

Natural Antioxidants in Dentistry – Review Article

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Abstract Antioxidants are being widely used in routine general clinical practice. Here the uses of natural antioxidants in the dentistry are noted, where the properties of most of the antioxidant have been noted to implicate the actions in dentistry. There are some debates about research methods, protocols on proper doses, the increasing evidences are raising hopes about antioxidants for human health and to make it a boon in dentistry.

Keywords: antioxidants, natural antioxidants in dentistry, free radicals

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1. Introduction

Antioxidants are being widely used in routine general clinical practice. An increased interest in the role of free radical oxidative damage in human diseases along with an upsurge in research implies its potential in dental practice too. [1] Consumption of antioxidant supplements in developed countries has become widespread with about one third of adults being 'addicted' to them [2] However; dental research field has not focussed in the safety and efficacy of the antioxidants.

2. Naturally Available Anti-oxidants

Anti-oxidants are naturally available in green tea, spinach, citrus fruits, legumes, green vegetables, turmeric, clove, blue green microalgae, papaya, mango, cocoa, tomato, cranberry.

2.1. Retinoids

Retinoids are the natural and synthetic derivatives of vitamin A. The retinoids in the body originate from retinyl esters, carotenoids, and retinal in diets. The effects of retinoids are mediated by Scavenging effect (traps peroxyl free radicals in tissue at low partial pressure of oxygen) [3].

2.2. L-Ascorbic Acid (Vitamin C) [6]

L-ascorbic acid (L-AA), the so-called vitamin C has antioxidant properties and reacts with superoxide produced as a result of the cells normal metabolic processes; this inactivation of superoxide inhibits the formation of nitrosamines during protein digestion and helps avoid damage to DNA and cellular proteins. LAA apart from being antioxidant also has following actions enhances chemo taxis, phagocytosis, collagen synthesis,

blocks formation of fecal mutagens, Reduces oncogene expression.

2.3. Tocopherol (Vitamin E)

Tocopherol is the commonest and most active form of vitamin E. Tocopherol is an effective antioxidant at high levels of oxygen, protecting cellular membranes from lipidic peroxidation, free radical scavenging, maintenance of membrane integrity and immune function.

2.4. Lycopene

The prominent carotenoid in serum is the antioxidant red pigment called lycopene which is fat soluble. Lycopene has been hypothesized to prevent carcinogenesis especially in upper digestive tract neoplasm and atherogenesis by protecting critical cellular biomolecules, including lipids, lipoproteins, proteins, and DNA. Lycopene has the unique feature of getting bound to chemical species that react to oxygen, thus being the most efficient biological antioxidantizing agent [4].

2.5. Catechins / Polyphenols

The tea leaves contain retinoid acid receptors (RARs) and retinoid X receptors (RXRs). Three subtypes, designated as and both RARs and RXRs, have been described. Recently, retinoids have been implicated in the induction of cell death in many tumor-derived culture cell systems in both retinoid receptor-dependent and independent manners. A mixture of green tea polyphenols (GTPP) induced TNF- gene expression and TNF- α release from cells [5].

3. Source of Free Radicals

Antioxidants neutralise free radicals by donating one of their electrons, ending the electron stealing reaction. The

antioxidant nutrient, however, does not become a free radical by donating electrons because they are stable in either form. There are two important sources of free radical formation. One of the internal factors i.e. normal cellular

metabolism like mitochondrial ETC, endoplasmic reticulum oxidation and many enzymatic activities. [7] Other external factors like radiation, oxidation of engine exhaust, carbon tetrachloride, cigarette smoke and oxygen itself [8].

