

Chocolate — A Functional Food?

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Brief Description:

A **functional food** is a food that contains an active compound that provides health benefits beyond basic nutrition. Protein, fat, carbohydrates, vitamins, and minerals are the basic nutritional needs but other components in food also contribute to your health. Phytochemicals, nutraceuticals — What are these in my food?

In this program, you will learn about the different types of chocolate, explore the health benefits of chocolate, including why chocolate can be considered a functional food, and demystify the functional food “jungle” in the grocery store.

“There are four basic food groups: milk chocolate, dark chocolate, white chocolate, and chocolate truffles.”

“Equal amounts of dark chocolate and white chocolate is a balanced diet.”

“Food of the gods” (Aztecs)

“Chocolate is cheaper than therapy and you don't need an appointment.”

Chocolate

Chocolate refers to a large number of raw and processed foods produced from the seed (bean) of the *Theobroma cacao* tree found in Mexico, and Central and South America. It was first documented around 1100 BC. The Aztecs and Mayans made a chocolate beverage that had a bitter taste. The Aztecs used chocolate for ceremonial purposes and believed that chocolate had medici-

nal properties. Cacao beans also were used as a form of currency. The Spanish who visited the Aztecs brought chocolate to Europe, and it was considered a luxury item. The modern chocolate bar with added sugar was created in 1847. Prior to this, chocolate was only consumed as a drink. The Dutch removed the cocoa butter from the solids and then were able to process chocolate in a solid form. The addition of sugar helped mask the natural bitter flavor. Through the centuries, chocolate was considered an aphrodisiac, and was used to treat fatigue and diarrhea.

Types of Chocolate

Chocolate products are made from cocoa solids, cocoa liquor, and cocoa butter in varying proportions. Dark chocolate may contain up to 70 percent cocoa; milk chocolate products contain less cocoa. To develop the taste, cocoa beans are fermented and dried, and the shell removed. The resulting nibs are ground into cocoa liquor, which is processed into cocoa solids and cocoa butter.

Unsweetened chocolate, bitter chocolate, or baking chocolate is pure chocolate liquor. **Dark chocolate** is made by adding fat and sugar to cocoa liquor and cocoa butter. Dark chocolate has a high cocoa content. **Bittersweet chocolate** is chocolate liquor plus sugar, cocoa butter, and vanilla. Usually, bittersweet chocolate has less sugar and more liquor than semisweet chocolate but the terms *bittersweet* and *semisweet*, are used interchangeably. Semisweet chocolate is dark chocolate with a low sugar content. **Milk chocolate** is made by adding sugar and milk powder or condensed milk to cocoa butter and cocoa liquor. **White chocolate** is made from sugar, cocoa butter, and milk solids. White chocolate does not contain cocoa liquor.

Processing chocolate affects the texture of the final product. More expensive chocolate products are usually processed longer and have a smoother texture and “feel” on the tongue. Conching is a grinding process that refines and blends the chocolate. Before conching, the texture is uneven and gritty. The length of time the chocolate is conched determines the smoothness of the final product. Chocolate may be conched from 6 to 72 hours. Tempering follows the conching process. The fats in chocolate can crystallize in several different forms. Tempering is done to create very small crystals in the chocolate, which also contributes to the feel on the tongue.

Storage of Chocolate

Chocolate is sensitive to temperature and humidity. Store chocolate between 59 and 63°F in low humidity. Chocolate can absorb aromas from other foods. Keep chocolates wrapped to prevent absorption of moisture and aromas. If chocolate is not stored properly, it can “bloom.” This whitish discoloration forms when the chocolate absorbs enough moisture for the fat or sugar crystals to rise to the surface. This bloom is visually unappealing but the chocolate is safe to eat. High temperatures can cause the chocolate to melt and change the crystals, causing a rougher feel on the tongue.

