Use of Aloe Vera in Dentistry

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ABSTRACT

The aloe vera plant has a long history of healing power. Recently, aloe vera has gained some popularity as an active natural product used in the medical and dental field for treating many diseases. It has various miraculous properties like anti-inflammatory, antibacterial, antiviral and antitumor which accelerates wound healing and helps in treating various lesions in oral cavity. Though, there are various indications for its use, more clinical research is required to determine its real efficacy in dentistry. The aloe vera plant, its composition, properties, mechanism of action and clinical uses are briefly reviewed in this article.

Keywords: Aloe vera, Antitumor, Antibacterial, Antifungal, Antiviral, Wound healing, Moisturizing.

INTRODUCTION

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, aloe vera, popularly known as ‘babosa,’ is a plant commonly found in the Northeast of Brazil. Its foliage, extract and resin present antimicrobial, anti-inflammatory and healing properties and are indicated to hepatic and stomach diseases.

The plant aloe vera has a history dating back to biblical time. Aloe vera plant is not a cactus, but a member of the tree lily family, know as Aloe barbadensis. It produces a tubular yellow flower in the spring that is typical of the lily family. There are over 250 species of Aloe grown around the world. Only two species are grown commercially: Aloe barbadensis Miller and Aloe aborescens. The aloe plant is grown in warm, tropical areas and cannot survive freezing temperatures. In the United States, most of the aloe is grown in the Rio Grande Valley of South Texas, Florida and Southern California. Internationally, aloe can be found in Mexico, the Pacific Rim countries, India, South America, Central America, the Caribbean, Australia and Africa.

COMPOSITION OF ALOE VERA

The aloe barbadensis plant consists of two different parts, each of which produce 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 a bitter yellow latex with powerful laxative-like actions. This exudate, which is not to be confused with the gel/mucilage from the parenchymal leaf tissue, is available commercially for systemic ingestion to produce catharsis.

The aloe vera is complex. The plant contains vitamins A, C and F. Vitamin B (thiamine), niacin, vitamin B2 (riboflavin), choline and folic acid along with traces of vitamin B12. Enzymes such as acid phosphatase, alkaline phosphatase, amylase, lactic dehydrogenase and lipase. When taken orally, these biochemical catalysts, amylase and lipase aid in digestion by breaking down fats and sugars. It consists of 75 different ingredients, including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid. Yamaguchi et al reported the presence of aluminum, sodium, potassium, calcium, magnesium, manganese, copper, zinc, chromium and iron in the aloe plant.

Polysaccharide Components

The major types of polysaccharides (described by Reynolds and Dweck) consisted of glucomannans of various compositions (Long chains of glucose and mannose units hooked together),

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some of which were acetylated. Polymers of galactose and galacturonic acid also have been found in the aloe vera gel.\textsuperscript{9} Different investigators have revealed different polysaccharide structures within the gel. Yaron’s 1991 studied regarding the gel’s viscosity and rheology, indicated that the glucomannans in aloe rarely were found in other plants and provided the plastic properties of the gel that are similar to the properties of human body fluids.\textsuperscript{10} One of the glucomannans in the gel is an acetylated mannan that is available commercially as a patented product, Acemannan Hydrogel (Carrasyn, Carrington Laboratories, Irving, TX; 800.444.2563).\textsuperscript{11}

**ROUTE OF ADMINISTRATION**

As an external application, it is currently available in market in the forms of gel, oil, face powder, face wash and toothpastes.