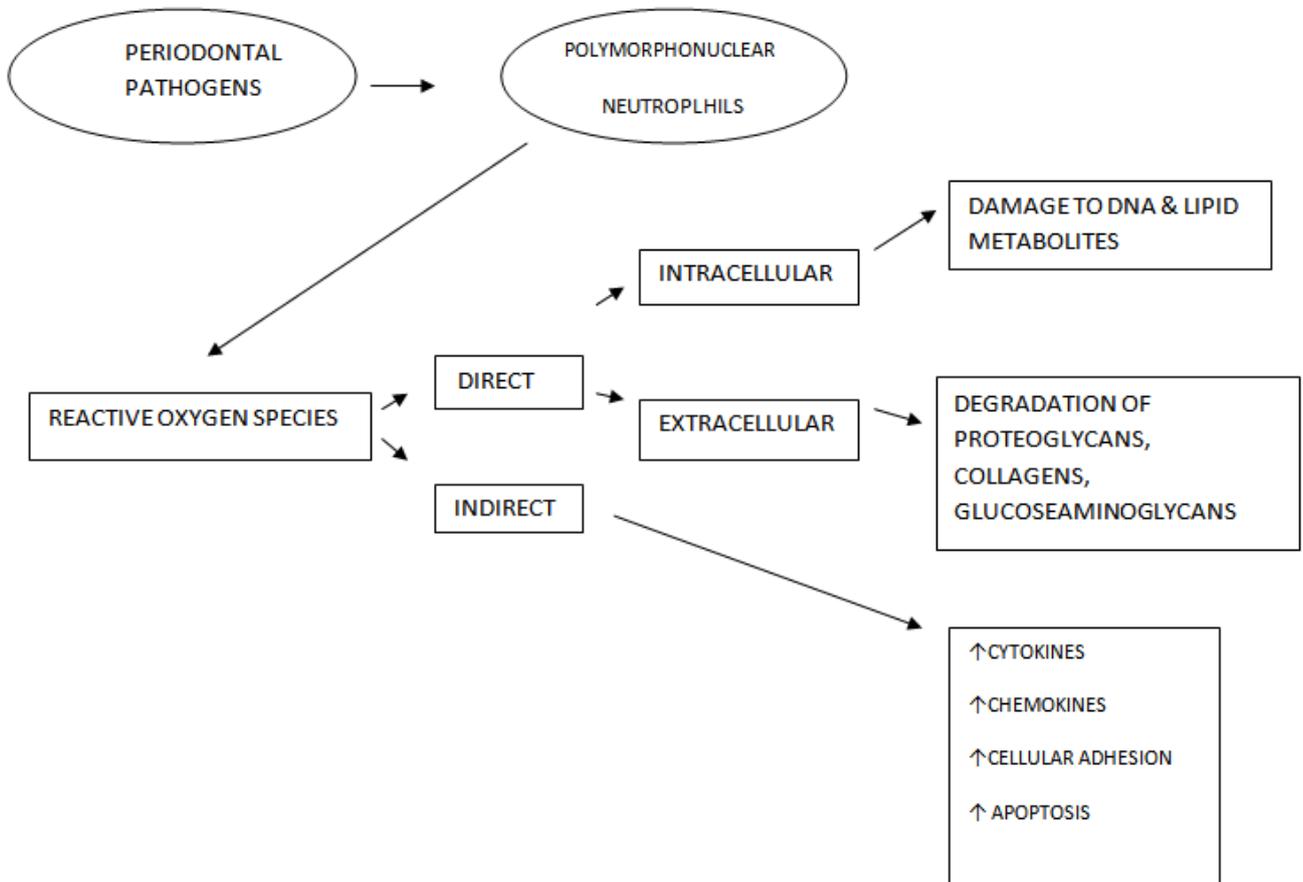


Figure 1. Mechanism of action

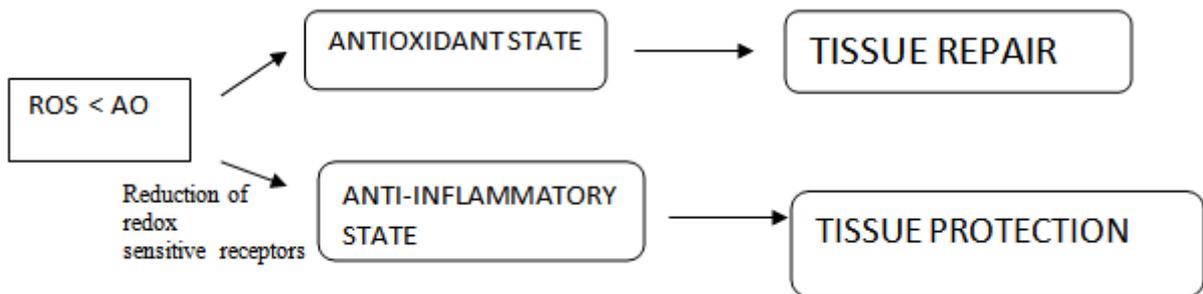


Figure 2. effect of more antioxidants

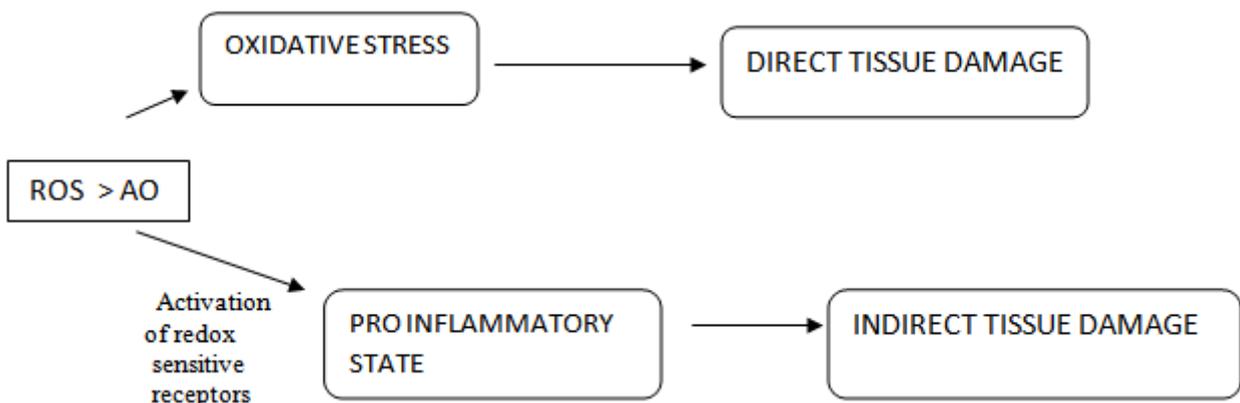


Figure 3. effect of lesser antioxidants

4. Implications In Dentistr

4.1. Periodontology

Antioxidants change the progress of oral problems such as periodontitis, gingivitis by compromising antioxidant capacity of crevicular fluid and plasma. One of the conditioning factors for gingivitis is ascorbic acid deficiency. Plant oils and green, leafy vegetables can break free radical chain reactions thus may contribute in reducing periodontal inflammation. Flavanoids possess anti-inflammatory properties that reduce inflammatory molecule expressions in monocytes within the gingival connective tissues. [1] The cranberry fraction could prevent biofilm formation by Phorphyromonas gingivalis that is a major pathogen of chronic periodontitis [9].

4.2. Conservative Dentistry

It was reported that green teas have scavenging effect on dental caries prevention. Cranberries were capable of having antibacterial activity against Streptococcus mutans and stopping dental caries [10]. In the restorative treatment of caries, to increase bond strength of composites, grape seed or pine bark extract solutions can be used, especially to raise decreased bond strength values for restorative treatments after bleaching [11].

4.3. Orthodontics

In bracket bonding, to increase bond strength values ascorbic acid solutions that were hard to prepare were used For maxillary expansion, there are several studies researching the effect of antioxidant agents on bone formation or maturation. the effect of antioxidants on bone formation was statistically significant by using vitamin C, propolis [12].

4.4. Oral Surgery

Treating peri-implantitis involves antioxidant supplementation that grape seed extract has positive effect on treating peri-implantitis [13]. For bone healing and bone formation, propolis have significantly improved bone healing.

4.5. Oral Medicine

