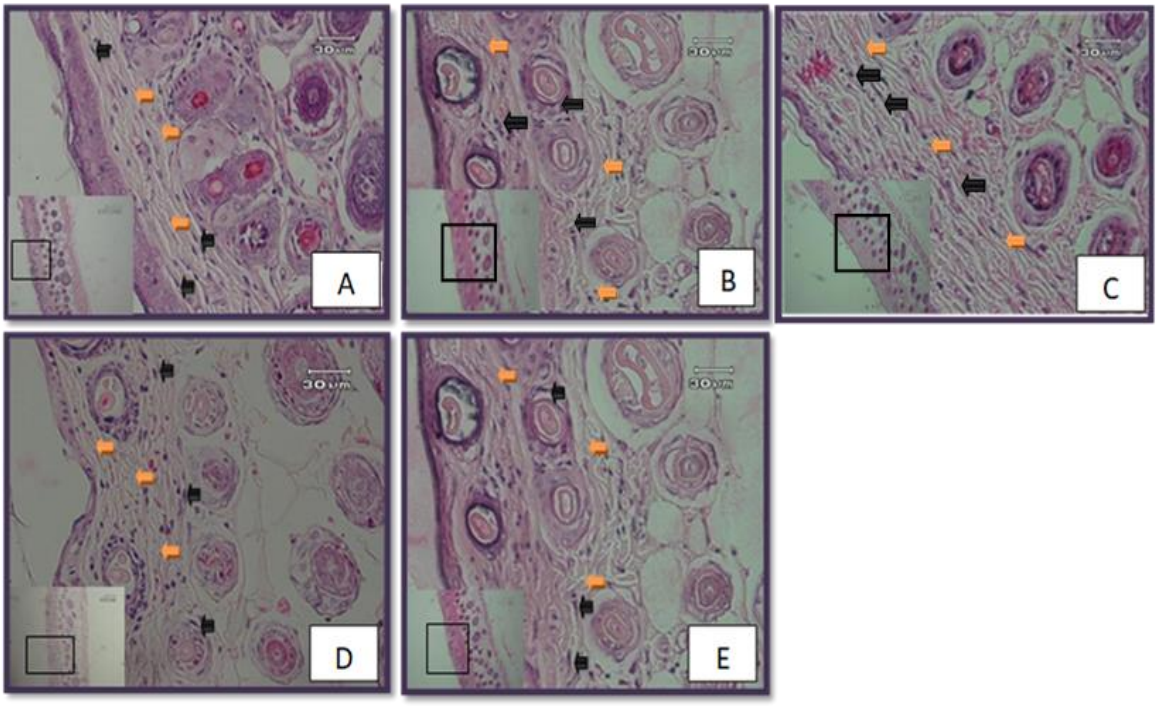

Figure 1. Fibroblast Cell Proliferation 400x Magnification (Day 14)

Note: Control Group (A) Serum DNA of salmon (B), VCO dose 5% (C), VCO dose 10% (D), and VCO dose 15% (E)

In Figure 1 above, the treatment group given a 15% dose of VCO cream (P4) had a more significant number of fibroblast cells and denser cells compared to the control group (K), 5% dose of VCO cream (P2), and 10% dose of VCO cream (P3). Meanwhile, the number of fibroblasts was also significant in the group given salmon DNA serum, approaching the situation in group P4.

In this phase, fibroblast cell proliferation will occur. The role of fibroblasts is enormous in the repair process, namely being responsible for preparing to produce protein structural products used during tissue reconstruction. The activity of flavonoids in increasing the number of fibroblasts is supported by research, which concludes that flavonoid compounds cause an increase in fibroblasts (Alamgir, 2018; Chen & Li, 2007; Ginting et al., 2020; Mawarni et al., 2020; Nisa et al., 2019).

