

ALOE VERA: NATURE'S GIFT TO DENTIST

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ABSTRACT:

Natural products, especially herbal medicines, have found great attentions in the recent decades as they are assumed to have less adverse effects. Aloe vera is a tropical plant with succulent leaves has been used for thousands of years as herbal medicine. Recent studies on the gel of the aloe vera leaves have shown that it might be of benefit in a wide range of inflammatory diseases, including healing of different types of wounds. Advances in the field of dentistry have promoted the use of various herbal and natural products for the treatment of various oral diseases and conditions. Aloe vera is one such product exhibiting multiple benefits. Its use in the treatment of oral lesions such as lichen planus and aphthous ulcers and also in the treatment of periodontitis has gained considerable importance in clinical research. This review focuses on Aloe vera, its compositions, effects on tissues and its varied uses in dentistry.

Keywords: Aloe vera gel, Inflammation, Aphthous ulcer, Lichen Planus, Periodontitis.



INTRODUCTION:

The use of aloe vera is being promoted for a large variety of conditions. Aloe vera looks like a cactus but it isn't the plant is a member of the lily family which includes garlic and onion. The aloe plant is grown in warm tropical areas and cannot survive

freezing temperatures. There are many species of aloe grown around the world but the main medicinal one is Aloe vera Barbadensis. Aloe vera a popular herbal remedy used medicinally for thousand years has multiple dental uses. It has been shown to enhance defence mechanisms, and has variety of components to help

combat periodontal diseases and other oral conditions [1]. The aim of this review was to summarize various effects of aloe vera particularly in dentistry.

History:

In mesopotamia, clay tablets dated 1750 B.C.E showed that aloe vera was being in a pharmaceutical manner. Egyptian books from 550 B.C.E mentioned that infections of the skin could be cured by the application of aloe vera. In 74 C.E a greek physician, wrote a book entitled De Materia Medica in which he stated that aloe vera could treat wounds, heal infections of the skin, cure chapping, decrease hair loss, and eliminate haemorrhoids [2]. Aloe was used predominantly for eczema around 1200 C.E³. Because Aloe was used mostly as a cathartic medicine, little thought was given to its other uses. Previously reported applications of aloe vera, which are not well substantiated, include seborrheic dermatitis, thermal burns and sunburn, cystic acne, peptic ulcers, amputation stump ulcers, lacerations, colds, tuberculosis, gonorrhoea, asthma, dysentery, and headaches. It has also been used as an insect repellent and as a laxative [3-4].

There are more than 300 species of aloe vera plants [5]. Aloe barbadensis is now referred to by taxonomist as aloe vera [2]. A major pharmaceutical text indicates that aloe united states pharmacopeia is either Cape aloe (aloe capensis, south africa), [6] otherwise known as A.ferox, or curacao aloe, also referred to as A. barbadensis. [7] Therefore, when studying aloe vera, one should mention the specific species used so that confusion is eliminated.

The aloe plant has yellow flowers. The leaves are arranged in a rosette configuration; they are triangular and spear-like and have thorny ridges. They are meaty if filled with gel that arises from the clear central mucilaginous pulp. The Arabic word "alooeh" means shining and bitter. [8] The peripheral bundle sheath cells give rise to a bitter, yellow exudate that is responsible for the cathartic effect. [9] The plant reaches maturity when it measures 11/2 – 4 feet long and has a base of 3 inches or greater in diameter. The most mature leaves are on the outer part of the rosette. Aloe vera was first cultivated for pharmaceutical distribution in 1920. [10] It matures differently depending on the cultivating conditions. Aloe vera dries to a black powder but will produce a red, gelatinous substance if frozen.

There are conflicting reports regarding the shelf life of aloe vera under varying storage conditions. Lt. Col Hammitt of the united states army medical research branch found no evidence of aloe vera having a therapeutic value. [2]

Chemical components of aloe vera:

In 1851 it was discovered that the potency of aloe vera was the result of aloin, a bitter juice that dried to a yellow powder and functioned as a cathartic medicine. It synonymous with barbaloin which is a glycoside. [7] Anthraquinone derivatives include anthracenes such as aloe-emodin, which is 1,8-dihydroxy-3 (hydroxy-methyl)-9,10-anthracenedione. These water soluble glycosides were separated from the water insoluble resinous material. Gjerstad [13] found that the leaves of aloe vera plant

contained 99.5% water and 0.0013% protein. Rowe and Parks [14] also noted fructose, ash, and amylase. Although they did not find vitamins A or D, Coats and

Ahola [2] indicate that aloe contains beta carotene and alpha-tocopherol. Many other organic compounds and inorganic elements have also been found (Table 1). [15]

