



ALOE VERA: A BOON IN DENTISTRY

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ABSTRACT

Aloe vera is well known for its marvellous medicinal properties. These plants are one of the richest sources of health for human beings coming from nature. It has been grown as an ornamental plant widely. Products of the plant are used in the treatment of various ailments. Various parts of the plant have different effects on the body. *Aloe vera* is an ancient, natural ingredient that would be hailed as a major scientific breakthrough if it came out of a modern drug lab. It coats, soothes and can even heal ulcers and irritations. Proven in multiple clinical studies, *Aloe vera* has been used in dentistry for its wound-healing effects, gingivitis, plaque control & curing oral mucosal lesions. *Aloe vera* may also reduce the pain and duration of oral ulcers while speeding healing. The dentists should use *Aloe vera* at a level high enough to maximize its therapeutic benefit.

Key words: *Aloe vera*, Dentistry, Pulp Infections, Oral Ulcers etc.

INTRODUCTION

The *Aloe vera* plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name *Aloe vera* derives from the Arabic word “Alloeh” meaning “shining bitter substance,” while “vera” in Latin means “true.” 2000 years ago, the Greek scientists regarded *Aloe vera* as the universal panacea. The Egyptians called Aloe “the plant of immortality.” Aloe *barbadensis* Miller (*Aloe vera*) belong to the liliaceal family, of which there are about 360 species. The use of natural products in the prevention and treatment of oral conditions has increased recently and could be of benefit to low socioeconomic level in urban and rural communities. Among the various currently available herbal agents the most popular and currently receiving a lot of scientific attention is *Aloe vera*. It is a perennial succulent xerophyte, which develops water-storage tissue in the leaves to survive in dry areas of low or erratic rainfall [1]. The plant has stiff grey-green lance-shaped leaves containing clear gel in a central mucilaginous pulp. Benefits associated with *Aloe vera* have been attributed to the polysaccharides contained in the gel of the leaves. It is a cactus like plant that grows in hot and dry climates. Numerous studies on *Aloe vera* are being done to demonstrate the antiviral, antibacterial, analgesic, anti-inflammatory & wound healing properties. The Aloe *barbadensis* plant consists of two different parts, each of which produces substances with completely different

compositions and therapeutic properties. The parenchymal tissue makes up the inner portion of the aloe leaves and produces the *Aloe vera* gel (or mucilage), a clear, thin, tasteless, jelly-like material. This tissue is recovered from the leaf by separating the gel from the inner cellular debris. The other part of the plant is a group of specialized cells known as the pericyclic tubules, which occur just beneath the outer green ring of the leaf. These cells produce an exudate that consists of bitter yellow latex with powerful laxative-like actions [2].

History: The plant *Aloe vera* has a history dating back to biblical times. *Aloe vera* has been used for medicinal purposes in several cultures for millennia: Greece, Egypt, India, Mexico, Japan and China. Egyptian queens Nefertiti and Cleopatra used it as part of their regular beauty regimes. Alexander the Great, and Christopher Columbus used it to treat soldiers’ wounds. The first reference to *Aloe vera* in English was a translation by John Goodyew in A.D. 1655 of Dioscorides’ Medical treatise De Materia Medica [3].

The Components or Elements in Aloe vera Are [4].

Lignins: Found in the pulp of the leaf gel. Has the capacity to penetrate tissue and carry elements with it.

Saponins: Glycosides that promote cleansing and provide an antiseptic quality.

Anthraquinones: Complex that has painkillers, antibacterial and antiviral agents.

Minerals: Act for the benefit of the overall health of our bodies and are interactive with the vitamins, co-enzymes and proteolytic enzymes.

Vitamins: Essential for maintenance of our health and function well as catalysing agents.

Mono and Polysaccharides: Mainly carbohydrates.

Amino Acids: Building blocks for repair and regeneration of traumatised tissue. Thus, a synergistic result occurs when the *Aloe vera* complex is positioned next to the injured tissue.

Mechanism of Action:

Anti-Inflammatory Effects:

It inhibits the cyclooxygenase pathway and reduces prostaglandin E2. Recently, the novel anti-inflammatory compound called C-glucosyl chromone was isolated from gel extracts. In addition, the peptidase bradykinase was isolated from *Aloe* and shown to break down the bradykinin, an inflammatory substance that induces pain [5].

