



REVIEW ARTICLE

DARK CHOCOLATE – MYTHS AND FACTS IN ORAL CANCER

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ABSTRACT

Dark chocolate is made from the seed of the cocoa tree which is loaded with nutrients that can positively affect your health and lower the risk of heart disease. Dark chocolate is one of the best sources of antioxidants on the planet which contains 12.5 % flavonoids quite higher than green tea & red wine. Flavonoids include a huge group of naturally occurring organic compounds containing antiallergic, anticancer and anti-inflammatory properties. Many studies have shown that there is a strong association between flavonoid intake and the long-term effects on mortality. It is widely used in dentistry and it has many clinical effects. This article summarizes the effects of flavonoids to humankind and its clinical applications in dentistry.

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INTRODUCTION

Oral cancer, a type of head and neck cancer may arise as a primary lesion originating in any of the tissues in the mouth, by metastasis from a distant site of origin, or by extension from a neighboring anatomic structure, such as the nasal cavity. There are several types of oral cancers, but around 90% are squamous cell carcinomas, originating in the tissues that line the mouth and lips. Oral cancer most commonly involves the tongue (Middleton, 1998). It may also occur on the floor of the mouth, cheek lining, gingiva (gums), lips, or palate (roof of the mouth). In 2013 oral cancer resulted in 135,000 deaths up from 84,000 deaths in 1990. Five-year survival rates in the United States are 63%. Flavonoids are a group of natural substances with variable phenolic structures. They are found primarily in fruit, grains, bark, vegetables, roots, flowers, tea, wine, and stems. On the basis of the number of experimental animal studies, numerous health-promoting properties are being attributed to flavonoids. The major effects include antioxidant, anti-inflammatory, antiviral antiallergic, and anticancer (Middleton and Kandaswami, 1994). Above 4000 varieties of flavonoids have been recognized. Some flavonoids also possess Vitamin C sparing activity (Formica and Regelson, 1995).

Classification

Flavonoids can be divided into various classes on the basis of their molecular structure.

- Catechins
- Anthocyanins
- Flavanones
- Flavones

One of the best-described flavonoids, quercetin, is a member of this group. The flavones and catechins seem to be the most powerful flavonoids for protecting the body against reactive oxygen species.

Myths and facts

Myth: Chocolate is loaded with saturated fat and is bad for your cholesterol (Middleton, 1998)

Fact: Stearic acid, the main saturated fat found in dark chocolate, is unique. Research has shown that it doesn't raise cholesterol levels the same way that other types of saturated fats do. In fact, eating a 1.4 ounces of chocolate bar instead shown to increase HDL (good) cholesterol levels.

Myth: Chocolate lacks any nutritional value (Middleton, 1998)

Fact: Chocolate is a good source of magnesium, copper, iron

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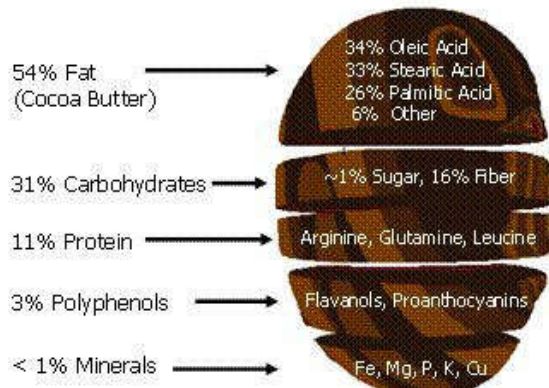
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and zinc. It also contains polyphenols that have been associated with a decreased risk of coronary disease. An average chocolate bar contains about the same amount of antioxidants as a 5-ounce glass of red wine.

Myth: Chocolate causes cavities (Middleton, 1998)

Fact: Flavonoids in dark chocolate prevents cavities because of its lesser sugar content. A study from Osaka University in Japan showed that parts of the cocoa bean actually prevent tooth decay and harmful mouth bacteria.

What's in the cocoa bean?



