

Bioflavonoids and Natural Health: An Overview

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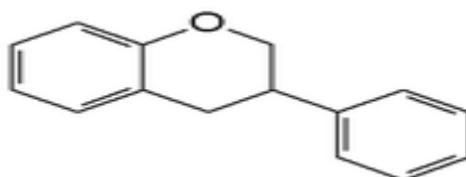
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Abstract: Bioflavonoids are prominent natural antioxidants, free radical scavengers; in general they have not been associated with any consistent side effects. Excess intake is simply excreted in the urine as they are water soluble nutrients, and they are of recent research interest through its various therapeutic activities, demonstrating antimicrobial and anti-inflammatory properties and a potentially valuable therapeutic tool for the treatment of variety of inflammatory conditions including periodontal diseases. Foods in this category contain natural ingredients that promote health by specific metabolic actions such as modulating the inflammatory response, inhibiting the growth of pathogenic organisms, promoting healing, fortifying tissue integrity and hindering malignant transformation.

Key words: bioflavonoids, flavanols, periodontal therapy

I. Introduction

Flavonoids an amazing array of over 6000 different substances found in virtually in all plants are responsible for many of the plant colors that dazzle us with their brilliant shades of yellow, orange and red. Classified as plant pigments, flavonoids were discovered in 1938 when a Hungarian scientist named Albert Szent-Gyorgyi used the term vitamin P to describe them. The chemistry of flavonoids is complicated and within the non-technical term flavonoids can be found with many different chemical groups of substances.¹ The structural component common to these molecules include two benzene rings on either side of a 3-carbon ring.



Multiple combinations of hydroxyl groups, sugar, oxygen and methyl groups attached to these structures create the various classes of flavonoids: flavanols, flavanones, flavan-3-ols (catechin), anthocyanidin and iso flavanones. Flavonoids or bioflavonoids are a ubiquitous group of polyphenolic substance. The flavonoids are phenyl substituted chromones (benzopyran derivatives) consisting of a 15 carbon basic skeleton (C6-C3-C6), composed of a chroman (C6-C3) nucleus also shared by the tocopherols, with a phenyl substitution usually at the 2 position.²

II. Classification Of Flavonoids²

Common Dietary Flavonoids		
Flavonoids	Dietary Flavonoids	Some common Food Sources
Anthocyanidins	Cyanidin, Malvidin, Peonidin, Petunidin	Red, blue, and purple berries; red and purple grapes; red wine
Flavanols	Monomers (Catechins): catechin, epicatechin, epicatechin-gallate Dimers and polymers: Theaflavins, proanthocyanidins	Catechins: Teas chocolate, grapes, berries, apples Theaflavins, Thearubigins: Tea Proanthocyanidins: chocolate, apple, grapes and red wine
Flavanones	Hesperitin, Naringenin	Citrus fruit and juices e.g oranges, grapefruits, lemons
Flavanols	Quercetin, Kaempferol	Yellow onions, apples, teas, kale
Flavones	Apigenin, Luteolin	Parsley, thyme, celery, hot peppers
Isoflavones	Glycitein, Genistein, Daidzein	Soybeans, soy foods, legumes

Flavonoids play a role in the prevention or treatment of the following health conditions including oral health: allergy, cataract, diabetes, atherosclerosis, gout, migraine, stomach ulcer, varicose veins, toxicity, periodontal disease and dental caries

III. Allergy

Clark W, Mackay E. Conducted a study on effect of flavanoid substance on histamine toxicity, anaphylactic shock and histamine enhanced capillary permeability to dye. Authors found bioflavonoids have long been known to possess anti-allergic effects. As early as the 1950s, studies showed that flavonoids could prevent the release of histamines and inhibit anaphylaxis. It wasn't until some years later, however, that any more attention was paid to the link between flavonoids and allergy. The breakthrough was the discovery of the flavonoid '**khellin**' that turned out to be an effective muscle relaxant. Bioflavonoids are highly effective anti-allergy and anti-asthma agents.³ While more research is needed to determine exact doses, the best methods of delivery (oral versus inhaled), and which combinations of flavonoids can offer the best effects, it is clear that bioflavonoids offer allergy sufferers a new form of relief, without the annoying side effects of prescription drugs.⁴