Antibacterial Property: The activity of *Aloe vera* inner gel against both Gram-positive and Gram-negative bacteria has been demonstrated by several different methods. *Streptococcus pyogenes* and *Streptococcus faecalis* are two microorganisms that have been inhibited by *Aloe vera* gel. *Aloe vera* gel reportedly was bactericidal against *Pseudomonas aeruginosa* while acemannan prevented it from adhering to human lung epithelial cells in a monolayer culture [6].

Antifungal Property: A processed *Aloe vera* gel preparation reportedly inhibited the growth of *Candida albicans* [7].

Antiviral Property: This action may be direct and indirect: indirect due to stimulation of immune system, and direct due to aloe emodin. Aloe emodin in *Aloe vera* makes it so that certain viruses are not able to function. Therefore, *Aloe vera* is virucidal to Herpes simplex virus type 1 and type 2, Varicella zoster virus, pseudo rabies virus and influenza virus according to the research of Thomson. During the course of these studies it was found that the virucidal activity was due to the anthraquinones extracted from the inner leaf of *Aloe* and the roots, bark, or leaves of a number of other anthraquinone-containing plants. The results indicated that aloe emodin directly affected both DNA- and RNA-containing enveloped viruses but had no effect on naked (unenveloped) viruses. It was concluded that under the conditions tested, the anthraquinones acted directly on the envelope of the anthraquinone-sensitive viruses, resulting in the prevention of virus adsorption and subsequent replication [8].

Immunomodulating Effects: *Aloe vera*, a great immune stimulant, contains 90% rhodium and iridium (trace minerals) in the acemannan which is one of the polysaccharides which dramatically increases the white blood cells or macrophages and T cells. Thus, immunomodulating effects occur via activation of macrophage cells to generate nitric oxide, secrete cytokines (e.g., tumor necrosis factor, interleukin-1, interleukin-6, and interferon- γ), and present cell surface markers. It helps enlarge the thymus gland in size by 40%. The thymus is what produces the T cells of the immune system [9].

Antioxidant Property: *Aloe vera* has very strong antioxidant nutrients. Glutathione peroxidase activity, superoxide dismutase enzymes and a phenolic antioxidant were found to be present in *Aloe vera* gel, which may be responsible for these antioxidant effects. Apart from these, it also contains A, C and E vitamins. These free radical components get rid of the toxins and carcinogenic properties in our bodies [10].

Antitumor Effect: The two fractions from *Aloes* that are claimed to have anticancer effects include glycoproteins (lectins) and polysaccharides. Different studies indicated antitumor activity for *Aloe vera* gel in terms of reduced tumor burden, tumor shrinkage, tumor necrosis, and prolonged survival rates. An induction of glutathione S-transferase and an inhibition of the tumor-promoting effect of phorbol myristic acetate have also been reported which suggest *Aloe* gel in cancer chemoprevention. Indirect action on antitumor activity is stimulation of the immune response [11].

***Aloe vera* in Dentistry [12-15].**

There are several uses of *Aloe vera* in dental practice:

1. Periodontal surgery.
2. Applications to the gingival tissues when they have been traumatized or scratched by toothbrush-dentifrice abrasion, sharp foods, dental floss, and toothpick injuries.
3. Chemical burns from accidents with aspirin.
4. Extraction sockets
5. Acute mouth lesions such as herpetic viral lesions, aphthous ulcers & cracks occurring at the corners of our lips.
6. Periodontal & gingival abscesses are soothed by the applications as well.
7. Chronic oral diseases Lichen Planus and Benign Pemphigus, gingiva problems associated with AIDS and Leukemia.
8. Migratory glossitis, geographic tongue and Burning Mouth Syndrome.
9. Denture patients with sore ridges and ill-fitting dentures
10. Dental implants

