



## EFFECT OF ALOE VERAGEL ANDAMINT TOOTH PASTE ON ANTICARIES IN EXPERIMENTAL ANIMAL MODEL

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### ABSTRACT

Disease that causes tooth decay, is known as dental caries it is infectious, and the mutans streptococci bacteria have long been identified as the primary disease-causing agents. Numerous tooth pastes and remedies are available to control the dental caries but permanent cure is still questionable. The side effects are one of most problematic issues with many modern drugs. Use of alternative therapies is common among patients with serious, chronic, or degenerative illness and to combat side effects with allopathic medicine. Herbal preparations can be derived from the root, leaves, seeds, and flowers. The preparations often contain a mixture of chemical substances may contain minerals and vitamins, and determining a specific active ingredient. Aloe vera and Minthas been used for many centuries for its curative and therapeutic properties, and although over 75 active ingredients from the inner gel have been identified. The study present study was conducted to evaluate the anti-caries activity of aloe vera minttooth paste against Streptococcus induced caries in rat teeth. The tooth paste was applied for 8 weeks and the prevention of dental caries was assessed by observing the maxilla and mandible molar teeth score. The % decrease in the caries score was found to be 59.4%, which was more than that of marketed fluoride rich tooth paste. From the result it was concluded that, aloe vera minttooth paste protected the caries induced by the dental pathogen inrats.

**Keywords :-** Aloe vera, Mint,Dental Caries and Streptococcus viridans.

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### INTRODUCTION

Dental caries is one of the most common oral health problems and its prevention is one of the most important strategies in preventive dentistry. It affects all people regardless of their sex, socioeconomic strata, race, and age. It is also profoundly affected by other factors like oral hygiene and saliva [1]. Dental caries is microbiological disease that results in dissolution of the mineral structure of teeth. Dental caries occurs due to demineralisation of enamel and dentine (the hard tissues of the teeth) by organic acids formed by bacteria in dental plaque through the anaerobic metabolism of sugars derived from the diet [2]. In most developing countries,

expenditure in oral health care is low, access to dental healthcare is limited and is generally restricted to emergency dental care or pain relief. Moreover, allopathic medicine is expensive thesechemicals can alteroralmicrobiota and have undesirable side-effects such as vomiting, diarrhea and tooth staining. Hence, the search for alternative products continues and natural extracts isolated from plants used as traditional medicines are considered asgoodalternatives. Aloe (Aloe vera) is an important and traditional medicinal plant belonging to the family Liliaceae. In India, it is scattered in the wild, along the coast of southern India. It is a powerful detoxifier, antiseptic and tonic for the nervous system.

It also has immune-boosting and anti-viral properties [3]. More than 75 active ingredients from inner gel (*Aloe vera* leaf pulp and exudates) have been identified including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid [4]. *Aloe vera* gel extract is a wellknown laxative and it reported to possess anti-inflammatory [5], antibacterial [6], antifungal [7], antiviral [8], immune-modulatory [9], antioxidant [10] and antitumor [11] activities.

*Aloe vera* is a handy home remedy that can be used as a moisturizing agent. *Aloe vera* has been used for various skin conditions, including radiodermatitis, [2] frostbite, psoriasis and genital herpes infection with good results. [7] Reported pharmacological actions of *Aloe vera* include anti-inflammatory, [5] antibacterial, antioxidant, [4] antiviral [5] and antifungal actions, [6] as well as producing hypoglycemic effects. [8].

Dental uses of *Aloe vera* are multiple. [3] It is extremely helpful in the treatment of gum diseases like gingivitis, periodontitis. [3] It reduces bleeding, inflammation and swelling of the gums. It is a powerful antiseptic in pockets where normal cleaning is difficult, and its antifungal properties help greatly in the problem of denture stomatitis, [1] aphthous ulcers, cracked and split corners of the mouth. [2] It is a powerful healing promoter and can be used following extractions. [3] It has been used in root canal treatment as a sedative dressing and file lubrication during biomechanical preparation. [9]

#### Various forms of *Aloe vera* used,

- As a toothpaste, mouthwash
- As gel for promoting healing in burns, stings, insect bites and many skin lesions.