IV. Cataract

Zunik M et al, (1950). Conducted a study on Nutrition antioxidants and age related cataract and maculopathy. Authors found the 2 million Americans with glaucoma may have prevented their condition by consuming more flavonoids. The initial abnormality occurring in glaucoma is a result of changes in collagen structure and function in blood vessels of the eye Flavonoids prevent these abnormalities from occurring. It is likely that the glaucoma would not have happened if a higher level of flavonoids was consumed. Bioflavonoids also promotes healthy skin and blood vessels, including the delicate capillaries in the retina. Studies suggest long-term consumption of bioflavonoids also may reduce the risk of forming a cataract and vision loss from macular degeneration.⁵

V. Diabetes

Hertog et al, (1993). Conducted a study on Dietary antioxidant flavanoids and risk diabetes. Bioflavonoids are extremely powerful antioxidants. They may enhance insulin secretion, decrease blood flow resistance, reduce vascular stasis and ischemia and strengthen capillary basement membranes. Bioflavonoids play a crucial role in regenerating vitamin antioxidants once they have been oxidized by contact with free radicals. Two major epidemiological studies shown that low bioflavonoids intake is associated with increased risk for cardiovascular disease.⁶

VI. Atherosclerosis

Hertog et al, (1993). Conducted a study on Dietary antioxidant flavanoids and risk of Atherosclerosis. Increased intake of flavonoid compounds reduces cholesterol levels and decreases the size of existing atherosclerotic plaques.' This again is probably a result of collagen stabilization .A decrease in the integrity of the collagen matrix of the artery results in cholesterol deposition. Many researchers feel that if the collagen matrix of the artery can remain strong, the atherosclerotic plaque would never develop. Flavonoids, by increasing the integrity of collagen structures, may offer significant protection against atherosclerosis.⁶

VII. Gout

Balu LW, (1950). Conducted a study on Cherry diet control for gout and arthritis. Author found their remarkable effects on collagen structures and their potent anti-oxidant activity; flavonoids are extremely useful in the treatment of a wide variety of inflammatory conditions including rheumatoid arthritis and periodontal disease. Flavonoids are particularly effective in the treatment of gout, as they reduce uric acid levels as well as reduce tissue description.⁷

VIII. Stomach Ulcer

Alarcon et al, (1994). Conducted a study on Anti ulcerogenic activity of flavanoids and gastric protection. Authors found flavonoids possess antiulcerogenic activity. Oral treatment with the ether fraction of the flavonoid extract demonstrated a good level of gastric protection. Mucous content was increased and accompanied by proportionate increase in proteins and hexosamines. B Hydroxyl ethyl rutosides, gossiping, Naringenin, Naringenin and Cyanidanol-3 were shown to exhibit anti-ulcer activity. Quercetin, rutin and Kaempferol administered intraperitoneally (25-100 mg/kg) inhibited dose-dependent gastric damage produced by acidified ethanol in rats.⁸

IX. Migraine

Keli SO, Hertog MG, Feskens EJ, Kromhout D, (1996). Conducted a study on Dietary flavonoids, antioxidant vitamins, and incidence of migraine attacks. Tart cherries contain anti-inflammatory compounds (anthocyanins and bioflavonoids) that help relieve the pain of arthritis and gout. By helping to reduce inflammation in the body, the anthocyanins and bioflavonoids in cherries also help eliminate migraine headaches.⁹