Chocolate Consumption, Kilos per person 2005

Belgium	10.74	Austria	8.33
Switzerland	10.14	Denmark	7.13
UK	9.94	Sweden	6.97
Norway	9.19	Finland	6.43
Germany	8.96	USA	5.58

Source: Adapted from CAOBISCO

Health Benefits of Chocolate

Women have been eating chocolate as a premenstrual fix for decades. According to recently published data, chocolate is the most craved food in North America, and most of the chocolate cravers are women.

A recent study focused on the effect of chocolate on depression (Archives of Internal Medicine). The researchers found that people who are clinically depressed are more likely to eat chocolate, and the more depressed they are, the more chocolate they eat. These researchers cannot conclusively state if depression stimulates chocolate cravings. The fat content, sugar content, caffeine, texture, or aroma may be responsible for the mood-enhancing effect of chocolate. Components in chocolate (theobromine, tyramine, and phenylethylamine) may be responsible for this effect on mood.

Are you a “chocoholic”? Several studies have focused

on chocolate craving. A compulsion to eat chocolate may be similar to a drug addiction; the chocolate addict may have a heightened sense of well-being during consumption. The drive for chocolate may interfere with performing everyday activities and thoughts, and may influence mood.

Recently, compounds in chocolate have been found to have health benefits, and chocolate sometimes is being referred to as a functional food. Components in chocolate include antioxidant flavanol compounds, such as catechins, which reduce free radicals produced by oxidation, lower LDL cholesterol, reduce blood pressure, and reduce platelet aggregation. The amount of the antioxidant flavanol compounds in chocolate products depends on the type of chocolate and the processing method. Dutched process cocoa will have lower levels of antioxidants. Dark chocolate is higher in these compounds, whereas white chocolate is very low in antioxidant flavanol compounds.

Cocoa butter contains stearic acid and small amounts of plant sterols. Studies on stearic acid from chocolate demonstrated a neutral cholesterolemic response in people who consumed the chocolate-enriched diet, which was high in saturated fat.

The fat and sugar content of chocolate does increase calories associated with chocolate consumption. The addition of milk to chocolate products may be of concern to people who are lactose intolerant. Nuts may be added to chocolate products, and people allergic to tree nuts or peanuts should avoid these products. Read the ingredient label for added ingredients that may cause a health problem.

Magnesium is a mineral found in significant amounts in chocolate products. Low dietary magnesium may be a risk factor for hypertension, stroke, and cardiac arrhythmias. Women in the US generally do not meet the recommended dietary amount for magnesium. A serving of milk chocolate (44 grams) provides 8 percent of the RDA, and a serving of dark chocolate provides 15 percent of the RDA for magnesium. Milk chocolate products contribute calcium to the diet.

Functional Foods

Functional foods are defined as any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains. A functional food is similar to a conventional food. Some functional foods are soy, garlic, oats, flax seed, and chocolate.

Phytochemicals or nutraceuticals are examples of food ingredients (components) that provide a health benefit. The term *phytochemical* refers to a large set of compounds that are found in plant foods and are usually responsible for color and flavor. These phytochemicals can provide health benefits. Examples of phytochemicals are carotenoids and lycopene found in red and orange fruits and vegetables.

A nutraceutical is a component that is isolated from a food and sold in dosage form. Nutraceuticals are physiologically active components that demonstrate specific health or medical benefits beyond basic nutritional functions. Examples of nutraceuticals are garlic extract, flax supplements, and fish oil capsules.

Medical foods are food products formulated for the management of a condition for which distinctive nutritional requirements have been established. They are intended for use only under a physician's monitoring and only by patients receiving regular medical attention.

List of Functional Foods (Whole Foods) with Health Benefits

Apples	Ginger
Beef	Hot peppers
Blackberries	Ketchup
Blueberries	Legumes/lentils
Bran	Nuts (almonds, walnuts)
Cantaloupe	Oats/oatmeal
Carrots	Onions
Celery	Parsley
Cheese	Pumpkin
Citrus fruit (grapefruit, lemons, oranges)	Prunes
Chocolate	Rosemary
Corn	Sesame seeds/sesame butter
Cranberries/cranberry juice	Sweet potatoes/yams
Cruciferous vegetables (broccoli, cauliflower, Brussels sprouts, cabbage, kale)	Sweet peppers
Dairy products	Soy
Eggs	Spinach
Eggplant	Strawberries
Fish/fish oil	Sunflower seeds
Flax/flax seeds/flax seed oil	Tea/green tea
Garlic	Tomatoes
	Watermelon
	Wine
	Whole grains
	Yogurt