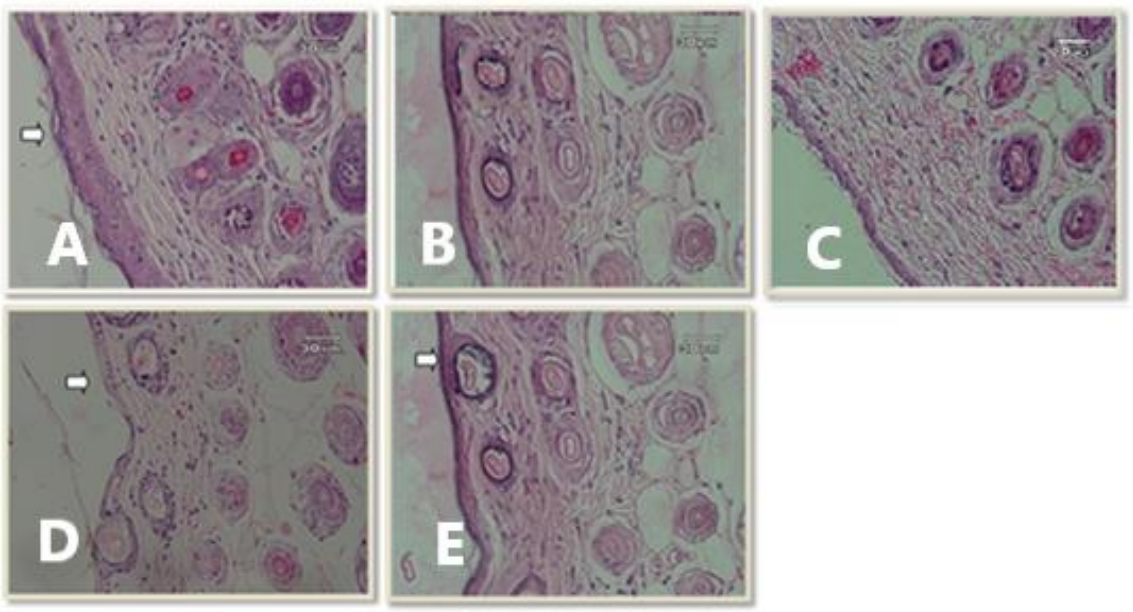

Figure 2. Collagen Density on the 14th Day

Note: Control Group (A) Serum DNA of salmon (B), VCO dose 5% (C), VCO dose 10% (D), and VCO dose 15% (E)

Histopathological observation of the cut wound on the 14th Day after administering a 15% dose of VCO cream (P4) showed that the density of collagen fibres in the wound area was denser than the cut wound in the control group K, the group given 5% dose of VCO cream (P2) and the group given VCO cream 10% dose (P3). However, the density of collagen fibres in group P1, which was given salmon DNA serum, was almost the same as the number of collagen fibres in group P4.

At the outset of the healing process, myofibroblasts—a kind of fibroblast—use their contractile powers to draw the wound's borders closer together, thereby sealing the injury. Fibroblast numbers rise throughout the healing process. Granulation tissue will gradually accumulate connective tissue matrix, leading to extensive fibrosis, since these cells create collagen (Liu et al., 2022; Röhl et al., 2015; Salem et al., 2018).

In this study, the test for the healing effect of incision wounds was based on reducing the length of the incision wound and the percentage of wound healing. The natural ingredients used in this research were Bali Nutra virgin coconut oil (VCO) and Somethinc brand salmon DNA serum. VCO is formulated in the cream dosage form. The cream preparation is chosen because it is easier to spread evenly, practical, not sticky, and easier to rinse. Likewise, several studies have explained that cream preparations have been widely used because they are easier to apply, more comfortable to use on the skin (face), not sticky, and easy to wash off with water (Andriana et al., 2020; Deen et al., 2021; Pham et al., 2022; Wallace, 2019).

This research made use of female white mice because of their humanoid physiology and anatomy, ease of procurement and handling, and other favorable characteristics. For this study, we used 25 mice that were 2-3 months old. Mice were given a week to adjust before being treated. There were five groups of rats that were studied. One group, known as control (K), got just cuts. The other three groups, P1, 10%, and 15%, were given various concentrations of topical VCO cream.

Two mice were placed in a cage with a divider to minimize movement so as not to influence wound healing or interfere with each other. This study recommends plaster and gauze for cut wounds to prevent infection. Treatment of cuts was complex since the plaster could not attach

to the rat's skin. Thus, the bandage came off, and the rat nibbled the plaster and gauze. In this study, cuts were treated without plaster and gauze. The incision wound was 2 cm long and 0.1 cm deep, but the damage expanded beyond 0.2 cm. Despite chloroform anaesthesia, the mice moved throughout induction. Incisions were treated and measured daily using callipers during the 14-day healing period.

