

Alum: Role in Dentistry as a Potent Anti-Plaque and Anti-Caries Agent

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Abstract: Alum is a cheaper chemical easily available near your home everywhere in the world. It is an ionic compound that is a salt and is a crystalline chemical that has a chemical formula $\text{Al} \cdot 2 \text{H}_2 \text{O}_4 \text{S} \cdot 12 \text{H}_2 \text{O} \cdot \text{K}$. Aluminum has a wide use in the field of dentistry. Its use ranged from its clinical efficacy to its pharmaceutical use in the preparation of dental materials and appliances. Pakistan is blessed with the best herbal remedies and alternative practitioners. In *Hikmat* system of medicine, widely practiced in Pakistan, the alum is used in making *manjans* (tooth powder), *surmeys* (eye preparations) and for treating leucorrhea. Alum has been used as an anticaries agent in *Hikmat*. Like wise, other Aluminum salts having Aluminum ion (Al^{3+}) have variety of uses in medical sciences. Aluminum oxide is used as acne face wash as abrasive.

Keywords: Alum, Cheaper, *Hikmat*, Anti-caries agent, Aluminum ion (Al^{3+}).

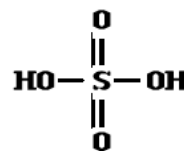
INTRODUCTION

Dental ailments are the major burden in developing countries due the treatments are costly and time consuming [1]. Dental plaque due to bacterial accumulation are the major cause of dental infections *i.e.* dental caries and gingivitis. The extent of gingivitis (mild, moderate or severe) is expressed as the gingival health is observed on every tooth or selected teeth and it is given a score. The final score that is gingival index, is the accumulative mean of them. Likewise, the intensity of dental plaque accumulation is expressed as the plaque intensity is observed on every tooth or selected teeth and the amount of plaque accumulated is given a score. The final score is the accumulative mean. Mostly plaque is measured on four sites of every tooth or selected tooth namely: labial, palatal/lingual, mesial and distal. The plaque index is the cumulative mean of all these surfaces [2]. Bacterial virulence was thought to control by alum and thus has a potent role in dentistry [3]. Thus, alum is the cheapest solution.

ALUM, AN IONIC COMPOUND

Alum is an ionic compound that is a salt and is a crystalline chemical that has a chemical formula $\text{Al} \cdot 2 \text{H}_2 \text{O}_4 \text{S} \cdot 12 \text{H}_2 \text{O} \cdot \text{K}$ (Figure 1). Its chemical abstract index name is Sulfuric acid, aluminum potassium salt (2:1:1), dodecahydrate (8CI, 9CI). While its other names are Aluminum potassium disulfatedode-

cahydrate; Aluminum potassium sulfate ($\text{Al}(\text{SO}_4)_2$), dodecahydrate; Aluminum potassium sulfate dodecahydrate; Potassium alum dodecahydrate; Potassium aluminum disulfatedodecahydrate; Potassium aluminum sulfate dodecahydrate; and, Potassium aluminum sulfate dodecahydrate ($\text{KAl}(\text{SO}_4)_2 \cdot 12 \text{H}_2 \text{O}$) [4]. Alum is a cheaper chemical easily available near your home everywhere in the world.



• $\frac{1}{2} \text{ Al}$

• $\frac{1}{2} \text{ K}$

• $6 \text{ H}_2 \text{O}$

Figure 1: The structural formula of Alum.

USE OF ALUM AGAINST DENTAL DISEASES

Aluminum has a wide use in the field of dentistry. Its use ranged from its clinical efficacy [3] to its

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pharmaceutical use in the preparation of dental materials and appliances [5]. Alum have been studied in dentistry as an anti-caries agent. Mechanism of dental caries treatment of Alum may be somewhat similar to the mechanism of dental caries treatment of Fluorides [6, 7]. In clinical use of aluminum rinse it was seen that alum was found to have anti caries effects [6]. In an animal study on rats alum showed anti caries effects. Rats dentine infected with *S. sobrinus* were applied with aluminum preparation $Al_2(SO_4)_3$ and it was found to decrease the caries fissures both smooth surface and sulcus caries [8].

ALUMINUM SALTS

Other Aluminum salts having Aluminum ion (Al^{3+}) have variety of uses in medical sciences. Aluminum oxide is used as acne face wash as abrasive, Aluminum chloride is used as anti-perspirant, Aluminum hydroxide is used as antacid; while; Aluminum acetate is used as anti-infective for ear diseases [9]. Alumina powder is used as strongest adsorbent, after charcoal, in column chromatography [10].

IGNITED OR BURNT ALUM USE IN HIKMAT SYSTEM OF MEDICINE

In *Hikmat* system of medicine, widely practiced in Pakistan, it is first kept in a pan and is melted on high flame. When it melted completely, then it is kept at room temperature to get the form of white amorphous mass called burnt alum. In this form the alum is used in making *manjans* (tooth powder), *surmeys* (eye preparations) and for treating leucorrhoea. Alum has been used as anticaries agent in *Hikmat* and there are some studies showing its anti caries effects [11].

ALUMINUM PERIODONTAL PROBES

Probe is a medical instrument that is used to check the depth of any sulcus or cavity within the human body. It should be sterilized before use. Dental probes are used to assess the intensity of plaque accumulation etc. Periodontal probes are used to measure the gingival sulcus and to check the bleeding on probing etc. The most common periodontal probe is the Michigan probe. Due to fungal and bacterial contents and bacterial by-products (toxins, acids) there may micro ulceration in the gingival sulcus. When the probe is touched to the gingival sulcus it may start bleeding in such cases. This is called bleeding on probing in

medical terminology. In measuring gingival index and to check whether there is bleeding on probing or not the periodontal probe is walked or touched in the gingival sulcus till the base of the gingival pocket/sulcus. In probing the working end of probe should be kept parallel to the surface of the tooth. The normal depth of the gingival sulcus ranges from 0.5mm to 2 mm [2]. Nevertheless, alum is used as an active surgical dressing [12] and is thus beneficial in periodontal diseases.

CONCLUSION

Idea is to develop a sustained release preparation of alum to be released in the dental caries. For the treatment of dental caries the drug should be released in the dentine for longer duration. Conventional dosage forms like mouthwashes and toothpastes, although efficacious, could not release the drug for longer durations. A kind of slow releasing patches that releases the drug in only the surface (tooth) that is in direct contact with it is the object of this study. There are to date these oral preparations are widely used: toothpastes, mouthwashes, oral rinses and tooth powder. Our idea is to invent a cheaper sustained released oral preparation. In addition, the alum could be tested as an anti biotic and anti cancer agent.

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