Ethanolic extract cream of red cabbage (Brassica oleracea L. var. capitata f.rubra) on the epidermal thickness in Wistar rats (Rattus norvegicus) after ultraviolet-B exposure

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ABSTRACT

Background: UV exposure is related to oxidative stress and also as an essential factor in skin photoaging. Several antioxidants are widely used in preventing skin photoaging by influencing epidermal skin layer. High concentrations of antioxidant properties in red cabbage are known to have these effects. This study aims to determine the role of ethanolic extract cream of red cabbage on the epidermal thickness in Wistar rats after UV-B exposure.

Methods: An experimental study was carried out among 25 Wistar rats which divided into 5 groups as follows: P1 as control (only exposed to UV-B), P2 (placebo and UV-B), P3 (5% ethanolic extract cream and UV-B), P4 (10% ethanolic extract cream and UV-B), and P5 (20% ethanolic extract cream and UV-B). The UV-B dosage applied for each group was 65 mJ/cm². The thickness of epidermis is calculated by direct measurement using Image Raster software from basal membrane to stratum corneum. The statistical analyses were performed using SPSS ver. 20.0.

Results: There was a significantly different in the epidermal thickness among groups (P < 0.05). The mean of epidermal thickness in the control group (P1) was 26.76±1.02 µm, followed by 24.94±1.25 µm in the treatment group II (P3), 20.24±1.47 µm in the treatment group IV (P5), and 23.66±0.87 µm in the treatment group III (P4).

Conclusion: The ethanolic extract cream of red cabbage (Brassica oleracea L. Var. capitata f. rubra) in different doses have a statistically significant impact on the epidermal thickness in Wistar rats after UV-B exposure.

Keywords: Cream, Ethanolic Extract, Red Cabbage, Thickness of Epidermis, Ultraviolet-B

INTRODUCTION

The skin is the largest organ of the body where the primary role is protection against microbes and the elements, body temperature regulation, and permits the sensations of touch, heat, and cold.¹ Skin has three layers which are epidermis, dermis and deeper subcutaneous tissue.¹ Skin aging is a complex biological process influenced by a combination of endogenous or intrinsic and exogenous or extrinsic factors.² The principal of aging is a natural skin maturing, which speaks to sequential maturation influence by intrinsic factors.³ In addition, extrinsic factor of skin maturation is the consequence of external components and ecological effects, such as sun creation and vivid (UV) illumination, smoking, infection, lack of sleep, and terrible sustenance.³ Proof of expanding age incorporates wrinkles and hanging skin. Brightening or turning gray of the hair is another obvious indication of maturing.

As humans age, they’re more vulnerable to skin damage. Human skin has a greater slender, sensitivity, and the protecting subcutaneous fats layer which is lost in aging. Likewise, the pores and skin capability to sense touch, weight, vibration, warmth and icy may be reduced. Alongside those strains, human pores and skin are at a higher chance for damage.⁴ Pores and skin modifications and lack of subcutaneous fats, consolidated with a bent to be much less dynamic, and additionally a few nutritional insufficiencies and distinct sicknesses upload to weight ulcers.⁴ Maturing skin repairs itself more gradually than more youthful skin. Wound mending may be up to 4 times slower.

Naturally, UV radiation is also a carcinogen which in charge of skin pathologies, including erythema and irritation, degenerative aging changes, and malignancy. Human is presented to UV radiation primarily as an outcome of unprotected presentation to sunlight. UV radiation has numerous pernicious consequences for cells. UV radiation produces both immediate and roundabout DNA harm, and each can bring about mutagenesis in skin cells. UV
radiation is composed of UVA, UVB and UVC. UVA radiation, despite harming the epidermis, also infiltrates further into dermal layer. Besides, UVA is not only damages epidermal cells, it is also harmful to collagen and elastin, which make up the structure of the dermis and keep the skin versatile. UVB radiation infiltrates the epidermal or outside layer of the skin. It harms DNA on this layer and reasons distinct changes in skin cells. These events lead to the symptoms of photoaging. Clinical signs of photoaging encompass wrinkles, mottled pigmentation (hypo- or hyperpigmentation), and hard skin, loss of the skin tone, dryness, sallowness, deep furrows, excessive atrophy, telangiectasias, laxity, leathery look, sun elastosis, actinic purpura, precancerous lesions, pores and skin most cancers, and cancer. Further, UVB irradiation substantially will increase pores and skin vascularization and angiogenesis.