***Aloe vera* in Endodontics:** Elimination of the microorganisms and prevention of reinfection within the pulp canal are the main objectives of the pulp space therapy. Due to the complex anatomy of the pulp space system and the ability of microorganisms to survive in the

periods of starvation, the microorganisms remain even after thorough mechanical instrumentation and irrigational procedures. Therefore an antimicrobial intracanal medicament is needed to eliminate the surviving resistant microorganisms. In many parts of the world, there is a rich tradition to use herbal medicine for the treatment of many infectious diseases. In developing countries, it is estimated that about 80 percent of the population rely on traditional medicine for their primary health care. Due to the side effects and the resistance that pathogenic microorganisms build against the common antibiotics, much recent attention has been paid to extracts and biologically active compounds isolated from plants used in herbal medicine. Also researchers have shown that the use of herbal drugs have increased instead of synthesized drugs. It has been shown that enterococcus faecalis may tolerate antimicrobial drugs. *Aloe vera* has shown antimicrobial effect against resistant microorganisms found in pulp space [16]. *Aloe vera* has antimicrobial effect against resistant microorganisms found in pulp space i.e. *Candida albicans* & *Enterococcus faecalis*. Water, chloroform & alcohol extracts of *Aloe vera* derived from pulp are found to have antibacterial efficacy & can be used as an intracanal medicament. It can also be used in root canals as sedative dressing & as file lubricant. The nerve ends in a root canal are very sensitive. *Aloe vera* greatly helps to lessen its sensitivity. This gel can be placed inside the pulp chambers while broaching to make aloe work in the pulp canals. Aloe can also be used as canal lubricant. During closed dressings cotton pellet with camphorated monochlorophenol drops could be added with a drop of *Aloe vera* gel and then sealed with temporary restorations [17].

Soothing healer to Periodontal Disease: Sub gingival administration of *Aloe vera* gel results in improvement of periodontal condition & can be used as a local drug delivery system in periodontal pockets. Pockets when filled with gel up to gingival margins & Copake placed over it shows reduction in pocket depth, gingival index and plaque index [18].

Gingival & Periodontal Diseases: *Aloe vera* greatly reduces the instances of gingival bleeding due to its soothing & healing properties, reduces swelling and soft tissue edema. Hence stops bleeding and restores gums to health [19]. Reduces plaque & calculus formation.

***Aloe vera* as a Tooth Gel:** It cleanses & soothes teeth & gums and effective in fighting cavities. Anthraquinones helps in healing & arresting pain. Less harsh on teeth as it does not have the abrasive elements and hence is a better alternative for people with sensitive teeth or gums. Study by Stanford University revealed that *Aloe vera* tooth gel is equivalent, and at times more effective, than the commercial brands, in controlling cavity-causing organisms. *Aloe vera* tooth gel is intended to perform the same function as toothpaste, which is to eliminate pathogenic oral micro flora. The ability of *Aloe vera* tooth gel to successfully perform that function has been a point

of contention for some dental professionals. However, the study compared the germ-fighting ability of an *Aloe vera* tooth gel to two commercially popular toothpastes and revealed that the *Aloe vera* tooth gel was just as effective, and in some cases more effective, than the commercial brands at controlling cavity-causing organisms [20].

***Aloe vera* as a Mouthwash:** Mouthwash prevents radiation-induced mucositis by its wound healing and anti-inflammatory mechanism. It reduces oral candidiasis of patients undergoing head and neck radiotherapy due to its antifungal & immunomodulatory properties. The efficiency of *Aloe vera* in treatment of oral lichen planus has been measured by many researchers. In one study, a patient of lichen planus with systemic involvement was placed on *Aloe vera* therapy. The patient's treatment involved drinking 2.0 ounces of stabilized *Aloe vera* juice daily for 3 months, topical application using *Aloe vera* lip balm and Aloe cream for itching hands. The oral lesions cleared up within 4 weeks, although the systemic lesions took longer. In another study, 46 patients with oral lichen planus were randomly divided into 2 groups. Each group was treated with *Aloe vera* mouthwash and triamcinolone acetonide 0.1% (TA), respectively. The treatment period for both groups was 4 weeks. Patients were evaluated on days 8 and 16 and after completing the course of treatment (visit 1–3). *Aloe vera* mouthwash is an effective substitute for TA in the treatment of oral lichen planus [21].

Gingivitis: Several studies have been conducted to test the efficacy of *Aloe vera* in treating gingivitis. In a double-blind study, a total of 120 subjects were requested to abstain from oral hygiene (tooth brushing) for 14 days. The subjects were then randomly divided into group A (test group) who received 100% *Aloe vera*, group B (negative control group) who received placebo (distilled water), and group C (positive control group) who received 0.2% chlorhexidine. Plaque accumulation was assessed by plaque index (PI) and gingivitis was assessed by modified gingival index (MGI) and bleeding index (BI) at baseline (0), 7th, 14th, and 22nd days. Mouthwash containing *Aloe vera* showed significant reduction of plaque and gingivitis, but when compared with chlorhexidine the effect was less significant. It was concluded that *Aloe vera* mouthwash can be an effective antiplaque agent and with appropriate refinements in taste and shelf life can be an affordable herbal substitute for chlorhexidine [22].