Mechanism of action

Flavonoids are identified as foreign substance by the body and in response produces certain enzymes that fights against mutagens and carcinogen. Researchers from the Lombardi Comprehensive Cancer Center at Georgetown University found that natural pentamer compounds in cocoa deactivate certain proteins resulting in apoptosis of cancer cells. (Molecular Cancer Therapeutics, April 18, 2005). In a study done by Maricela Haghiac and Thomas Walle have shown that Quercetin Induces Necrosis and Apoptosis in oral squamous cell carcinoma. Quercetin originally induces a stress response, which results in necrosis of the oral epithelial cells. Prolonged exposure to quercetin to the epithelial cells will cause apoptosis of the remaining cells. The flavones and catechins seem to be the most powerful flavonoids for protecting the body against reactive oxygen species (Middleton and Kandaswami, 1994).

Other actions: Antiatherosclerotic effects—Oxygen radicals can oxidize LDL, which injures the endothelial wall and thereby promotes atherosclerotic changes. A few clinical studies have pointed out that flavonoid intakes protect against coronary heart disease. Hertog et al stated that the flavonoids in regularly consumed foods might reduce the risk of death from coronary heart disease in elderly men. A Japanese study reported an inverse correlation between flavonoid intake and total plasma cholesterol concentrations.

Antiinflammatory effects— Flavonoids inhibit eicosanoid biosynthesis & Quercetin, in particular, inhibits both cyclooxygenase and lipoxygenase activities, thus diminishing the formation of these inflammatory metabolites.

Antitumor effects— damage from reactive oxygen species is proposed to be involved in carcinogenesis. Furthermore, it has been speculated that flavonoids can inhibit angiogenesis. 2009 review ponders that the high concentration of catechins and

procyanidins, bioactive compounds in chocolate products, might mean it could fight against cancer and other conditions

Stimulation of immune system

They bound and seal viruses stimulating white blood cells and lymphocytes and produces interferon therefore stimulating immune system.

May improve blood flow and lower blood pressure—stimulate the endothelium, the lining of arteries, to produce Nitric Oxide (NO), which is a gas. One of the functions of NO is to send signals to the arteries to relax, which lowers resistance to blood flow and therefore reduces blood pressure.

It may prevent diabetes—It sounds mad, but cocoa has been shown to improve insulin sensitivity. So dark chocolate - in moderation - might delay or prevent the onset of diabetes.

Application in dentistry

Flavonoids has been known as natural source of medicine in ancient times. It is used widely as locally or systemically in the treatment of diseases and in inflammatory conditions. It prevents and inhibits bacterial cell division and help to break down the bacterial cell wall and cytoplasm. Flavones is more pronounced to Gram-positive bacteria than Gram-negative bacteria (Scalbert and Williamson, 2000).

Anti Cancer effect

Studies show that dark chocolate can help lower risk of lung, prostate, and skin cancer. According to Dr. David Servan-Schreiber in his book *Anticancer*, dark chocolate containing more than 70 percent cocoa is loaded with potent antioxidant flavonols, polyphenols and proanthocyanidins, all of which help to slow the growth of cancer cells. The higher the percentage of cocoa, the higher the content of these beneficial components.



Antibacterial effect

In many clinical study, flavonoids was demonstrated an *in vitro* antibacterial effect on the isolated oral streptococci and salivary bacterial counts. It was stated that the action of flavonoids have controlled dental caries

Plaque

According to a study conducted by Ammar *et al.*, flavonoids, quercetrin and naringenin, were added into two pharmaceutical preparations in the form of toothpaste. It was found that the flavonoids inhibit plaque formation. It showed the significant

decrease in the levels of Gram-positive streptococci by the usage of the toothpaste.

Repair of dental sockets and skin wounds

Numerous studies have pointed out that topical application of 10% hydroalcohol solution of flavones in cutaneous wound healing and socket wound after the extraction of tooth in rats, promoted oral epithelial repair but had no effect on wound healing of the socket.

Anticavities

Dark chocolate containing 90% of flavonoids prevents dental caries.

Dosage – 1.5 ounces per day of dark chocolate.

Conclusion

Nowadays, there is a trend in using natural materials as cure for variety of diseases. Flavonoids are one of the natural sources of medicine, and said to be antibacterial and anti-inflammatory, antioxidant properties, and stimulate immune system. To conclude, flavonoids is a natural medication with a promising future but further studies should be emphasized and conducted to explore its merit and demerits in Clinical dentistry & Only limited studies have been published regarding use of dark chocolate in prevention of oral cancer.

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