Mint is commonly known for improving the dental health [6] and oral hygiene. Though Mint is associated with fresh breath, it also offers other benefits for the overall health of mouths such as healthy teeth and gums. Anti-inflammatory and anti-bacterial properties in Mint help in keeping the bacteria at bay and prevent dental issues. Refer to this article to find out the most health benefits of Mint for a healthy mouth.

Mint is a group of 15-20 plant species which include the most popular herbs such as spear Mint and pepper Mint. Very few know that Mint causes the cooling sensation similar to that of after brushing or using mouthwash. Menthol is a compound, found in the Mint plant triggers the cold reporters in soft tissues [16] which produce the cooling sensation.

The high levels of vitamins A, C, B6, folate, and riboflavin in Mint are all essential for overall health, as well as for maintaining periodontal health and fortifying bone mass. Calcium, iron, potassium, phosphorus, magnesium, and manganese are all essential minerals in

the formation and maintenance of bone density [1] in the teeth, jaw, and the rest of the skeletal system. These minerals work hand-in-hand with the vitamins to fortify enamel and ensure that your teeth and gums are strong and healthy.

Notably *aloe vera* has been used extensively in dental practice. *Aloe vera* has shown antimicrobial effect against resistant microorganisms found in pulp space [12]. 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 [13]. *Aloe vera* greatly reduces the instances of gingival bleeding due to its soothing & healing properties [14]. *Aloe vera* gel boosts body's ability to create collagen, which strengthens diseased and swollen gingiva [15]. Smoothing *aloe vera* gel onto the denture once or twice a day has antifungal benefits. It prevents denture stomatitis [16]. In alveolar osteitis, bandages soaked in *Aloe vera* gel, may enhance its healing property [17]. *Aloe vera* gel placed around dental implants is found effective to reduce inflammation [18].

## MATERIAL AND METHODS:

### Plant Collection & Authentication

*Aloe vera* and Mint was collected from the medicinal garden of Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry and Pondicherry Institute of Medical Sciences, Pondicherry and the plant was authenticated, Plant Anatomy Research Centre, Chennai. The voucher specimen was deposited in the herbarium for future reference.

### Extraction of gel from *Aloe vera* leaves and Mint powder

The fully expanded leaves of *Aloe vera* were selected from the plants, washed with distilled water and were subjected to surface sterilization with 70% Iso propyl alcohol. The Parenchymatous covering of the leaves were peeled and the gel drained out. Slurry was formed with the help of pestle and mortar, leaf gel was dried in the oven at 80°C for 48 h. and then powdered. Mint leaves were dried in the oven at 80°C for 2 h and then powdered. 10 grams of this *Aloe vera* extract and 1 gm of Mint extract powder was soaked in 100ml ethanol as solvent, for 24 h. The contents were then filtered through Whatman filter paper no. 1 and the filtrate was evaporated to dryness. This dried extract was further powdered and stored in refrigerator.

### Preparation of *aloe vera* gel and Mint Tooth Paste

Tooth paste base was prepared by mixing the ingredients, Calcium Carbonate 3.5 gm (Abrasive), Sodium Lauryl Sulphate 0.15 gm (Surfactant), Glycerin 3.0 gm (Anticrusting agent), Methyl cellulose 0.1 gm (Gelling agent), Sodium Saccharine 0.03 gm (Sweetener), Methyl

paraben 0.01 gm (Preservative), Propylparaben 0.002 gm (Preservative), Titanium dioxide 0.05 gm (Opacifier), Menthol 0.015 gm (Flavoring agent) and sufficient Purified water (Vehicle). 1.00 gm of *Aloe vera* gel and Mint extract was mixed in the base to give aloe vera gel and Mint tooth paste.

