Efficacy of Aloe Vera Cream in Prevention and Treatment of Sunburn and Suntan

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The efficacy of aloe vera cream in prevention of burn and tan from ultraviolet were studied in 20 volunteers. The minimal erythema dose of 20 volunteers were tested. The mean MED was 40-60 mj. The well preserved containing 70% of aloe vera cream. The aloe vera cream was applied randomized double blind technique on the test sites 30 minutes before, immediately after, or both before and after then the serial ultraviolet UVB 40,50,60,70,80 mj were radiated. MED reading at 24 hour for sunburn evaluation. Erythema and pigmentation were evaluated by visual grading 1-4 score. The aloe vera cream was continuing applied at the test sites twice daily for the the next three weeks. The results showed that the aloe vera cream has no sunburn or suntan protection and no efficacy in sunburn treatment when compared to placebo. The aloe vera cream has no bleaching effect too.

Keywords: *Aloe vera, Sunburn, Suntan*

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Sunlight is composed[1] of various spectra in frequency of radiation; 50% visible light, 40% infrared and 10% ultraviolet (UV) type B and A. The frequency of ultraviolet type B or UVB ranges from 290-320 nanometers is the most effective erythema of sunburn and suntan. Once human skin is exposed to UVB, it is absorbed by DNA of keratinocyte. Long-term minimal exposure of UVB may cause minimal cell degradation. On the other hand, maximal UVB exposure may cause permanent cell damage, acute inflammation and is shown as skin erythema or sunburn and follow by pigmentation as suntan. Minimal erythema dose (MED) is used as a clinical standard procedure for diagnosis and treatment. MED is defined as the minimal amount of radiation that causes slight erythema within 24 hours after the radiation. The test for MED is beneficiary in terms of diagnosis of UV hypersensitivity and MED can be used as an optimal dose for treatment of various skin diseases that is responsive to UV. Moreover, MED can be used as a standard test for efficacy of sunblock and other substances which reduces sunburn. Melanogenesis is stimulated by UVB exposure and it is found that tanning tends to occur after 72 hours of UVB exposure while the degree of tanning is directly proportional to the radiation exposed that maximizes in 3 weeks and gradually fades out. Therefore, the degree of erythema, tanning and sunburn is indicative to the amount of radiation absorbed by the keratinocyte and melanocyte.

The study of UV-damaged keratinocyte pathogenesis demonstrates[1] that UV stimulates the release of histamine, kinin, and prostaglandin which then causes erythema. Various cytokines releasing are also known to induce melanogenesis. Therefore, any substances or drugs that block their action may reduce the chance for erythema and tanning to occur. Aloe vera cream is made from herbal substance that is believed to heal ulcer as well as sunburn. It is one of the ingredients of many cosmetics known for its skin nourishment. Even though aloe vera cream is often seen over-the-counter, it has never yet been clinically proved. One study showed no efficacy of aloe vera in sunburn prevention as compared to the standard sunscreen (PABA) but the intensed UVB[2] was used. Aloe vera[3,4] composes of Aloctin A and Aloctin B. Aloctin A is a glycoprotein with a molecular weight of 18,000 and composes of sugar and protein with ratio of

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8:2. Aloctin B contains 2 subunits with molecular weight of 12,000 each. Both, Aloctin A and B are in the gel part of the leaf and easily degraded by the action of certain enzyme and oxidation. Therefore, their action depends mostly on the amount of undegraded product. Naturally, its half-life is 3 hours once excreted from the leaf and the effective concentration has to be at least 70% gel in the formulation. Many studies showed that aloe vera cream helped cure burn-wound caused by UV[5,6], thermalburn[7] roentgen burn[8-10] and chemical burn[11]. Its action was known to help reduce the release of histamine, kinin and prostaglandin. Therefore, aloe vera cream should be able to prevent erythema causes by UV. Other studies also showed that aloe vera cream helped prevent sunburn and that it helped absorb radiation frequency between 290-320 nanometers that belong to the range that causes increase in melanogenesis too. As mentioned, UV causes keratinocyte damage followed by its regeneration, therefore, continuous use of aloe vera cream may reduces keratinocyte damage as well as its degeneration caused by UV. Due to the fact that UV accumulation may lead to skin cancer, many medical researchers turn their interest to the true action of this herbal substance. In this study, 70% aloe vera cream was used to proof whether its action is consistent with its reputation.