Frequently Touted Nutraceuticals

Allyl sulfides (found in garlic, onions, etc.)
 Antioxidants (beta-carotene, carotenoids, limonene, lutein, lycopene, terpenes, vitamins C and E, zeaxanthin)
 Caffeic, ellagic, and ferulic acids (found in fruits and vegetables)
 Catechins (polyphenolic flavonoid compounds found in tea and cocoa)
 Conjugated linoleic acid (CLA) [found in animal fat]
 Fiber, Lignin
 Flavonoids/flavanols (found in fruits and vegetables, chocolate)
 Indoles (found in cruciferous vegetables)
 Isoflavones (found in soy)

Isothiocyanates (found in cruciferous vegetables)
 Omega-3 fatty acids
 Phenols/phenolic compounds (found in fruits and vegetables)
 Phytoestrogens
 Phytosterol
 Prebiotics (found in the onion family)
 Probiotics (bacteria cultures found in yogurt)
 Quercetin/resveratrol (found in onions, wine, tea)
 Saponins (found in vegetables, legumes)
 Selenium

Labeling

Functional foods can have a health claim on the food product's label. These health claims are regulated by the Food and Drug Administration (FDA). An FDA-approved health claim is granted when the scientific evidence is very strong — and experts agree — that a relationship exists between a food compound and a disease or health condition. Approved foods have convincingly demonstrated their health benefits when consumed at sufficient amounts on a regular basis as part of a well-balanced and healthful diet. An example of a statement that may be on a food label: *While many factors affect heart disease, diets low in saturated fat and cholesterol may reduce the risk of this disease.*

FDA-approved Health Claims

- A diet with enough calcium and a reduced risk of osteoporosis
- A diet low in total fat and a reduced risk of some cancers
- A diet low in saturated fat and cholesterol and a reduced risk of coronary heart disease
- A diet rich in fiber-containing grain products, fruits, and vegetables and a reduced risk of some cancers
- A diet low in sodium and a reduced risk of hypertension
- A diet high in potassium and a reduced risk of hypertension and stroke
- A diet rich in fruits and vegetables and a reduced risk of some cancers
- A diet adequate in the synthetic form of folate or folic acid and a reduced risk of neural tube birth defects
- Use of sugarless gum containing sugar alcohols and a reduced risk of tooth decay, especially when compared with foods high in sugar and starches
- A diet rich in fruits, vegetables, and grain products that contain fiber, especially soluble fiber, and a reduced risk of coronary heart disease
- A diet rich in foods that contain fiber from whole oats, including oatmeal, oat bran, and oat flour, and a reduced risk of coronary heart disease

- A diet rich in foods that contain fiber from phyl-
lium and a reduced risk of coronary heart disease
- A diet that includes 25 grams of soy protein daily
and that also is low in saturated fat and cholesterol
and a reduced risk of coronary heart disease
- A diet containing 1.3 grams of plant sterol esters
or 3.4 grams of plant stanol esters daily and a
reduced risk of coronary heart disease
- A diet rich in whole grain foods and a reduced risk
of coronary heart disease and certain cancers.

Resources

- Bruinsma, K. and Taren, D. L. 1999. Chocolate: Food or Drug? JADA 99:1249-1256.
- Marcus, J. B. 2003. New Age Foods for Disease Prevention. Today's Dietitian 12(5).
- Steinberg, F. M., Bearden, M. M., and Keen, C. L. 2003. Cocoa and chocolate flavonoids: Implications for cardiovascular health. JADA 103:215-223.

For more information on functional foods, check the University of Nebraska–Lincoln Extension Publication *Functional Foods*, EC473, at <http://www.ianrpubs.unl.edu/sendIt/ec473.pdf>