X. Varicose Vein

Keli SO, Hertog MG, Feskens EJ, Kromhout D, (1996). Conducted a study on Dietary flavonoids, antioxidant vitamins, and incidence of varicose vein. Varicose veins, also called varicosities, are veins that have become swollen, twisted, and tortuous and are usually seen on the legs. People who get varicose veins often have a family history of someone with them, a particular constitutional type, along with a lifestyle that aggravates the condition. Many bioflavonoids, especially rutin and Quercetin, support the health of the body's circulatory system by helping maintain capillary blood flow and proper vascular permeability, integrity, and resiliency and their by reducing chances of varicosity.⁹

XI. Toxicity

Even in very high amount (140 grams per day), flavanoids do not appear to cause unwanted side effects. Even when raised to the level of 10% of total caloric intake, flavonoid supplementation has been shown non-toxic. Studies during pregnancy have also failed to show problems with high-level intake of flavanoids. Administration of grape seed extracts to male wistar rats at different concentration did not induce any toxicologically significant effects.

XII. Effect Of Bioflavonoids On Oral Health

(a) Periodontal Disease

Dr. Jaques M has reported that proanthocyanidins attach to the polymeric filaments in the bacterial membranes, thereby inhibiting their aggregation and thus preventing the key initiation factor that leads to periodontal disease. In response to bacterial aggregation along the gingival crevice, neutrophils release large quantities of collagenase to break their filamentous bond and disrupt their attachment to the teeth surfaces. Vitis vinifera seed extract which has been found to bind to proline-rich proteins in bacterial membrane preventing them from forming aggregation that initiate the onset of periodontal disease. It also inhibits the collagenase and serine proteases secreted by bacteria and white blood cells deactivates the oxygen free radicals that lead to destruction of the periodontium.¹⁰

Extracts of leaves from the tea plant (*Camellia sinensis*) contain polyphenolic components with activity against a wide spectrum of microbes. Studies conducted over the last 20 years have shown that the green tea polyphenolic catechins, in particular epigallocatechin gallate (EGCg) and epicatechin gallate (ECg), can inhibit the growth of a wide range of Gram-positive and Gram-negative bacteria species with moderate potency. Evidence is emerging that these molecules may be useful in the control of common oral infections, such as dental caries and periodontal disease. Sub-inhibitory concentrations of EGCg and ECg can suppress the expression of bacterial virulence factors and can reverse the resistance of the opportunistic pathogen *Staphylococcus aureus* to β -lactam antibiotics.¹¹

Hirasawa et al. (2002) demonstrated bactericidal activity of green tea catechins at 1 mg/ml against species of *Prevotella* and *P. gingivalis*, and found significant reduction in markers of gingivitis after the use of a slow-release buccal delivery system applied over a period of 8 weeks.¹²

(b) Bioflavonoid and Anticariogenic Activity

Dental caries is one of the most common infectious diseases of man, particularly in deprived urban industrial areas. It is a multifactorial condition in which diet, nutrition, the resident oral flora and the host response interact to determine whether infection occurs.

Any intervention that can reduce its incidence will have a significant impact on public health. Anecdotal reports quoted in the Japanese literature, such as "those who continuously drink a large amount of green tea have less tooth decay" and "drinking green tea makes the mouth clean" have spurred research into the potential of tea as an anti-caries agent.⁸

XIII. Conclusion

The most recent scientific breakthroughs confirm that these powerful nutrients are an important part of a healthy diet. Studies from around the world support the fact that diets high in bioflavonoids are associated with lower incidences of most diseases. Along with other phytonutrients, the health benefits of bioflavonoids are one reason why the National Institutes of Health and the U.S. Surgeon General's office advocate the intake of

several servings of fruits and vegetables every day. Bioflavonoids fight disease by reducing **inflammation**, preventing release of histamines, improving **immunity** and fighting **free radicals** through their oxidant property and **anti tumor activity** by inhibiting proliferation of cells. The available data also indicates that bioflavonoids possess biological activity, are safe and effective in improving periodontal and dental caries status.

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