Material and Method

Subject

The study was the experimental study performed in 20 volunteers. Subject inclusion criterias included age more than 18 years old with no history of sun sensitivity or skin cancers in the family. The exclusion criterias are the previous cream application on testing site, taking medications which may cause photosensitivity and pregnant persons. The protocol was approved by the Ethical committee of the Faculty of Medicine Chulalongkorn University Clinical investigation and written informed consent was obtained from the participants.

Light source

Artificial light source, matal halide lamp is the standard UVB (290-320 nanometer) photo testing equipment.

Cream preparation

Cream preparation 70% aloe vera cram and even base as placebo was prepared Department of Pharmacognosy, Faculty of Pharmacology Mahidol University which was already tested for stability.

Purpose

To study the efficacy of aloe vera cream for treatment of sunburn and suntan once exposed to UV

4.1 Study the minimal UVB concentration that causes erythema in 24 hours (MED) in 20 volunteers.

4.2 Study the efficacy of aloe vera cream on the inner arm of 20 volunteers. One side was for MED testing with following UVB dosage 10,20,30,40,50 and 60 mj. The other side for efficacy of aloe vera. The selected exposed area was divided into 4 columns and 5 rows, total of 20 one-by-one centimeter squares for aloe vera testing. The first column: apply aloe vera cream 30 minutes prior to UVB exposure (A1), the second row apply aloe vera cream immediately after UVB exposure (A2) the third column apply aloe vera cream 30 minutes prior and immediately after UVB exposure (A3), the forth column: apply placebo 30 minutes prior and immediately after UVB exposure (B). Randomized double blind technique was used. The unified application of the cream was applied to all site testing.

4.3 UVB exposure: rows were exposed to the UVB at the same time while the 1st, 2nd, 3rd, 4th, 5th row were exposed to 40, 50, 60, 70, 80 mj consecutively.

Assessment

1. Evaluate the degree of erythema after UV exposure score 1-4

0. No erythema
1. Minimal erythema
2. Mild erythema with sharp border
3. Moderate erythema
4. Marked erythema

All the data collected were nonparametric data, related group and were analyzed by using Kruskal-Willis one way analysis of variance by rank. They were evaluated 24 hours erythema after UVB exposure and 4 groups were then compared.

2. Evaluate after pigmentation score 1-4

0. no hyperpigmentation
1. minimal hyperpigmentation
2. mild hyperpigmentation with sharp border
3. moderate hyperpigmentation
4. marked hyperpigmentation

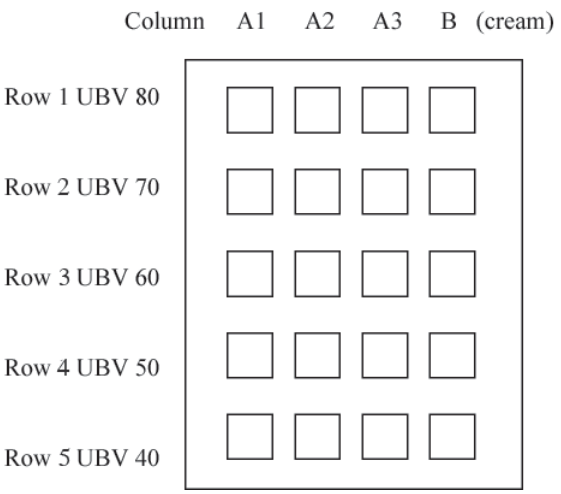
All the data collected were analyzed and compared the pigmentation in week 1 and week 3 score 1-4 after treatment with aloe vera and placebo using Kruskal-Willis one way analysis of variance by ranks in 4 groups study.

Results

MED of 20 volunteers was 40-60 mj. The

results of erythema after UVB exposure and treatment with aloe vera cream showed in table 1 that there was no statistic significant difference between applying the aloe vera cream prior or immediately after and the placebo ($p \geq 0.05$). After 1 and 3 weeks, there were also no difference in pigmentation change in tables 2 among the groups as well. Therefore, 70% aloe vera cream is proved to have no effect on protecting human skin from sunburn and suntan caused by UVB as well as no bleaching effect.

The light-proved plate was cutting 1X1 cm square as showed. Each cream was applied in column and UVB was exposed in row.