Table 1: Chemical composition of aloe vera

<p><u>Anthraquinones</u></p> <ol style="list-style-type: none"> 1. Aloin 2. Barnaloin 3. Iaobarnaloin 4. Anthranol 5. Aloetic acid 6. Anthracene 7. Ester of cinnamic acid 8. Aloe-emodin 9. Emodin 10. Chrysophanic acid 11. Ethereal oil 12. Resistannol 	<p><u>Inorganic</u></p> <ol style="list-style-type: none"> 1. Calcium 2. Sodium 3. Chlorine 4. Manganese 5. Magnesium 6. Zinc 7. Copper 8. Chromium 9. Potassium 10. Sorbate 	<p><u>Saccharides</u></p> <ol style="list-style-type: none"> 1. Cellulose 2. Glucose 3. Mannose 4. L-Rhamnose 5. Aldopentose 	<p><u>Enzymes</u></p> <ol style="list-style-type: none"> 1. Oxidase 2. Amylase 3. Catalase 4. Lipase 5. Alkaline phosphatase
<p><u>Vitamins</u></p> <ol style="list-style-type: none"> 1. Vitamin B₁ 2. Vitamin B₂ 3. Vitamin B₆ 4. Choline 5. Folic acid 6. Vitamin C 7. Alpha-tocopherol 8. Beta carotene 	<p><u>Essential amino acids</u></p> <ol style="list-style-type: none"> 1. Lysine 2. Threonine 3. Valine 4. Methionine 5. Leucine 6. Isoleucine 7. Phenylalanine 	<p><u>Nonessential amino acids</u></p> <ol style="list-style-type: none"> 1. Histidine 2. Arginine 3. Hydroxyproline 4. Aspartic acid 5. Glutamic acid 6. Proline 7. Glycerine 8. Alanine 9. Tyrosine 	<p><u>Miscellaneous</u></p> <ol style="list-style-type: none"> 1. Cholesterol 2. Triglycerides 3. Steroids 4. Beta-sitosterol 5. Lignins 6. Uric acid 7. Gibberellins 8. Lectin like substance 9. Salicylic acid

Effects of aloe vera:

1. Antibacterial/antifungal/antiviral effects of aloe vera

Streptococcus pyogenes and Streptococcus faecalis are two microorganisms that have been inhibited by aloe vera gel. [15,16] Heggors et al in 1995 [17] suggested that the antibacterial effect of the aloe vera gel in vivo could enhance the wound healing

process by eliminating the bacteria that contributed to inflammation. Aloe vera gel reportedly was bactericidal against Pseudomonas aeruginosa while acemannan prevented it from adhering to human lung epithelial cells in a monolayer culture. A processed aloe vera gel preparation reportedly inhibited the growth of Candida albicans. [16] In terms of antiviral effects, acemannan reduced herpes simplex infection in two cultured target cell lines. [18] In a study Saoo et al noted that fractions of

aloe vera gel containing lectins directly inhibited the cytomegalovirus proliferation in cell culture, perhaps by interfering with protein synthesis.^[19] Sydiskis et al in 1991^[20] tested a purified sample of aloe emodin on the infectivity of herpes simplex virus Type 1 and Type 2 and found that aloe emodin inactivated all of the viruses, including varicella-zoster virus, influenza virus, and pseudorabies virus. Electron micrograph examination of anthraquinone-tested herpes simplex virus demonstrated that the envelopes were partially disrupted. These results showed that anthraquinones extracted from a variety of plants (including aloe vera) are directly virucidal to enveloped viruses.^[21]

An important finding by Zimmerman was that these effects of aloe vera were not apparent until there was at least 70% concentration of the gel. To achieve 70% or more concentration an aloe vera gel must be stabilized with antioxidants in order to minimize the otherwise necessary preservatives which lessens the percentage of aloe vera in the product.^[22] According to George D aloe must not be treated with excessive heat or filtered during the manufacturing process, as this destroys or reduces the effects of certain essential compounds such as enzymes or polysaccharides.^[23]

2. Antioxidant effects and free radical scavenging activity of aloe vera

Three relatively recent reports have demonstrated an antioxidant action for some constituents of aloe vera gel. Three aloe derivatives from aloe (namely isorabaichromone, feruoylaloetin, and p-

coumaroylaloetin) showed potent free radical and superoxide anion-scavenging activities in an assay using the lipid peroxidation rat liver microsomal system as the free radical generator. This lipid peroxidation assay is recognized as a standard technique for measuring the free radical scavenging effects of anti-oxidants. The same study noted that aloe compounds inhibited cyclooxygenase-2 (COX-2) and thromboxane (Tx) A2 synthase; such actions could explain in part the healing effects of aloe vera.^[24]

ALOE VERA IN DENTISTRY:

The mouth is a breeding ground for bacteria which can be a major problem if preventative measures are not taken because these bacteria can attack the teeth and gums, and can lead to bad breath, gingivitis, stomatitis and periodontitis. Aloe vera, however, has many anti-bacterial qualities that is why it is said to be very effective in fighting the bacteria and preventing these problems. It is extremely helpful in the treatment of gum diseases. It reduces swelling of the soft tissues and consequently this reduces the bleeding of the gums. It exhibits strong antiseptic action in gum pockets where normal cleaning is difficult. Its antifungal properties help greatly in the management of denture stomatitis. Cracked and split corners of the mouth are also subject to fungal infection and this can be cured by Aloe. Its antiviral properties help in the treatment of cold sores (Herpes Simplex) and shingles (Herpes Zoster). It is a powerful healing promoter and when inserted into extraction sockets are very beneficial. It can be used in any

surgical wound. It has a use in root canal treatment as a sedative dressing, healing promoter and file lubricant. Aloe vera can be used around dental implants to control inflammation from bacteria contamination. An extract from aloe vera has been shown to be beneficial and some dentists recommend 1-3 tablespoon of aloe vera juice to be used as a mouthwash, then swallowed three times daily.

