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## BENEFITS OF ANTIOXIDANTS ON ORAL HEALTH

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### ABSTRACT

Antioxidants have been successfully used in dentistry because of their positive benefits on human health. It has the most well-known effect of neutralising the damaging effects of free radicals. It is being used more frequently in dentistry, as they are in every other medical sector. It can help in treating oral diseases such as dental caries, dentinal hypersensitivity, pulp capping, periodontal disorders, bone repairing, bone formation or maturation, peri implantitis, oral cancers and precancer. This article will highlight the clinical significance and use of antioxidants therapy in dentistry.

**Keywords:** Antioxidants, Free radicals, Reactive Oxygen Species, Dentistry

### INTRODUCTION

Antioxidants are compounds that prevent the destructive capability of free radical by their scavenging ability [1]. Free radical like Reactive oxygen species (ROS) cause

biological cell damage. They can be created by UV light irradiation, X rays, and gamma rays produced during metal catalysed reactions and are present in the atmosphere

as pollutants [2]. These free radicals destruct chain reactions that produce cell damage or cell death, which will lead to carcinogenesis. Antioxidants inhibit the electron transfer reaction by giving these radicals their electrons [3]. Antioxidants can prevent free radicals from damaging

human cells by deactivating them. Antioxidant systems in humans are extremely complex, and they protect human from free radical damage. It might be endogenous or exogenous, as in foods or dietary supplements [4].

### Classifications [5]

ANTIOXIDANTS		
Enzymatic	Non-enzymatic	
	Nutrient	Non-Nutrient
<ul style="list-style-type: none"> <li>• Superoxide dismutase</li> <li>• Glutathione Peroxidase               <ul style="list-style-type: none"> <li>• Selenium</li> <li>• Catalase</li> </ul> </li> <li>• Glutathione reductase</li> <li>• Glutathione transferase</li> </ul>	<ul style="list-style-type: none"> <li>• Alpha tocopherol</li> <li>• <math>\beta</math>-Carotene Ascorbate               <ul style="list-style-type: none"> <li>• Glutathione</li> <li>• Selenium</li> </ul> </li> <li>• Proanthocyanidins               <ul style="list-style-type: none"> <li>• Lycopene</li> <li>• Green tea</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Ceruloplasmin</li> <li>• Transferrin               <ul style="list-style-type: none"> <li>• uric acid</li> </ul> </li> <li>• Peptides Camosine Anserine</li> </ul>

Some polyphenolic natural antioxidants from plant sources are:

Flavonoids, chlorogenic acid, folate, Vitamin E, Catechins, Salicylic acids derivatives, Gallic acid derivative, Caffeine, resveratrol, anthocyanins, curcumin, and tannins.

Non-phenolic secondary metabolites have excellent antioxidants activity which includes retinal, Jasmonic acid, Asco pyrones melatonin, carotenoids, thiols, eicosatetraenoic acid [6].

### Application of Antioxidants in Dentistry

#### 1. Dental Caries

Dental caries has become a very common oral health issue. Dental hygiene and saliva, have a significant impact. Recently it has been reported that salivary levels imbalances of free radicals, reactive oxygen species, and antioxidants have a role in the

genesis and development of dental caries. Oral microorganisms that cause dental caries are controlled by salivary peroxidase. It catalyses the peroxidation of the thiocyanate ion to produce oxidation products, which hinder the growth and metabolism of numerous microorganisms, hence preventing or reducing caries progression [7, 8].

#### 2. Bonding and remineralization

Antioxidants improve the composite resin binding by reducing the harmful effects of free radicals after dental bleaching. It reverses the negative effects of bleaching chemicals and increase the binding strength. Studies reported the antioxidants successfully improved the bonding strengths of bleached enamel including Proanthocyanidin, sodium ascorbate, alpha

tocopherol, grape and guava seed extract [9-12].

An antioxidant flavonoid Hesperidin contain in Citrus fruits. According to a study, hesperidin enhances remineralization by maintaining the collagen structure [13]. Studies reported remineralization increase in the grape seed extract [14]. Before remineralization treatment, white tea and grape seed extract can be utilized as a pretreatment regimen [15].