**PROPERTIES**

**Moisturizing Actions**

The moisturizing effect of aloe vera gel appears to be due to the mix of water and polysaccharide components, creating a Jelly-like consistency that holds the water within the mix and minimizes its evaporation, providing a sustained moist environment when applied to drying tissues and humectant properties that promote retention of moisture in tissues.\textsuperscript{12}

**Wound Healing Effects**

Countless studies have demonstrated the healing powers of aloe vera gel. A 1996 study reported that a high molecular weight polypeptide constituent from the gel demonstrated a healing effect on excisional wounds in rats.\textsuperscript{13} Yagi et al reported that aloe vera gel contains a glycoprotein with cell proliferating-promoting activity, while Davis et al noted that aloe vera gel improved wound healing by increasing blood supply, which increased oxygenation as a result.\textsuperscript{14,15}

In 1991, Thompson reported that topical application of the aloe vera-derived allantoin gel stimulated fibroblast activity and collagen proliferation.\textsuperscript{16} Angiogenesis is the growth of new blood capillaries and is a part of tissue regeneration. A 1993 study showed that topical application of aloe vera gel reestablished vascularity of burn tissue for a guinea pig, although no specific constituents were identified.\textsuperscript{17} The aloe vera gel polysaccharide acemannan was shown to activate macrophages, an effect that improved wound healing in a rat model.\textsuperscript{18,19} Two years later, Lee et al reported that the low molecular weight component of freeze-dried aloe vera gel stimulated blood vessel formation in a chick chorioallantoic membrane; in addition, a methanol-soluble fraction of the gel stimulated proliferation of artery endothelial cells in an *in vitro* assay and induced them to invade a collagen substrate.\textsuperscript{20}

**Antitumor Effect**

An induction of glutathione S-transferase and an inhibition of tumor promoting effect of phorbol myristate acetate has also been reported which suggests possible benefit of using aloe gel in cancer chemotherapy.\textsuperscript{21}

**Antibacterial/Antifungal/Antiviral Effects**

*Streptococcus pyogenes* and *Streptococcus faecalis* are two microorganisms that have been inhibited by aloe vera gel.\textsuperscript{22,23} Using a rat model, Heggers et al 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.\textsuperscript{24} Aloe vera gel reportedly was bactericidal against *Pseudomonas aeruginosa*, while acemannan prevented it from adhering to human lung epithelial cells in a monolayer culture.\textsuperscript{25,26} A processed aloe vera gel preparation reportedly inhibited the growth of *Candida albicans*.\textsuperscript{22}

**Uses of Aloe Vera in Dentistry**

Aloe vera has shown antimicrobial effect against resistant microorganisms found in pulp space. The antimicrobial activity of alcohol and chloroform extract could be due to the high solubility of active ingredients in these liquid extract media.\textsuperscript{27} The antimicrobial effect of a dentifrice containing aloe vera has been demonstrated in an *in vitro* study, in which this phytotherapeutic agent inhibited the growth of diverse oral microorganisms, such as *S. mutans*, *S. sanguis*, *A. viscosus*, and *C. albicans*.\textsuperscript{28}

One study available evaluating the clinical effects of aloe vera showed a significant reduction of gingivitis and plaque accumulation after use of a mouthrinse containing this natural product.\textsuperscript{29} A study carried out at University of Fortaleza, Ceará, Brazil. In 2007, concluded that the dentifrice containing aloe vera did not show any additional effect on plaque and gingivitis control compared with the fluoridated dentifrice.\textsuperscript{30} Few article on uses of aloe vera suggested various applications of it in dentistry:\textsuperscript{3,31}

1. Applications directly at sites of periodontal surgery.
2. Applications to the gum tissues that have been traumatized or injured by abrasion brushes, dental floss, toothpicks, etc.
3. Chemical burns caused by accidents with aspirin are quickly relieved.
4. Extraction sites respond comfortably and empty purses not develop when aloe vera is applied.
5. Acute lesions of the mouth are improved by direct application in viral lesions, aphthous ulcers and cracks in the corners of the lips. Abscesses in the gums are also reduced with the implementation of the plant.
6. Other oral chronic diseases respond kindly. Even gum problems associated with tong and burning mouth syndrome are much improved.
7. Patients with sore gums and teeth with dentures maladaptive may also benefit.
8. Aloe vera can also be used around dental implants to control inflammation caused by bacterial contamination. But no clinical studies are present to support these applications.
CONCLUSION

Though aloe vera is a promising herb with its various clinical applications in medicine and dentistry, more clinical research should be undertaken, so that it can establish in the field of medicine and dentistry.

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