1. Aloe vera as Tooth gel

Aloe vera as a tooth gel is intended to perform the same function as tooth paste which is to eliminate disease causing bacteria in the mouth. Aloe vera in tooth gel is used to cleanse teeth and gums as effectively as toothpaste does. Because aloe vera tooth gel does not contain the abrasives found in most tooth pastes, it is less harsh on teeth and is a great alternative for people with sensitive teeth or gums.

George D, Bhat SS, Antony B²³ conducted a study to compare the antimicrobial efficacy of aloe vera tooth gel (Forever Bright, Forever Living Products, Scottsdale, AZ), and two popular tooth pastes pepsodent (Unilever, Englewood Cliffs, NJ) and colgate (Colgate-Palmolive, Canton, MA), and concluded that aloe vera tooth gel was as effective as two commercially popular tooth pastes in controlling all the organisms (*S.mutans*, *candida albicans*, *lactobacillus acidophilus*, *enterococcus faecalis*, *prevotella intermedia* and *peptostreptococcus anaerobius*, *S,mitis*) used in the study. In addition gel demonstrated superior antibacterial effect

against *S. mitis* despite the absence of additional fluoride.

2. Aloe vera as denture cleanser

A small amount of gel can be placed in the denture once or twice daily. Taste is not bad and is not harmful if swallowed. It acts as an antifungal agent. This can also be used along with soft liners.^[25]

3. Aloe vera extract as denture adhesive

Because of the sticky and viscous nature of gel, a prototype acemannan was formulated into a denture adhesive and evaluated for adhesive strength in both wet and dry conditions; the adhesive also was used to evaluate cytotoxicity to human gingival fibroblasts. An optimal formula with a high and relatively stable adhesive bond strength and minimum cytotoxicity was observed.^[25]

4. Use of aloe vera in the treatment of aphthous ulcers

It has been reported that acemannan hydrogel accelerates the healing of aphthous ulcers and reduces the pain associated with them.^[13] Ninety patients with histories of recurrent aphthous ulcers were separated into three groups, with each group receiving a different treatment (either acemannan hydrogel, freeze-dried acemannan hydrogel, or an unspecified over-the-counter product as an active control) four times a day. The groups using acemannan hydrogel in either form healed faster than those using the over-the-counter remedy. The report noted that compared with other remedies for aphthous ulcers, the acemannan hydrogel

did not have the disagreeable taste and texture associated with traditional therapies and did not sting when applied.^[26]

5. Use of aloe vera in the treatment of lichen planus

Hayes SM in 1999 ^[27] in a study placed a patient on aloe vera therapy for lichen planus with systemic involvement. The treatment involved drinking 2.0 ounces of stabilized aloe vera juice daily for three months with additional topical application using aloe vera lip balm and aloe cream for itching hands. The oral lesions cleared up within four weeks, although the systemic lesions took longer, due in part to the fact that the patient temporarily interrupted the course of aloe therapy and sought an alternate source of treatment. Despite discontinuing the aloe therapy, complete success still was achieved.

6. Aloe vera as a local drug delivery agent in the treatment of Periodontitis

Geetha et al in 2012 ^[28] conducted a study on Aloe vera and highlights its property when used as a medicament in the periodontal pocket. A total number of 15 subjects were evaluated for clinical parameters like plaque index, gingival index, probing pocket depth at baseline, followed by scaling and root planing (SRP). Test site comprised of SRP followed by intra-pocket placement of Aloe vera gel, which was compared with the control site in which only SRP was done, and clinical

parameters were compared between the two sites at one month and three months from baseline. Results exhibited encouraging findings in clinical parameters of the role of Aloe vera gel as a drug for local delivery. We conclude that subgingival administration of Aloe vera gel results in improvement of periodontal condition. Aloe vera gel can be used as a local drug delivery system in periodontal pockets.

7. Effect of aloevera on MMPs

In study by Barrantes and Guinea in 2003,^[29] a collagenase from *Clostridium histolyticum* was dose-dependently inhibited by aloe vera gel and an active aloe vera gel fraction containing phenolics and aloins; aloe vera gel and aloins also were effective inhibitors of stimulated granulocyte matrix metalloproteinases (MMPs). The authors, noting some chemical structural similarities between the aloins and the MMP inhibitory tetracyclines, suggested that the aloe derivatives could inhibit the MMPs through a mechanism similar to that of inhibitory tetracyclines such as doxycycline.

CONCLUSION:

Although Aloe vera has wide spectrum of the properties and uses, some of them could be myths and some of them could be real magic. In future, controlled studies are required to prove the effectiveness of Aloe vera under various conditions.

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