Discussion

Aloe vera has been used as a healing medicine for several decades. The beneficial claims are analgesia, anticancer, antiviral, antiulcer, cough suppressant, hyperglycemia, antifungal, antihelmintic, antiarthritis, antiparasite, antifertility, cathartic, cosmetics, insecticide, etc. The most important therapeutic effect is antinflammatory action by inhibit the oxidation of arachidonic acid, reflexing inhibition of lipoxygenase and/or prostaglandin synthesis activity. So aloe vera may be reduced the prostaglandin synthesis causing by sunburn and suntan. The propose of the study was to prove these properties but no efficacy was showed.

Aloe vera cream used in this study composes of 70% aloe vera which might be less effective as compared to 100% fresh aloe vera. The more frequency of application may be needed. Therefore, further study is still necessary and other variables should carefully be considered.

Table 1. Treatment efficacy comparison with aloe vera cream and placebo between 4 groups pigmentation evaluated from erythema 24 hours after being treated with UVB

UVB (mj)	A1	A2	A3	B	p-value
UVB (80)	2.5	2.7	2.8	2.95	0.091
UVB (70)	1.85	2.25	2.85	2.1	0.056
UVB (60)	1.3	1.65	1.7	2	0.876
UVB (50)	0.55	0.9	0.8	1.05	0.090
UVB(40)	0.35	0.5	0.45	0.75	0.197

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Table 2. Treatment efficacy comparison with aloe vera cream and placebo between 4 groups evaluated from pigmentation (suntan) 1 week and 3 week hours after being treated with UVB

UVB (mj)	A1		A2		A3		B		p-value
	(week 1)	(week 3)	(week 1)	(week 3)	(week 1)	(week 3)	(week 1)	(week 3)	
UVB (80)	2.85	2.45	3.00	2.90	3.15	2.80	3.30	2.90	0.700
UVB (70)	2.15	1.65	2.50	2.05	2.60	2.10	2.75	2.40	0.833
UVB (60)	1.40	1.05	1.90	1.50	1.95	1.60	2.50	1.75	0.253
UVB (50)	0.80	0.65	1.25	1.05	1.30	1.05	1.70	1.25	0.493
UVB (40)	0.40	0.30	0.75	0.50	0.75	0.45	1.15	0.55	0.068

A1 - Applied aloe vera before
A2 - Applied aloe vera after
A3 - Applied aloe vera buth before and after
B - Control

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การศึกษาประสิทธิภาพของครีมวุ้นว่านหางจระเข้เพื่อป้องกันและรักษาผิวหนังไหม้แดดและผิวคล้ำจากรังสีอัลตราไวโอเลต

พรทิพย์ ภูวบัณฑิตสิน, รุจิรัตน์ วงศ์ทองศรี

การศึกษาครีมวุ้นว่านหางจระเข้เพื่อป้องกันและรักษาผิวหนังไหม้แดดและผิวคล้ำจากรังสีอัลตราไวโอเลตในอาสาสมัคร 20 ราย ซึ่งมีค่า MED เท่ากับ 20-40 มิลลิจูลล์ โดยทาครีมก่อน หลังหรือทั้งก่อนและหลังฉายรังสีอัลตราไวโอเลต บี (UVB 40,50,60,70 และ 80 มิลลิจูลล์) เปรียบเทียบกับการทายาหลอก โดยอ่านผลรอยไหม้แดด 24 ชั่วโมง หลังฉายรังสี และให้ทาครีมต่อ 3 สัปดาห์ อ่านผลรอยคล้ำ 1 และ 3 สัปดาห์หลังฉายรังสี การประเมินรอยแดงและรอยดำโดยให้คะแนน 1-4 และนำมาประเมินทางสถิติพบว่าครีมวุ้นว่านหางจระเข้ไม่มีประสิทธิภาพในการป้องกันหรือรักษาการไหม้แดด ครีมวุ้นว่านหางจระเข้ไม่สามารถป้องกันการสร้างเม็ดสี และเมื่อทาครีมเพื่อรักษารอยผิวคล้ำนาน 3 สัปดาห์ พบว่าครีมวุ้นว่านหางจระเข้ไม่สามารถ ฟอกสีผิวได้เมื่อเปรียบเทียบกับยาหลอก