

Clinical abstracts

Wound healing

Wound Healing, Oral & Topical Activity Of Aloe Vera

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J Am Podiatr Med Assoc Vol 79, Number 11, Nov 1989, P559-62

The influence of Aloe vera, orally and topically, on wound healing was studied. Wounds were induced on both sides of the vertebral column of ICR mice using a biopsy punch. For the oral study, experimental animals received A. vera in their drinking water for 2 months, whereas the control animals received only water. In the topical study, experimental animals were given 25% A. vera in Eucerin cream topically. The control animals received cream only. A 62.5% reduction in wound diameter was noted in mice receiving 100 mg/kg/day oral A. vera and a 50.8% reduction was recorded in animals receiving topical 25% A. vera. These data suggest that A. vera is effective by both oral and topical routes of administration.

Anti-Inflammatory & Wound Healing Activity Of A Growth Substance In Aloe Vera

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J Am Podiatr Med Assoc 84(2):77-81 1994 Feb

Aloe vera improves wound healing and inhibits inflammation. Since mannose-6-phosphate is the major sugar in the Aloe gel, the authors examined the possibility of its being an active growth substance. Mice receiving 300 mg/kg of mannose-6-phosphate had improved wound healing over saline controls. This dose also had anti-inflammatory activity. The function of mannose-6-phosphate in A. vera is discussed.

Aloe Vera, Hydrocortisone, & Sterol Influence On Wound Tensile Strength & Anti-Inflammation

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J Am Podiatr Med Assoc 84(12):614-21 1994 Dec

Aloe vera at doses of 100 and 300 mg/kg daily for 4 days blocked the wound healing suppression of hydrocortisone acetate up to 100% using the wound tensile strength assay. This response was because of the growth factors present in A. vera masking the wound healing inhibitors such as sterols and certain amino acids. The sterols showed good anti-inflammatory activity (-36%) in reducing the croton oil-induced ear swelling. This activity displayed a dose-response relationship.

Beneficial Effects Of Aloe In Wound Healing

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Phytotherapy Research (1993) Vol 7, No. Special issue, pp. S48-S52. 10 pl. (5 col. pl.). 17 ref.

The therapeutic effects of A. vera [A. babadensis] were examined in preventing progressive dermal ischaemia caused by burns, frostbite, electrical injury, distal dying flap and intra-arterial drug abuse in man and animal models. In vivo analysis of these injuries showed that the mediator of progressive tissue damage was thromboxane A₂ (TxA₂). Experimentally, A. vera was compared to a variety of antithromboxane agents (U38450, a lodoxamide, a lazaroïd and an Aloe wound gel). In the burn injury, A. vera was comparable to the lodoxamide and lazaroïd with an 82% to 85% tissue survival when compared with the control and the Aloe wound gel. Tissue survival in the experimental frostbite injury was 28.2% when compared with the control. Similar results were obtained for the electrical injury, and intra-arterial drug abuse. Clinically burn patients treated with A. vera healed without tissue loss as did those with frostbite. In the intra-arterial drug abuse patients, A. vera reversed tissue necrosis. This therapeutic approach was used to prevent progressive tissue loss in each injury by actively inhibiting the localized production of TxA₂. A. vera not only acts as a TxA₂ inhibitor but maintains a homeostasis within the vascular endothelium as well as the surrounding tissue.

Full-face dermabrasion provided an ideal opportunity to document the effects of dressings on wound healing management. Following the procedure, the abraded face was divided in half. One side was treated with the standard polyethylene oxide gel wound dressings. The other side was treated with a polyethylene oxide gel dressing saturated with stabilized Aloe vera. The polyethylene oxide dressing provided an excellent matrix for the release of Aloe vera gel during the initial 5 days of wound healing. By 24-48 hours there was dramatic vasoconstriction and accompanying reduction in edema on the Aloe-treated side. By the third to fourth day there was less exudate and crusting at the Aloe site, and by the fifth to sixth day the reepithelialization at the Aloe site was complete. Overall, wound healing was approximately 72 hours faster at the Aloe site. This acceleration in wound healing is important to reduce bacterial contamination, subsequent keloid formation, and/or pigmentary changes. The exact mechanism of acceleration of wound healing by Aloe vera is unknown.