Red cabbage (Brassica oleracea or B. oleracea var. capitata F. rubra) is a variation of white hard-heading cabbage and a descendant of three particular cabbage sorts inside the Brassica family. Red cabbage is an excellent source of Vitamin C, which helps as anti-oxidation and therefore involved in maintaining skin and delaying aging process. Besides, red cabbage also contains glucoraphanin and glucobrassicin which are precursors of sulforaphane and indole-3-carbinole as anti-cancer at different stages of its development. Recently, there is only a paucity of data for antioxidant properties usage on skin by red cabbage. Data regarding topical cream of red cabbage extract as a self-administered medication is also limited. This study aims to determine the role if ethanolic extract cream of red cabbage on the epidermal thickness in Wistar rats after UVB exposure.

METHODS

An experimental study was carried out using randomize post-test only control group design among 25 male Wistar rats which divided into five groups during 2 weeks of study. The study was conducted at Histology Laboratory of Udayana University. The skin of the rat was exposed to UV light 3 times per week with a dosage of 325 mJ/cm². Group 1 (P1) as a negative control group was exposed with UV-B at a dosage of 325 mJ/cm². Group 2 (P2), positive group, was given UV-B exposure at a dose of 325 mJ/cm² and base cream. Group 3 (P3) was also given UV-B exposure with dose 325 mJ/cm² and cream 5% extract of purple cabbage ethanol. In addition, Group 4 (P4) was exposed to UV-B light with dose 325 mJ/cm² and cream 10% extract of purple cabbage ethanol and cream 20% extract ethanol purple cabbage particularly in Group 5. The thickness of male Wistar rat’s epidermal skin after the treatment is observed and measured by micrometers (µm). Throughout study, all five groups were given the exact amount of food and water. The temperature and humidity of the experiment surrounding are strictly controlled. Data analysis was conducted using SPSS ver. 17 for descriptive and analytic using ANOVA method. A P-value < 0.05 indicates for statistically significant.

RESULTS

The histological findings by using 100 x 10 magnification of light microscope were shown in
Table 1. The average thickness and Shapiro Wilk normality tests of the epidermis in male Wistar rats after UV-B exposure

<table>
<thead>
<tr>
<th>Group</th>
<th>Total Amount of Sample</th>
<th>Mean±SD (µm)</th>
<th>Shapiro-Wilk</th>
<th>ANOVA (P-Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>5</td>
<td>36.00±1.08</td>
<td>0.288</td>
<td></td>
</tr>
<tr>
<td>Basic Cream</td>
<td>5</td>
<td>27.66±0.87</td>
<td>0.179</td>
<td></td>
</tr>
<tr>
<td>Cream 5% Ethanol</td>
<td>5</td>
<td>26.76±1.02</td>
<td>0.953</td>
<td>0.007*</td>
</tr>
<tr>
<td>Cream 10% Ethanol</td>
<td>5</td>
<td>24.94±1.25</td>
<td>0.456</td>
<td></td>
</tr>
<tr>
<td>Cream 20% Ethanol</td>
<td>5</td>
<td>20.24±1.47</td>
<td>0.755</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>26.12±5.70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*statistically significant; P<0.05

Figure 1 as a reduced epidermal thickness among groups. The results found that the average thickness of epidermal layer among subjects was 26.12±5.70 µm, whereas the lowest average of epidermal thickness was 20.24±1.47 µm in P5 group that received 20% ethanolic extract cream of red cabbage (Brassica oleracea L. Var. capitata f. Rubra) after UV-B exposure. Normality test by using Shapiro-Wilk on the thickness of epidermis in each group was found normally distributes as presented in Table 1.

