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Fatty Acids and Oral Health: A Review.

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ABSTRACT

Good oral hygiene is important and crucial to maintain good oral health; scientific research uncovers the importance of dietary choices. Among various dietary sources fatty acids in daily intake also provide various benefits that decreases the intensity of inflamed conditions and can be used as adjuvants to routine treatments. This review article explains the importance various fatty acids and its role in improving oral health.
Keywords: Fatty acids,coconut oil,omega 3,oral health

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INTRODUCTION

Saliva, a complex and vast biological fluid plays major role in maintenance of oral health. Various factors' effect the salivary flow, consistency, pH and composition of saliva which conversely affects the oral health. Organic and inorganic constituents of saliva serve as biomarker's in various systemic conditions [1,2,3].

Lipids in saliva were first described by Doubleday in 1909. The total reported salivary lipid concentration have ranged from 0.9 to 8 mg/100 ml in submandibular salivaand from 0.24 to 7.6 mg/100 ml in parotid saliva [4]. Lipids in saliva are dominantly or major salivary glands. Various studies conducted in rats of different age groups showed association between caries and fatty acid levels[5].

Phospholipids, triglycerides and cholesterol ester's are building blocks of fatty acids. They are acidic, monocarboxylic linear chains of varying length further classified as saturated, polyunsaturated and monounsaturated fatty acids. Their prime involvement is in various energetic, structural and metabolic activities. Basically their functions are primarily dependent on chain length[6]. They mediate various intracellular signalling pathways, genetic modulations and expressions, structure and function of cellular membranes [7].

Fatty acids are grouped into saturated and unsaturated fatty acids based on presence and absence of bonds. Saturated fatty acids have no double bonds, whereas unsaturated fatty acids can be further divided based on number of double bonds they share, into monounsaturated and polyunsaturated fatty acids(PUFA'S).

Polyunsaturated fatty acids are further classified based on number of carbons between the methyl end of the molecule and the nearest double bond i.e, omega classification.Four major families of omega that exist in animals are omega 3,6,7,9.Among these omega 6 and omega 3 are essential fatty acids, that cannot be generated in human body thus needs to be accessed only through diet [8].Butyric acid, Caproic acid, Caprylic acid, Capric acid, Laurie acid, Myristic acid, Palmiticacid,Stearicacid,Palmitoleic aid, Oleic acid, Gadoleic acid, Erucic acid, Linoleic acid and Linolenic acid are various components of fatty acids[9] .

Fatty acids have shown to reduce oral microbial count especially S.Mutans, decrease diffusion of acids, decrease plaque accumulation in various studies [5], thus the aim of this article is to present an overview on effect of fatty acids on oral health.

EFFECT OF DIETARY FATTY ACID INTAKE ON ORAL HEALTH:

Saturated fatty acid intake should always be <11 % of our total energy intake, increase intake of saturated fatty acids have shown to be harmful and associated with high rate of heart diseases[10].

Table 1: main source of saturated, monounsaturated, polyunsaturated and trans saturated fats in diet [11,12].

SATURATED FAT	TRANS SATURATED FAT	POLYUNSATURATED FAT	MONOUNSATURATED FAT
Butter,ghee,lard Fatty meat-beef,lamb,corned sausages Dairy products- Fat milk,cream,cheese, yoghurt,cake,pastry products.	Baked products, pastry, Convenience food, take way ready meals.	Oil: coconut oil Sunflower oil Sesame oil Soybeans Flax seed Fish	Olive oil Peanut oil Almonds Peanuts Avocados

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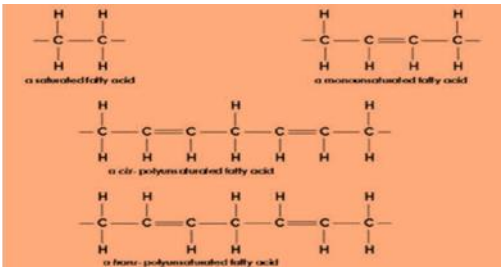
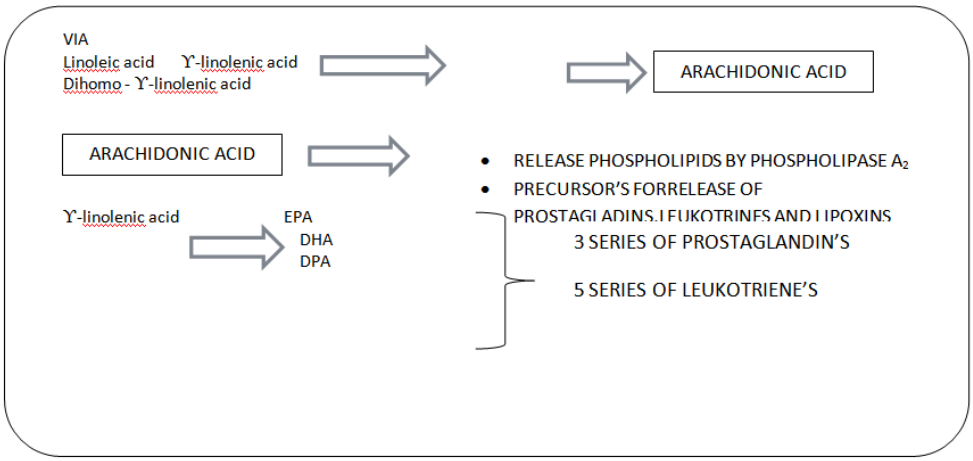


