Nutrition and Health Info-Sheet

For Health Professionals

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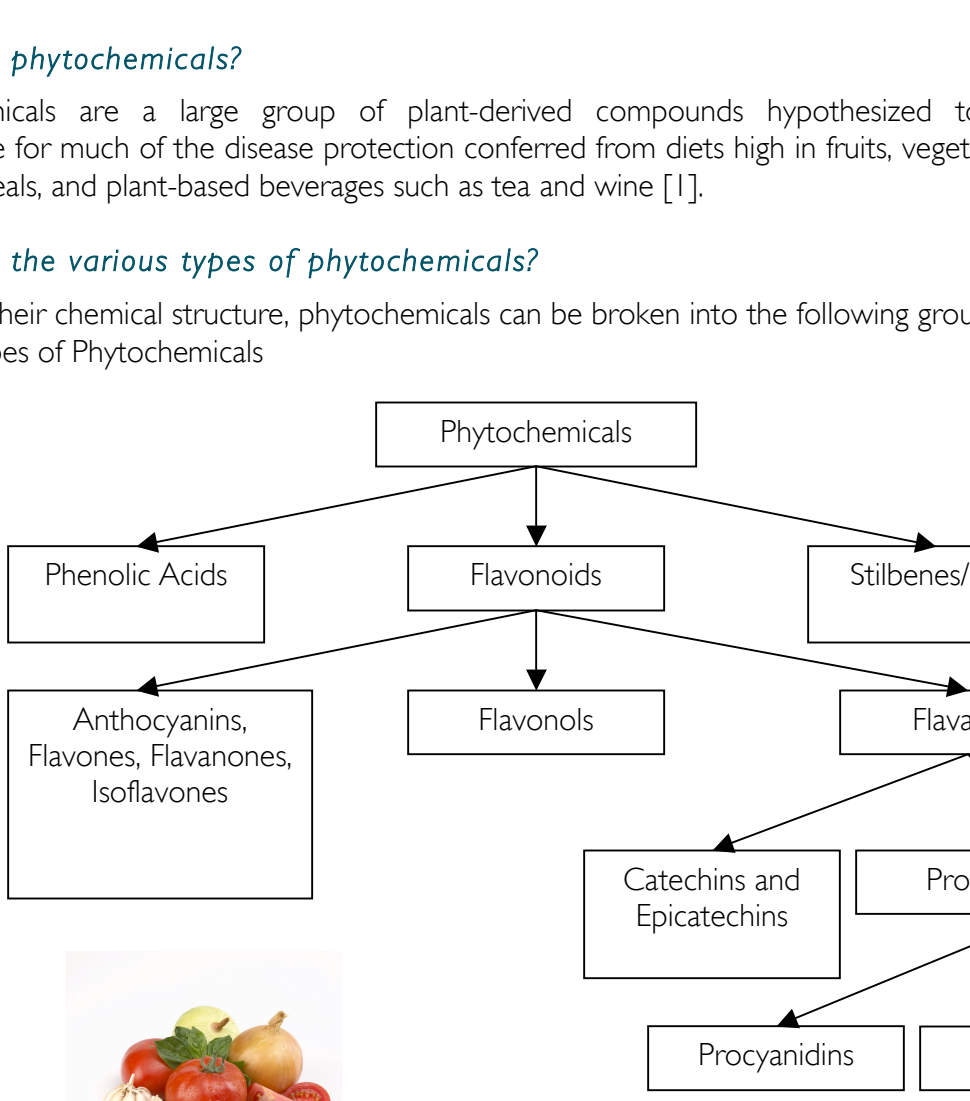
Some Facts About Phytochemicals

What are phytochemicals?

Phytochemicals are a large group of plant-derived compounds hypothesized to be responsible for much of the disease protection conferred from diets high in fruits, vegetables, beans, cereals, and plant-based beverages such as tea and wine [1].

What are the various types of phytochemicals?

Based on their chemical structure, phytochemicals can be broken into the following groups [1].
Figure: Types of Phytochemicals



What are flavonoids?