Antioxidants show preventive and therapeutic potential in many stages of oral carcinogenesis. There is inhibition of oral cancer phenotypes after antioxidant intakes. Antioxidants have an ability to reduce cell growth and proliferation of oral carcinomas and effective in treating oral submucosal fibrosis. Dietary antioxidants can protect the lipids and other membrane molecules against oxidative damage by intercepting oxidants before they try to destroy the tissues. [14] Antioxidants such as Vitamin C and Vitamin E may be utilized in oral Lichen planus patients to counteract free radical mediated cell [15].

5. Discussion

Thus, antioxidants plays a role in majority fields of dentistry, but there exists a confusion in using it in a full fledged manner, since

1) The clearcut dosage level and safety level of antioxidants uses have not been clearly stated.

2) Overdoses or high doses of Vitamin E and Vitamin A causes lethal effects [16].

3) Drug interactions to other group of drugs are not clearly known.

Simply if any drug enhances free radical activity, the usage of antioxidants will neutralise this effect. There are lack of protocols for quality control and quality parameters in standardizing antioxidants with respect to potency and safety doses for its usage in patients.

6. Conclusion

In conclusion, the properties of most of the antioxidant have been studied to understand their mechanisms and to clarify their activities. Future researches should continue with the aim of investigating the antioxidants biocompatibility, pharmacokinetics, pharmacodynamics and understanding their pathways on human health.

Some antioxidants have more anti-inflammatory activity whereas some have more anti-tumor properties. So, some researchers have suggested using combined antioxidant supplements thus the supplements will provide higher protection against free radicals Although there are some debates about research methods, protocols on proper doses, the increasing evidences are raising hopes about antioxidants for human health and to make it a boon in dentistry.

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