PICTURE SOURCE: British Nutrition Foundation 'Fats [13]

Monounsaturated fatty acids are said to increase HDL levels thus, decreasing LDL levels, providing protection against any risk factors. One of the major source of monounsaturated fatty acids is olive oil which provides protection to blood lipids against oxidative damage.

The polyphenol content in olive oil is also said to decrease incidence of cancer due to its efficiency to reduce free radical levels [14,15].

Polyunsaturated fatty acids are essential fatty acids, which cannot be synthesised in body thereby are flourished with dietary intake. Various forms of Omega 3 are alpha docosahexaenoicacid (DHA), eicosapentaenoicacid(EPA) and alpha linoleic acid (ALA). Amongst the various families of PUFA's omega 2 and omega 3 are unique and distinct. Precursors for these are linoleic and alpha linoleic acids which are obtained from dietfurther converted to form arachidonic acid.



Thus, it is showed in various studies that high intake of omega 6 is directly proportional to increase in leukotriene's, thromboxane A_2, Tumour necrotic factor and C-reactive protein also can be balanced by increased intake of omega 3 such ALA,EPA,DHA rich diet[16].

Coconut oil is one among the easily available edible oils, highly composed of saturated fatty acids (92%) and medium chain fatty acids (MCFA's). It is made up of Lauric acid, myristicacid, capricacid, Caprylicacid, Palmitic acid, Oleic acid, stearic acid and linoleic acid. Medium chain fatty acids are directly transported to liver and metabolised, thus do not participate in formation of cholesterol. Thereby, proving coconut oil doesn't contribute to bad cholesterol. Coconut oil has anti-viral,anti-fungal,anti-thrombotic ,cardioprotective, anti-diabetic,hypolipidemic ,anti-caries,anti-diabeticproperties.Various studies conducted show that coconut oil improves periodontal health and decreases onset of caries. In India where coconut production is in abundance coconut oil can be used has an adjuvant over chemical mouth washes [17,18,19].Table 2 describes the fatty acid content of coconut oil.

Table 2: Fatty acid profile (% of total fatty acid) of coconut oil

Fatty acid	Coconut oil (%)
C6 , Caproic Acid	0.4
C8 , Caprylic Acid	7.3
C 10, Capric Acid	6.5
C 12, Lauric Acid	49.2
C 14, Myristic Acid	18.9
C16, Palmitic Acid	8.9
C 18, Stearic Acid	3.0
C18:1, Oleic Acid	7.5
C18: 2 ,Linoleic Acid	1.8
C18: 3, Linolenic Acid	0.1

Various studies are conducted based on potential of coconut oil to reduce oral bacterial count thus, improve oral health, thereby decreasing onset of caries and periodontal problems. Among various microorganisms in the oral micro biota Streptococcus Mutans are considered most pathogenic bacteria responsible for dental caries. Study conducted by Kaushik M et al comparethe efficiency of chlorhexidine and coconut oil pulling in reducing oral microbial count, both groups showed significant reduction of bacterial count. Thus, proving coconut oil can be used as preventive therapy at home[20].

Monolaurin and other medium chain mono-glycerides alters' bacteria cell wall, disruption of cell membrane, inhibits enzymes production and nutrient transfer all of which leads to death of bacteria[21].Saponification process occurs due to hydrolysis of fat and thus helps in improving the viscosity of oil resulting in decreased bacterial adhesion and aggregation[22].Coconut oil has shown significant antimicrobial activity against Escherichia vulneris, Enterobcater spp., Helicobacter pylori, Staphylococcus aureus, Candida spp., including C. albicans, C. glabrata, C. tropicalis, C. parapsilosis, C. stellatoidea and C. Krusei[23].Study conducted by Naqvi et al showed decreased occurrence of periodontitis with high intake of dietary omega 3 (DHA).Omega 3 and omega 6 as mentioned earlier has anti-inflammatory effect thus helps in decreasing further infection, thereby decreasing probing depth and improving periodontal health. Improving periodontal health helps less exposure of root and tooth surface thereby decreases onset of root caries [24].

Thus, in addition to treatments that are performed, preventive and adjuvant dietary therapy with usage of omega 3 along may help in decreasing the chronic inflammatory situation.

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