Effect Of Aloe Vera Gel To Healing Of Burn Wound, A Clinical & Histologic Study

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Journal of The Medical Association of Thailand (1995 Aug) 78 (8) 403-9

In a study of twenty-seven patients with partial thickness burn wound, they were treated with Aloe vera gel compared with vaseline gauze. It revealed the Aloe vera gel treated lesion healed faster than the vaseline gauze area. The average time of healing in the Aloe gel area was 11.89 days and 18.19 days for the vaseline gauze treated wound. Statistical analysis by using t-test and the value of $P < 0.002$ was statistically significant. In histologic study, it showed early epithelialization in the treated Aloe vera gel area. Only some minor adverse effects, such as discomfort and pain were encountered in the 27 cases. This study showed the effectiveness of Aloe vera gel on a partial thickness burn wound, and it might be beneficial to do further trials on burn wounds.

Comparative Evaluation Of Aloe Vera In The Management Of Burn Wounds In Guinea Pigs

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Plast Reconstr Surg 81(3):386-9 1988 Mar

An experimental study was designed using Hartley guinea pigs, who received full-thickness burns covering 3 percent of their body surface area by direct contact with a hot plate. A total of 40 animals were equally divided among four modalities of closed burn wound management as follows: group I: silver sulfadiazine (Silvadine); group II: Aloe vera gel extract; group III: salicylic acid cream (aspirin); and group IV: plain gauze occlusive dressing only. The dressings were changed daily, and the size and appearance of each burn wound were recorded until complete healing. On the sixth postburn day, quantitative burn wound cultures were made. The average time to complete healing in the control group was 50 days, and the only significant difference was found in the Aloe vera-treated animals, which healed on an average of 30 days (p less than 0.02). Wound bacterial counts were effectively decreased by silver sulfadiazine ($p = 0.015$) and by Aloe vera extract ($p = 0.015$). From our data it appears that Aloe gel extracts permit a faster healing of burn wounds.

Aloe Plant For Promotion Of Wound Healing

Davis, Robert H

The present invention describes a compn. derived from the Aloe plant which when used as an adjuvant for the healing of wounds exhibits increased anti-inflammatory and wound-healing activity. An open wound is treated by (1) applying a first wound-healing compn. comprising Aloe vera and gibberellin or micronized aspirin to an open wound and (2) overlaying the first compn. with a bandaging mixt. comprising an 1:1 ratio of whole leaf Aloe vera and Aloe

vera mucilage. The compn., an Aloe vera mucilage at approx. 1:1 ratio, preferably with Aloe pulp fibers, increased open wound healing activity and tensile strength by 131% over controls.

Effects Of Topical Medications On The Healing Of Open Pad Wounds In Dogs Swaim SF; Riddell KP; McGuire JA

Scott-Ritchey Research Center, College Of Veterinary Medicine, Auburn University

Journal of the American Animal Hospital Association (1992) Vol 28, No. 6, pp. 499-502

A triple antibiotic ointment (containing polymixin B sulfate, bacitracin and neomycin sulfate) and an Aloe vera extract gel were evaluated for their effects on open wound healing of pad wounds created under anesthesia in 15 Beagle dogs. The primary difference between the 2 medications was noticed at 7 days when the Aloe-treated wounds had a smaller unhealed area than did untreated control wounds and wounds treated with antibiotics.

Aloe Vera: Its Potential Use in Wound Healing & Disease Control in Oral Conditions

Moore, Timothy E

Aloe vera has been shown to enhance defense mechanisms, and it has a variety of components to help combat periodontal disease and other oral conditions. As a periodontist utilizing Aloe vera in various consistencies for the last 14 years with over 6,000 documented patients who have been treated with applications, I've observed remarkable healing, reduced edema, and pain control. There are eight main uses of Aloe vera in dental practice:

1. Applications directly to the sites of periodontal surgery.
2. Applications to the gum tissues when they have been traumatized or scratched by toothbrush-dentifrice abrasion, sharp foods, dental floss, and toothpick injuries.
3. Chemical burns are relieved quickly from accidents with aspirin.
4. Extraction sites respond more comfortably and dry sockets do not develop when Aloe vera is applied.
5. Acute mouth lesions are improved by direct application on herpetic viral lesions, aphthous ulcers, canker sores, and cracks occurring at the corners of our lips. Gum abscesses are soothed by the applications as well.
6. Other oral diseases chronic in nature respond with Lichen Planus and Benign Pemphigus. Even gum problems associated with AIDS and Leukemia patients receive relief. Migratory glossitis, geographic tongue and Burning Mouth Syndrome are improved.
7. Denture patients with sore ridges and ill-fitting dentures and partials can benefit as fungus and bacterial contamination reduce the inflammatory irritations.
8. Aloe vera can also be used around dental implants to control inflammation from bacteria contamination.

Other oral disorders such as Candidiasis, Desquamative Gingivitis, Vesiculobullous diseases, acute monocytic leukemia, hematological disorders and nutritional problems all respond to Aloe vera use. Even diabetes mellitus, Sjorgen's Syndrome, menopausal patients and medications which can cause Xerostomia or dry mouth. Interest is gathering momentum across our country as researchers are becoming interested in alternative therapy utilizing natural products versus synthetic agents. Aloe vera research is currently being undertaken at

Oklahoma University, Baylor University, and Loma Linda. Lastly, it was a privilege to use Aloe vera on the bombing victims in the April 1995 disaster in Oklahoma City. The attendants, doctors and especially the injured learned that the healing capabilities of Aloe vera far exceeded their expectations in pain control and healing time reduction. Aloe vera has an unlimited future in new applications, and I sense in dentistry we are just on the cutting edge of promising utilization for anti-inflammatory procedure, antiviral, and immunological benefits for our patients.

A Bacteriological Study **Shupe-Ricksecker, Kathleen**

In 1994 a biologist and assistant professor at the University of Dallas, Dr. Shupe recently undertook a series of in vitro bacteriological examinations testing various percentages of Aloe vera solutions against tissue cultures of four common pathogens – Streptococcus pyogenes, Staph aureus, Pseudomonas aeruginosa (pseudomonas) and Escherichia coli (more popularly known as E. coli). Strep pyogenes are particularly known to be present in cross-infections and side-infections from improper wound healing, as are pseudomonas. Pseudomonas aeruginosa are also present in a number of secondary urinary tract infections in men and is commonly found as a second microorganism present in prostatitis. E. coli is a potent bacteria common to the rectal cavity of every living mammal. Well behaved in that singular context, once it is released and exposed to outside air it can wreak absolute havoc especially when exposed to wounds, mucous membranes or adjacent to foodstuffs such as meat. Uncaught and untreated, E. coli can be one of the most dangerous bacteria known to medicine.

In her findings, Dr. Shupe noted that all these microorganisms were killed within twenty four hours of exposure to high levels of Aloe vera (85%). The Strep pyogenes and Staph aureus strains were virtually killed (99.5%) within the twenty four hour period. The more resistant strains, E. Coli and pseudomonas, were killed upon an increase of Aloe percentages to 90%, and at that there was a 90% bactericidal ratio in the same period of time.

Dr. Shupe studies the germicidal effects of Aloe vera on Propionibacterium acnes (ATCC strain 6919). This is a causal agent in the formation of acne, often resulting from the introduction of a comedogenic agent such as an improper oil-base ingredient to the skin. In vitro testing with samples using various percentages of Aloe vera revealed that a 100% killing ratio against the bacteria could be achieved within that twenty four hour period.

Aloe Vera & Gibberellin, Anti-Inflammatory Activity In Diabetes **Davis RH; Maro NP**

J Am Podiatr Med Assoc 79(1):24-6 1989 Jan

Aloe vera inhibits inflammation and adjuvant-induced arthritis. The authors' laboratory has shown that A. vera improves wound healing, which suggests that it does not act like an adrenal steroid. Diabetic animals were used in this study because of their poor wound healing and anti-inflammatory capabilities. The anti-inflammatory activity of A. vera and gibberellin was measured in streptozotocin-induced diabetic mice by measuring the inhibition of polymorphonuclear leukocyte infiltration into a site of gelatin-induced inflammation over a

dose range of 2 to 100 mg/kg. Both Aloe and gibberellin similarly inhibited inflammation in a dose-response manner. These data tend to suggest that gibberellin or a gibberellin-like substance is an active anti-inflammatory component in *A. vera*.