Halitosis: *Aloe vera* is natural anti-fungal and antibacterial agent. It protects the sensitive tissue in the mouth, kills bacteria as well as fight tooth decay. It boosts body's ability to create collagen, which strengthens diseased and swollen gingiva. Take a 1/4 cup of pure *Aloe vera* gel and dissolve it in about 1/2 cup of water or apple juice. Drink this to soothe acid indigestion, which is a very common cause of bad breath [23].

Denture Care: Smoothing *Aloe vera* gel onto the denture once or twice a day has antifungal benefits. It prevents denture stomatitis. It can be used along with soft

liners [24].

Denture Adhesives: It is sticky & viscous nature of gel. It strengthens gingiva, soothes & alleviates gingival irritation. It has adequate adhesive strength to wet and dry conditions. Acemannan, a complex mannose carbohydrate and one of the main ingredients of the *Aloe vera* gel, has an inherent stickiness/viscosity. It is this property that led to the production of prototype acemannan denture adhesives. These new denture adhesive formulations were evaluated for pH changes, cytotoxicity to human gingival fibroblasts, and adhesive strength in both dry and wet conditions. The denture adhesive formulations tested consisted of five combinations of acemannan with varying concentrations of preservatives. The pH and cytotoxicity of each formulation was measured over 24 hours and, the adhesive strength was evaluated with a universal testing. The experiment concluded that acemannan denture adhesive formulation 150:1 and preservative concentration of formulation 4 with an initial pH value of 6.0 was an effective herbal substitute for traditional denture adhesives [25].

Aloe in Canker & Cold Sores: It has been reported that acemannan hydrogel accelerates the healing of aphthous ulcers and reduces the pain associated with them. Researchers evaluated a gel that combined allantoin, *Aloe vera* and silicon dioxide and its effects on aphthous ulcers of the oral cavity. Each patient used a daily diary to document the number and duration of aphthous ulcers, the interval between ulcers, ulcer size and ulcer pain over a period of 3-4 months. The reduced duration of the lesions in one arm of the study and the increased interval between lesions in the other arm of the study both were significant statistically. The gel did not demonstrate any consistent

effectiveness on ulcers in the oral cavity [26]. Richard L. Wynn, PhD, mentions a study done on a patient. Patient drank 2.0 ounces of *Aloe vera* juice daily & topical application of *Aloe vera* lip balm. Oral lesions clear up in 4 weeks & complete success was achieved. It can be taken both as *Aloe vera* juice & *Aloe vera* gel [27].

Alveolar Osteitis: Currently, special medical bandages are available for intraoral use following extraction of teeth. They are available as freeze-dried pledget that contains acemannan hydrogel obtained from the clear inner gel of *Aloe vera*. In 2002, a retrospective evaluation was performed of the records of 587 patients (1,031 sockets) whose extraction sites had been treated with clindamycin-soaked gelfoam. A prospective trial was conducted in which 607 patients (1,064 sockets) had 2 SaliCept Patches (containing *Aloe vera*) placed immediately after extraction. Results showed that 78 of 975 sites (8.0%) in the gelfoam group developed alveolar osteitis, whereas only 11 of 958 sites (1.1%) in the SaliCept group developed alveolar osteitis. Further analysis of all extraction sites revealed that the incidence of alveolar osteitis in the gelfoam group was 7.6% compared with 1.1% in the SaliCept-treated group. Therefore, it was concluded that the SaliCept Patch significantly reduces the incidence of alveolar osteitis compared with clindamycin-soaked gelfoam. After extraction, gauze saturated with *Aloe vera* when placed in socket and asked by the patient to bite on it, has shown improved healing & formation of blood clot [28].

Dental Implants: *Aloe vera* gel placed around dental implants is found effective to reduce inflammation. *Aloe vera* reduces inflammation by its antimicrobial & anti-inflammatory effects [29].

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