This study measures erythema, oedema, and wound closure. Redness (erythema) is the first sign of inflammation. Red mouse wounds are caused by inflammation, and blood clots are formed by activated platelets and fibrinogen proteins produced by blood vessels (Deppermann & Kubes, 2016; Massberg et al., 1999; Rodrigues et al., 2019).

The wound-healing phase includes inflammation, proliferation, and maturation (Che Soh et al., 2020; Grey & Harding, 2009; Rahmadani et al., 2022; Sorg et al., 2017). On average, the control group received salmon DNA serum (P1), the group received 10% VCO cream (P3), and the P4 group (15% VCO dose) had a significant inflammatory phase during wound healing on days 1–4. Compared to the P2 group (5% VCO dosage) and the control group (K), which had inflammation until day 6, wound length decreased faster. Lemongrass contains flavonoids, limiting wound bleeding and reducing inflammatory cell formation during wound healing. Tannin, an astringent, reduces mucosal permeability and strengthens mucosal connections, preventing irritants indirectly. It shrinks and kills microorganisms (Enwemeka et al., 2021; Irza et al., 2021; Lin et al., 2019).

The 15% VCO cream group (P4) performed best in this trial. In contrast to the 5% VCO cream group, the 10% VCO cream group, and the control group (K), the salmon DNA serum (P1) group exhibited an excellent healing effect after the P4 treatment group on cut wounds in white mice. At greater doses, VCO's secondary metabolite chemicals heal wounds better, but at low quantities, they inhibit bacteria, making them less effective. Several researchers agree that natural antibacterials at low concentrations are only inhibiting. In high quantities, they destroy microorganisms (Enwemeka et al., 2021; Irza et al., 2021; Lin et al., 2019).

Several elements, including experimental mice, could affect this research's outcomes. Stress in the rat might impair wound healing; thus, it must be considered. Several studies show that stress increases cortisol, suppressing cellular immunity and slowing wound healing (Decker et al., 2021; Grey & Harding, 2009; Rodrigues et al., 2019; Theoret & Schumacher, 2017). This study employed just 25 female white mice, or five mice/group, which may also affect the outcomes. The number of samples utilized affects research because it reduces generalization errors.

Conclusion

Last thoughts According to a study that examined the effects of a salmon DNA serum supplemented with virgin coconut oil (VCO) extract on the healing of skin wounds in female Wistar rats (Rattus norvegicus) over the course of 14 days, the phytochemical components of VCO were determined to consist of tannins and flavonoids, with no saponins or alkaloids detected. Because of its high concentration of antioxidant molecules, VCO is thought to include phytochemicals that have therapeutic potential.

It was later shown that there was a significant difference in the average healing rate for incisions between the control group (K) and the treatment groups P1, P2, P3, and P4. This is due to the fact that the control group (K) did not receive any therapy that included active ingredients to hasten the healing of wounds. Results demonstrated that compared to groups administered 5% or 10% VCO, those given 15% VCO had a greater impact on the speed and severity of wound healing in white mice. But in the group who got salmon DNA serum, it was almost the same as in the group that got 15% VCO cream. The reason for this is because wounds are already affected by the secondary metabolite chemicals in both the VCO and salmon serum preparations, even at a concentration of 15%.

ISSN 2721-1215 (Print), ISSN 2721-1231 (Online)

Future studies should compare higher or better virgin coconut oil (VCO) concentrations with additional factors—or further study on pure coconut oil's (VCO) safe wound-healing properties. Researchers might also investigate using VCO and salmon DNA serum to repair cut wounds. Or study other virgin coconut oil (VCO) preparations that are more valuable and easier to generate on a big scale, especially in North Sumatra or other VCO-producing regions. Finally, the research results must be compared to other studies to help other researchers study virgin coconut oil (VCO) to expedite wound healing.

Acknowledgement

Prima Indonesia University's School of Medicine, Dentistry, and Health Sciences, as well as the Animal House at Medan State University's Faculty of Mathematics and Natural Sciences, are both thanked for their contributions to the success of this study. Additionally, we appreciate the assistance of others not directly involved in this study.

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