Isolation Of A Stimulatory System In Aloe Extract

Dr. Davis

A set of experiments Dr. Davis and team members conducted involving the “Isolation of a Stimulatory System in Aloe Extract.” This study was done as a follow up on a previous clinical study in which a 50% ethanol extract was done to evaluate a croton oil-induced ear swelling assay. In this test, the Davis research team found that the “supernatant fraction” decreased inflammation when applied topically by 29.2%, and the precipitate decreased inflammation by 12.1%. Even more significantly, the precipitate wound healing activity was increased by an average of 47.5. In the original study the supernatant exhibited a 78% anti-inflammatory activity of Aloe vera, and promised to offer a low-cost, natural substance that could be used to manage inflammation and wounds in the lower extremities.

In the new study, however, the Davis research team did not attempt to alter the original alcohol (or ethanol percentage). Instead, they ultracentrifuged the Aloe compound and then froze the two fractions to approximately -80°C . Then they applied the supernatant (freeze-dried) powder and the Aloe vera freeze dried powder to a test group and control group of white mice. The precipitate (combination of Aloe and ethanol) tested better for wound healing than the supernatant and the Aloe each on their own. In fact the supernatant showed no ability to heal wounds, the Aloe vera showed an ability of wound healing and anti-inflammatory capacities ranging from a 29.4% ratio, yet exhibited a higher anti-inflammatory activity ratio of 37.4 more than that of either the precipitate or the supernatant, and the precipitate combination showed a range of 47.1 in wound healing yet a lower 12.1 anti-inflammatory activity. It was concluded in both these tests that: “Aloe vera has anti-inflammatory components such as amino acids, vitamin C, aspirin like compounds, and mannose which can normalize the acute vascular response. Aloe vera can block the polymorphonuclear leucocyte response, but does not reduce connective tissue formation.”

Part of the process of this particular Davis et al. study also entailed the attempt to isolate a polysaccharide component and glycoprotein (enzyme) constituent in the Aloe vera that might hold the key to all this effective activity. In this case the polysaccharide in question was mannose phosphate. In the singular context, it was determined that the mannose phosphate did serve as a binding agent to the same receptors that formed a positive growth medium for accelerated wound healing, as well as anti-inflammatory activity. However, the researchers arrived at the conclusion that it would be an all but futile determination to credit any complex saccharide or single element for the total activity attributable to the Aloe vera complex itself.

Effects Of Low Molecular Constituents From Aloe Vera Gel On Oxidative Metabolism & Cytotoxic & Bactericidal Activities Of Human Neutrophils **t' Hart LA; Nibbering PH; van den Barselaar MT; van DiJk H; van den Berg AJ; Labadie RP**

Department Of Pharmacognosy, Faculty Of Pharmacy, University Of Utrecht
Int J Immunopharmacol Vol 12, ISS 4, 1990, P427-34

In traditional South-East Asian medicine the therapeutic value of the parenchymous leaf-gel of Aloe vera for inflammatory-based diseases is well-reputed. The aim of this study is to investigate at which level gel-constituents exert their activity. We show here that low –Mr constituents of an aqueous gel-extract inhibit the release of reactive oxygen species (ROS) by PMA-stimulated human PMN. The compounds inhibit the ROS-dependent extracellular effects of PMN such as lysis of red blood cells. The capacity of the PMN to phagocytose and kill micro-organisms at the intracellular level is not affected. The inhibitory activity of the low-Mr compounds is most pronounced in the PMA-induced ROS production, but is significantly antagonized by the Ca-ionophore A23187. It is shown that the inhibitory effect of the low-Mr compounds is the indirect result of the diminished availability of intracellular free Ca-ions.