### **3. Dentinal hypersensitivity and pulp capping**

Exposed dentin causes dentinal hypersensitivity in response to temperature, evaporative, sensory, osmotic, or chemical stimulation. In multiple studies, propolis has been found to occlude dentinal tubules and diminish dentinal hypersensitivity in periodontally affected teeth. According to Madhawan et al propolis' anti-inflammatory properties increase production of reparative dentin, dentin permeability also lowers down the dentinal hypersensitivity rapidly [16-19].

Propolis also contains zinc and iron, both help to make collagen, as well as flavonoids, which help to control immune system response. Propolis flavonoids have been found in studies to accelerate reparative dentin and postpone the beginning of pulp inflammation when used as a direct pulp capping agent [20-24].

### **4. Infection of the periodontium and peri implant disease.**

Periodontal disease is caused by bacterial infection and the inflammatory response of the host. ROS and free radicals trigger the inflammatory response. Vitamin A and C deficiency, as well as carotene and crytoxanthin deficiency, can induce gingival disease. Antioxidants help periodontal tissue resist oxidative stress and preserve homeostasis. Micronutrients like vitamins A, C, E and beta carotene are lowered during inflammation. These vitamins support the structural and functional integrity of epithelial tissues, as well as physiological and metabolic processes important to periodontal health.

According to Ohnishi *et al*, the development of oxidative stress, is a main systemic condition that caused alveolar bone loss. Peri-implantitis is caused by gram-negative, anaerobic bacteria that colonise the subgingival space. Studies have reported that grape seed extract is effective in treating peri-implantitis. Caffeic acid phenethyl ester, which may be found in propolis, has been shown to promote bone repair and formation in rat models [25-28].

### **5. Bone development and maturation.**

Pine bark extract solution, rather than ascorbic acid solution, was discovered in a recent study to be effective in orthodontics. Several studies have been undertaken on

maxillary growth to explore the effect of antioxidant on bone development and maturation.

According to Uysal *et al*, the effect of Vitamin C and resveratrol in the enlarged premaxillary suture had a significant influence on bone growth. Another study reported that using systemic propolis increases bone growth in the extended suture area [29-31]. According to studies, mangosteen peel extract has been used as antioxidant after bleaching proved successful in reversing the decreased strength of shear bond in orthodontic brackets [32].

## 6. Oral Precancer and Cancer

Antioxidants have shown to be both preventive and therapeutic in many phases of oral carcinogenesis. Many studies reported that antioxidants reduce the characteristics of oral cancer. Proanthocyanidins inhibit cell growth and proliferation in oral carcinomas. Vitamin A, beta carotene, C, E, B12, and folate shows higher evidence of cancer prevention and control.

Low intakes of vitamin E, carotenoids, or both have been associated with a high risk of cancer in epidemiological studies. In a variety of animal model systems and laboratory, beta carotene and other antioxidants have been proven to prevent oral cavity carcinogenesis. Many studies have shown that taking vitamin A, serum

lycopene, and beta carotene supplements can help to reduce or eliminate Leukoplakia [33-36].

Oral Sub-Mucous Fibrosis (OSMF) premalignant oral lesions for which Antioxidants, particularly lycopene, have been suggested and have the advantage of being nontoxic and easily supplied in the diet. Studies have reported that taking Vitamin A helps in relieving symptoms like burning sensation but it is not effective on trismus. Several micronutrients, including retinol, vitamin E, vitamin B complex, vitamin D, and minerals, improved clinical results in the therapy of OSMF, according to Maher *et al* [37, 38].

Although the specific cause of lichen planus is unknown, the pathophysiology of the disease has been related to free radicals and oxidative stress. The study has reported decreased levels of lycopene in patients with atrophic and erosive Oral Lichen Planus (OLP). Lycopene was found to be beneficial in lichen planus treatment. In addition, different retinoids with pro-vitamin A activity have been utilized to treat OLP [39-43].

## CONCLUSION

Antioxidants play a very important role in oral and general health. It protects the cell damage or apoptosis caused by free radicals. However, there are very less studies conducted to prove the importance of antioxidants in improving oral as well

as general health. Therefore, further studies need to be conducted for knowing the importance of anti-oxidants and their application in oral diseases since they can change the modality of treatment to many diseases.

**Ethical Clearance-** Not applicable

**Source of funding-** Nil

**Conflict of Interest-** Nil

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