The result of epidermis thickness of the male Wistar rat in the study was analyzed by using one way ANOVA. The results showed that there was a significant difference in the epidermal thickness between groups (p<0.05). The results of the data analysis can be seen in Table 1.

DISCUSSION

The skin covers the whole outside surface of the human body and is the important site of connection with the encompassing scene. It fills in as a defensive boundary that keeps internal tissues from exposure to trauma, bright (UV) radiation, temperature extremes, poisons, and microbes. Other imperative capacities incorporate tactile recognition, immunologic reconnaissance, thermoregulation, and control of numb liquid misfortune. The integument comprises of two commonly subordinate layers, the epidermis, and dermis, which lay on a fatty subcutaneous layer, the panniculus adipose. The epidermis is gotten principally from surface ectoderm yet is colonized by shade containing melanocytes of neural peak birthplace, antigen-handling Langerhans cells of bone marrow inception, and weight detecting Merkel cells of neural peak cause. Several studies, including the present one, demonstrate that dietary antioxidant prevention agents enhance skin structure and give photoprotective impacts when controlled as nourishment supplements.

This study uses cream of fresh red cabbage ethanol extract due to the high anthocyanin content in red cabbage has effectiveness as a natural antioxidant. Brassica vegetables have large amounts of high-level antioxidants agent metabolites related to beneficial wellbeing impacts including vitamins, carotenoids, anthocyanins, solvent sugars and phenolic. Phenolic mixes with ascorbic corrosive are significant antioxidants agents of Brassicaceae vegetables, while lipid-dissolvable cell reinforcements are in charge of just 20% of the aggregate antiradical limit. Flavonoids comprise the largest and most diverse group of phenolic compounds in plants. In the plant cell, flavonoids occur most frequently as glycosides dissolved in the vacuole juice which is mainly in the O-glycoside form, rather than C-glycosides. They can also crystallize around the epidermis. Studies demonstrate the health benefits of these flavonoids keep on multiplying for enhancing human wellbeing.

This study did not measure the antioxidant capability of ethanol extract of red cabbage but directly measures the antioxidant property's ability against the thickness of epidermis of male Wistar rat exposed to UV-B at concentrations of 5%, 10%, and 20%. Based on the literature review, research studies on the effect of red cabbage ethanol cream extract on male Wistar rats’ exposed UV-B rats have not been done.

Data from the treatment of placebo group, 5%, 10%, and 20% concentration of ethanol red cabbage showed the mean of the thickness of epidermis in rat decreased compared to control group. A study conducted by Hassan et al found a significant association between UVB irradiation and increasing epidermal thickness where 12.979 times greater than normal epidermal thickness. It could be UV radiation on the skin induces a variety of responses in the epidermis, including keratinocyte proliferation that leads to epidermal hyperplasia. Besides that, a study conducted by Kim HN et al. stated that histological analysis showed a thicker epidermis and dermis in UVB-irradiated mice compared with control mice. In the present study, UV irradiation caused deep wrinkle formation and histopathological changes, characterized by epidermal hypertrophy, collagen fiber loss and an amorphous mass of abnormal elastic fibers.

Two things may explain reason causing some of the comparative test results are not being meaningful. First, a dose of constant of red cabbage extracts inversely proportional to the thickness of the epidermis of Wistar rat. And secondly, the duration of red cabbage ethanol extract is not long enough to produce the effect as expected.
CONCLUSION

Based on the explanation above, it can be concluded that the extract of red cabbage ethanol cream has a beneficial effect on the thickness of epidermis in different doses. However, further study is needed to determine the optimum dosage that can influence the thickness of skin epidermis.

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REFERENCES


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