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Secondary plant phenolics -Flavonoids

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Flavonoids are a class of secondary plant phenolics with significant antioxidant and chelating properties. In the human diet, they are most concentrated in fruits, vegetables, wines, teas and cocoa. Their cardioprotective effects stem from the ability to inhibit lipid peroxidation, chelate redox-active metals, and attenuate other processes involving reactive oxygen species. Flavonoids occur in foods primarily as glycosides and polymers that are degraded to variable extents in the digestive tract. Although metabolism of these compounds remains elusive, enteric absorption occurs sufficiently to reduce plasma indices of oxidant status. The propensity of a flavonoid to inhibit free-radical mediated events is governed by its chemical structure. Since these compounds are based on the flavan nucleus, the number, positions, and types of substitutions influence radical scavenging and chelating activity. The diversity and multiple mechanisms of flavonoid action, together with the numerous methods of initiation, detection and measurement of oxidative processes in vitro and in vivo offer plausible explanations for existing discrepancies in structure-activity relationships.[1]

Despite some inconsistent lines of evidence, several structureactivity relationships are well established in vitro. Multiple hydroxyl groups confer upon the molecule substantial antioxidant, chelating and prooxidant activity. Methoxy groups introduce unfavorable steric effects and

increase lipophilicity and membrane partitioning. A double bond and carbonyl function in the heterocycle or polymerization of the nuclear structure increases activity by affording a more stable flavonoid radical through conjugation and electron delocalization. Further investigation of the metabolism of these phytochemicals is justified to extend structure-activity relationships (SAR) to preventive and therapeutic nutritional strategies.

Flavonoids are a broad class of low molecular weight, secondary plant phenolics characterized by the flavan nucleus. Widely distributed in the leaves, seeds, bark and flowers of plants, over 4,000 flavonoids have been identified to date. In plants, these compounds afford protection against ultraviolet radiation, pathogens, and herbivores.[1] The anthocyanin copigments in flowers attract pollinating insects and are responsible for the characteristic red and blue colors of berries, wines, and certain vegetables—major sources of flavonoids in the human diet. [2]Although dietary intake varies considerably among geographic regions and cultures; it is estimated to be 23 mg daily in the Netherlands. Most of the beneficial health effects of flavonoids are attributed to their antioxidant and chelating abilities. By virtue of their capacity to inhibit LDL oxidation, Flavonoids have demonstrated unique cardioprotective effects. Flavonoid-rich diets have been shown to reduce myocardial post-ischemic damage in rats. A protective role in the diet of humans has also been indicated in some large, prospective studies. For example, high flavonoid intake predicted lower mortality from coronary heart disease and lower incidence of myocardial infarction in older men and reduced the risk of coronary heart disease by 38% in postmenopausal women.[3]

Flavonoids are benzo--pyrone derivatives consisting of phenolic and pyrane rings and are classified according to substitutions Dietary flavonoids differ in the arrangements of hydroxyl, methoxy, and glycosidic side groups, and in the conjugation between the A- and B- rings.

During metabolism, hydroxyl groups are added, methylated, sulfated or glucuronidated. In food, flavonoids exist primarily as 3-O-glycosides and polymers.2

Understanding the biodynamics of flavonoids after oral administration is fundamental to appropriate extrapolation of existing SAR information to preventive nutrition. In addition to structural and physico-chemical attributes of the nascent compound, the absorption,

pharmacokinetics, biotransformation, and the relative activities of metabolites are critical determinants of biological effects in organisms. In vitro data effectively and consistently demonstrate the antioxidant efficacy of structurally diverse flavonoids under many circumstances of oxidative stress. However, the current understanding of absorption and metabolism in humans is limited to a small number of dietary flavonoids.[4]

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