### Animals

Wistar albino rats of either sex weighing 150 -180 gms were used in the study. The animals were obtained from animal house of Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, India. On arrival the animals were placed at random and allocated to treatment groups in polypropylene cages with paddy husk as bedding. Animals were housed at a temperature of  $24 \pm 2^\circ\text{C}$  and relative humidity of 30–70 %. A 12:12 light:dark cycle was followed. All animals were allowed free access to water and fed with standard commercial pelleted rat chaw (Hindustan Lever Ltd, Mumbai). All the experimental procedures and protocols used in this study were reviewed by the Institutional Animal Ethics Committee (932/a/06/CPCSEA) and were in accordance with the guidelines of the IAEC.

### Anticaries Study

The animals were divided into 4 groups of 5

each. All the rats were inoculated orally with 200  $\mu\text{l}$  of freshly prepared glucose nutrient broth culture of *Streptococcus viridians* for the first five days of the experiment. The rats were fed with 56% sucrose in addition to the normal rat chaw pellet along with water *ad libitum*. Group I served as control, where the rats' molar teeth were brushed with water. Group II the molar teeth were brushed with the *Aloe vera* gel tooth paste, Group III the molar teeth were brushed with the *Aloe vera* gel and Mint tooth paste and the molar teeth of IV group rats were brushed with marketed fluoride rich tooth paste (Reference Control). The tooth paste application was performed twice daily in all the animals by using cotton swabs from 6<sup>th</sup> day to for a period of 8 weeks. The animals were sacrificed at the end of the experiment after which the jaws were dissected out and placed in 95% ethyl alcohol. The maxillary and mandibular molar teeth were then scored for dental caries as per the method of [19].

### STATISTICAL ANALYSIS

The values were expressed as mean  $\pm$  SEM. The statistical analysis was carried out by Chi square test. *P* values  $<0.05$  were considered significant.

**Table 1: The effect of Aloe vera and Mint tooth paste on Maxilla and Mandibular Molar Caries Score in Rats**

S.No	Groups	Mean Molar Caries Score		% Decrease in Caries Score
		Maxilla	Mandible	
1	Normal Control	14.82 $\pm$ 0.95	24.32 $\pm$ 1.12	-
2	<i>Aloe vera</i> Tooth Paste	22.67 $\pm$ 1.04**	36.42 $\pm$ 1.76**	50.97
3	<i>Aloe vera</i> and Mint Tooth Paste	26.83 $\pm$ 1.24**	42.84 $\pm$ 1.96**	59.4
4	Reference Control	18.22 $\pm$ 1.06*	35.51 $\pm$ 2.32**	37.41

Values are in mean  $\pm$  SEM, \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$  Vs Normal Control

The anticaries activity of *Aloe vera* and Mint tooth paste on Maxilla and Mandibular molar teeth was studied and the report was shown on table 1. The maxilla and mandible molar teeth exposed to water showed caries score of 14.82 $\pm$ 0.95 and 24.32 $\pm$ 1.12 respectively. The caries score of maxilla and mandibular molar teeth was 22.67 $\pm$ 1.04 and 36.42 $\pm$ 1.76 respectively in the animals applied with *Aloe vera* tooth paste [20]. The caries score of maxilla and mandibular molar teeth was 18.22 $\pm$ 1.06 and 35.51 $\pm$ 2.32 respectively in the animals applied with reference control. The % decrease in caries score with reference control was 37.41%. In *Aloe vera* and Mint tooth paste applied animals

there was significant ( $P < 0.01$ ) increase in caries score (Maxilla - 26.83 $\pm$ 1.24 and Mandible-42.84 $\pm$ 1.96) compared to normal control animals. The % decrease in the caries score was found to be 59.4%, which was more than that of marketed fluoride rich tooth paste

### CONCLUSION:

From the above study it was concluded that, *Aloe vera* and Mint exhibited anticaries activity in experimentally induced dental caries in rats. The anticaries activity of *Aloe vera* and Mint may be due to its antimicrobial activity and antioxidant property.

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