Topical Anti-Inflammatory Activity of Aloe vera as Measured by Ear Swelling

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Previous studies have shown that Aloe vera effectively reduces edema and inflammation and improves wound healing.1 Adjunctive-induced arthritis was prevented and reversed by the topical application of Aloe.2 Aloe vera contains acetylsaliclyc acid, sotocin A, and magnesium lactate, which block the inflammatory substances prostaglandin and thromboxane.3-5 It possesses the enzyme bradykinase, an inhibitor of the tissue hormone bradykinin, which is a potent vasodilator. Also, the vitamins E found in Aloe stabilizes free radical formation, which inhibits inflammation. Vitamin C also promotes wound healing.6 The antiedenic activity of A. vera was recorded by the authors in normal and diabetic animals in small doses.7

Current topical and nonsteroidal anti-inflammatory drugs provide relief of local inflammation, but the effectiveness is limited by severe side effects. Aloe’s remedy range extends from burns to insect bites to arthritis. Given that commercial A. vera preparations must have a concentration of 0.5% Aloe to have healing power and anti-inflammatory activity, Aloe vera gel is approved by the FDA for treatment of inflammation and that the dosage to be used is still in question. The authors attempt to determine the topical activity of decolorized (containing anthraquinone) A. vera over a dose range of 0.5% to 5% as measured by the t裆on oil-induced swelling of the mouse ear. This assay provides an effective way of measuring the topical biological activity of A. vera for clinical use.

Materials and Methods

Adult female ICR mice 20 to 30 gm; 10 animals/group were given 25 μg/ml croton oil topically on both surfaces of the right ear. The concentration of croton oil 3% aceton was 25 mg/ml. The irritant was applied by means of a Hamilton syringe. The left ear remained untreated (acetone alone did not induce any change in ear weight) and served as a control. The peak swelling occurred 6 hr later, at which time the ear swelling was measured by obtaining a 6-mm Bako punch biopsy from the intumescence and control ears of either anesthetized mice. The ear tissue was weighed in the earroom 0.01 mg. The difference in weight between the intumescence and control ear represents the degree of swelling for each group. Each group of animals had its own internal control. Topical application of 0.25%, 1%, and 5% decolorized A. Vera anthraquinones removed was applied 30 min after croton oil to minimize nonspecific interaction between the irritant and A. Vera. Ear weight differences for each group were recorded and the percentage of inhibition of swelling was obtained from each Aloe test group. The ears were placed in 10% formalin and stained with hemaexin-resin. The Student's test was used to determine significance for each test group.

Results and Discussion

Topical administration of 25 μg/ml croton oil produced a 20.35% increase in punch biopsy ear weight over 6 hr. Topical administration of 0.25%, 1%, and 5% decolorized A. Vera 30 min later produced a 8.7%, 10.7%, and 54.1% inhibition of croton oil-induced ear swelling. The percentage of inhibition recorded by the 0.25% dose of Aloe was not significant from control mice (p > 0.1), but the percentage of inhibition produced by the 1% and 5% was significant (p < 0.01; p < 0.001). The punch biopsy ear weight for the four groups of untreated control ears was not significantly different from each other (p = 0.01). Aloe vera shows a dose-response relationship between the 0.25% and 1% doses but, thereafter, reaches a plateau. The responses obtained by 1% and 5% Aloe are similar (p < 0.5%). This means that the effective anti-inflammatory dose range for topical administration is below 1%; since higher doses did not produce a greater response (Table 1). This data proves that commercial preparations need not exceed a concentration of 1%.

The earlier studies provided good results for A. Vera when treating burns, cuts, and skin ulcers, but the effective dose, route of administration, and mechanism of action tended to be shrouded in mystery. The authors’ laboratory has shown that certain amino acids, vitamins, anthraquinones, and asparagins could account for Aloe’s biological activity. Since A. Vera had an anti-inflammatory activity against connective tissue, the authors concluded that Aloe had its primary influence on acute inflammation and that it did not act like a steroid. Furthermore, A. Vera improved wound healing in small doses in a dose-response fashion. The croton oil-induced ear swelling assay provides a quick, sensitive, accurate method of evaluating the anti-inflammatory activity of A. Vera. The histology of ear tissue samples confirmed the responses.

Summary

Topical anti-inflammatory activity of A. Vera was tested at 0.25%, 1%, and 5% against croton oil-induced ear swelling over 6 hr. A maximum percentage of inhibition of 67.4% was obtained by 5% A. Vera. An increase in dose did not produce a

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Table 1: Inhibition of Croton Oil Ear Swelling Response by Topical Aloe Vera

<table>
<thead>
<tr>
<th>Dose</th>
<th>Increase</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25%</td>
<td>42%</td>
<td>8.7</td>
</tr>
<tr>
<td>1%</td>
<td>15%</td>
<td>67.4</td>
</tr>
<tr>
<td>5%</td>
<td>27%</td>
<td>94%</td>
</tr>
</tbody>
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14 Hamilton Co., Asheville, NY.
15 M.R. Pharmaceuticals, Miami, Fl.
greater response so that the effective dose-response part of the biological curve is between 0.25% and 1% A. vera concentration. Commercial preparations of A. vera need not exceed this concentration. The authors believe that this study provides a major breakthrough for Aloe and an effective treatment against inflammation for podiatrists. The authors’ ear swelling assay is an accurate and sensitive method of testing the topical activity of anti-inflammatories agents.

References

Avascular Necrosis of an Accessory Sesamoid of the Foot

A Case Report

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The term osteochondritis, osteochondrosis, osteonecrosis, avascular necrosis, and avascular necrosis may be confused and considered synonymous. Osteochondritis is inflammation of the bone and cartilage. Osteonecrosis refers to a number of conditions characterized by disorders enchondral ossification of epiphyseal growth during childhood. Osteochondrosis is inflammation of the bone and cartilage. Osteonecrosis is inflammation of the bone and cartilage. Osteonecrosis is inflammation of the bone and cartilage. Osteonecrosis is inflammation of the bone and cartilage.

Osteonecrosis, often incorrectly referred to as osteochondritis or osteonecrosis, is a rare pathologic condition found in the human foot. Less rare are sesamoid and accessory sesamoids. However, both conditions occurring together to produce avascular necrosis or osteochondrosis of the sesamoid is unusual. The authors describe such a case diagnosed and treated at Sheridan Park Hospital, and review the literature on this rare condition.

The authors found little in the literature on avascular necrosis of the accessory sesamoid of the metatarsophalangeal joints of the foot. There is, however, a condition that presents similar signs and symptoms. The condition, osteochondritis of the first metatarsophalangeal joint sesamoids, also known as Turek’s disease, presents equally in males and females 15 to 18 years old (Turek, M: Lecture notes, 1953-1984).