Flavonoids are the most diverse group of phytochemicals. Research suggests that flavonoids, in particular, may be an important phytochemical group that contributes to the reduced mortality rates observed in people consuming high levels of plant-based foods. In the Zutphen Elderly Study, findings revealed a significant inverse association between flavonoid intake and myocardial infarction [2]. Similarly, findings from the Seven Countries Study (comparing the diets of men living in Finland, Italy, Greece, the former Yugoslavia, Japan, Serbia, the Netherlands, and the United States) suggested that consumption of flavonoids was responsible for 25 percent of the observed difference in mortality rates in the various countries studied [3]. Indeed, once consumed and absorbed, flavonoids act favorably in the body, through actions such as inhibiting xanthine oxidase and arachidonic acid metabolism [4].

What are some examples of flavonoids and their food sources?

Class	*Example*	*Common Food Source*
Flavonol	Quercetin	Apples, Onions
Flavanol	Catechin	Tea, Coffee, Chocolate
Isoflavone	Genistein	Soy
Flavonone	Hesperitin	Grapefruit
Anthocyanidin	Cyanidin	Berries

What is the evidence that phytochemicals protect against disease?

Epidemiological studies suggest that consumption of a diet high in fruits and vegetables is associated with a reduced risk of chronic disease [5]. Unfortunately, there is not yet enough evidence to support the concept that phytochemicals are responsible for these effects. Fruits and vegetables are important sources of a variety of beneficial agents including vitamins, minerals, fiber, and phytochemicals. More research is needed to fully explain the actions of phytochemical compounds in the human body [6].

Why is it important to eat a variety of plant-based foods?

Hundreds of phytochemical compounds, with several different biological functions, have been identified in plant-based foods. Therefore, consuming a variety of plant-based foods helps to ensure that individuals receive the optimum benefits from the fruits and vegetables consumed [7].

What are the potential health benefits from some phytochemical compounds?

Food	*Phytochemical*	*Possible Benefit*
Soy Beans, Soy Milk, and Tofu	Isoflavones (Genistein and Daidzein)	A reduction in blood pressure and increased vessel dilation [8]
Strawberries, Red Wine, Blueberries	Anthocyanins	Improvement of vision, inhibition of nitric oxide production, induction of apoptosis, decreased platelet aggregation, and neuroprotective effects [8]
Red Wine, Grape Juice, Grape Extracts, Cocoa	Proanthocyanidins and flavan-3-ols	Inhibition of LDL oxidation, inhibition of cellular oxygenases, and inhibition of proinflammatory responses in the arterial wall [8]
Garlic, onions, leeks, olives, scallions	Sulfides, thiols	Decrease in LDL cholesterol [9]
Carrots, tomatoes, and tomato products, and various types of fruits and vegetables	Carotenoids such as lycopene, beta-carotenes	Neutralization of free radicals that cause cell damage [9]
Broccoli and other cruciferous vegetables such as kale, horseradish	Isothiocyanates (sulforaphane)	Neutralization of free radicals that cause cell damage [9] and protection against some cancers [10]

What is the recommended intake of phytochemicals?

Due to the lack of food composition data and a true understanding of the absorption and metabolism of phytochemical compounds, the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes and Its Panel on Dietary Antioxidants and Related Compounds of the Food and Nutrition Board at the Institute of Medicine chose not to create a Dietary Reference Intake (DRI) for these compounds [11]. Therefore, a recommended intake for phytochemicals does not currently exist. Today, many health authorities such as the American Cancer Society and the American Heart Association recommend consuming a diet high in fruits and vegetables to ensure that an individual ingests an adequate amount of phytochemical compounds [12, 13].

Should people take phytochemical supplements?

The long-term effects of pharmacological doses of phytochemicals on human health are not well understood and therefore supplementation is not recommended. Furthermore, the relationship between food and health is complex. By replacing foods with supplements, beneficial food components or important interactions between food components may be lost. Current evidence still supports that consumption of a balanced diet, high in a variety of fruits, vegetables, and whole grain foods, is associated with optimal health [6].

References:

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