Anti-Inflammatory & Wound Healing Properties Of Aloe Vera **Udupa SL; Udupa AL; Kulkarni DR**

Dep. Biochem., Kasturba Med. Coll.
Fitoterapia 65 (2). 1994 141-145

The fresh juice of the indigenous drug A. vera (0.2 ml/100 g, i.p.) was studied for its anti-inflammatory and wound healing properties in rats. Anti-inflammatory action was studied by observing percent reduction in carrageenin-induced paw oedema at 3 h. Wound healing effects were studied on incision (skin breaking strength), excision (percent wound contraction and epithelization time) and dead space (granuloma breaking strength and biochemical parameters) wound models. A. vera showed significant anti-inflammatory activity in acute inflammatory model without any significant effect on chronic inflammation. Significant increase in breaking strength (skin and granuloma tissue), enhanced wound contraction and decreased epithelization period were observed. An increase in lysyl oxidase activity and mucopolysaccharide content were also seen. This drug could therefore increase tensile strength by increasing cross-linking in collagen and interactions with the ground substance.

The External Use Of Aloes **Crewe JE**

Minnesota Journal of Medicine October 1937. Vol. 20. pp. 538-539

In 1937 and again in 1938, Dr. J.E. Crewe reported (in the *Minnesota Journal of Medicine*) a broader spectrum application of Aloe vera in treating chronic ulcers, eczema, thermal burns, scalding, sunburn, pruritus vulvae, minor injuries, and certain allergies including poison ivy. As the Collinses before him, Crewe had also tried using both the fresh leaf gel and an

ointment made from it. In almost all cases treated, Dr. Crewe was able to record healing that ranged from effective to remarkable. And in all instances mentioned healing was complete, and tissue regenerated without scarring.

Aloe Vera - Anti-Edemic & Analgesic Activity In Diabetes

Davis R

A 1988 study by the Davis, Leitner group established a criteria to test Aloe vera as an anti-edemic, analgesic and wound healing agent against opportunistic infections in the presence of diabetes, and to prove that Aloe vera works effectively even in “an abnormal physiological state.”

In this study, mice were divided into five groups. One control group of non-diabetic mice, and one control and three test groups of mice subjected to a diabetes induction agent (streptozotocin in this case), and given time for the diabetes to set in place. After 48 hours lapsed time, wounds were induced on all groups. Afterward, the control group was administered no Aloe vera while the two test groups were administered decolorized Aloe vera in varying and incrementally higher dosages – 1 milligram per kilogram, 10 mg/kg and 100 mg/kg. Then the five groups were tested at intervals of four and seven days to determine what effect, if any, the introduction of Aloe vera had on pain, edema, and the treatment of wounds.

Not only did increased doses of Aloe vera help accelerate healing and aid in the rapid healing of the wounds. The percentage of wound reduction increased in direct proportion to the amount of Aloe vera administered during treatment. On day four, no significant difference in healing was noticed in the non-diabetic group and the control group of mice (about 18% versus 20%, allowing for a margin of error factor of 3). But by day 7, the wound healing in the normal group had increased to 30 versus only 28% in the untreated diabetic mice.

Test groups given the dosages of Aloe vera showed increased wound healing abilities on both day 4 and day 7. By day 4, the Aloe test groups had shown wound healing ranging from 32% (for the 1 mg/kg group) to 43% for the 100 mg/kg group. On day seven the average level of healing had increased to 43% for the 1mg/kg group all the way to 56.6% for the 100 mg/kg group. That marked a jump of nearly 30 percentage points for the test group of diabetic mice treated with large doses of Aloe vera.

When the mice were tested for analgesic effects and blood edema tests, the Aloe vera test groups showed equally dramatic positive results in exhibiting lessened inflammation and improved pain response.

1989, In a follow-up study by Dr. Robert Davis and Nicholas P. March, Aloe vera was measured again for its anti-inflammatory activity in diabetes. This time, it was tested in combination with gibberellin. Gibberellin is a naturally occurring glycoside and growth hormone found in plants, including the complex chemistry of the Aloe plant.

Again the diabetes was adjuvant induced with the diabetic agent, streptozotocin, on adult male mice in control and test groups. In fact when tested individually and in context with the Aloe over the properly apportioned number of days, the gibberellin did show almost identical anti-inflammatory results. So the evidence, in this test, seemed to point to the fact that the

glycoside, gibberellin, might indeed hold the key to the healing plant's anti-inflammatory powers.
