Cauvery College for Women (Autonomous)

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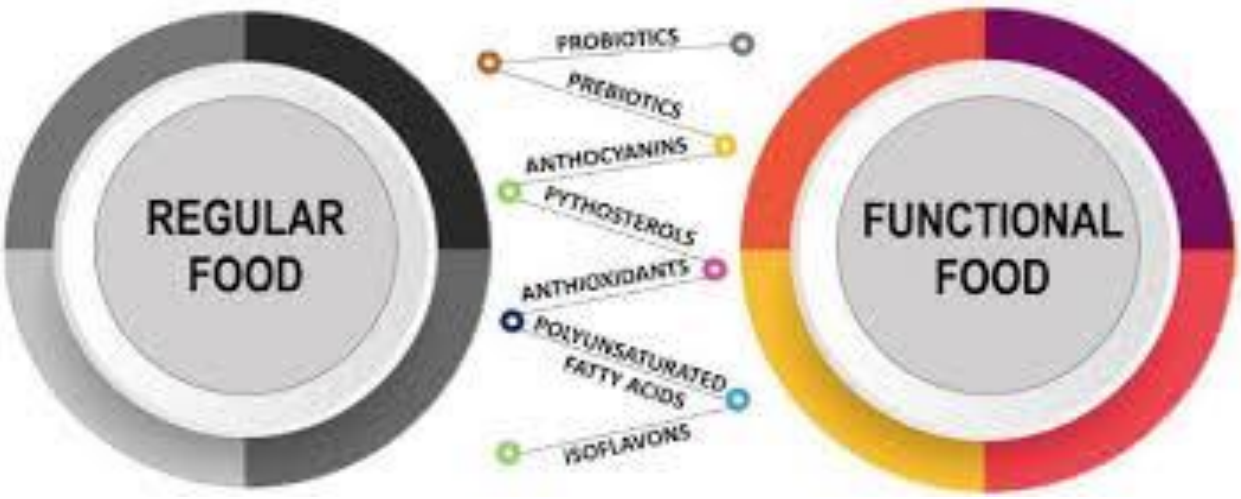
FUNCTIONAL FOODS AND NUTRACEUTICALS IN THE PREVENTION OF DISEASES



Introduction

It is common knowledge that foods provide nutrients that help to nourish our bodies and keep our systems in proper working condition. However, from early in human history, it was also known that certain foods confer additional health benefits to humans such as prevention and treatment of various types of diseases. “Let food be thy medicine” is a popular quote from Hippocrates that emphasizes the role of foods in disease prevention and recognizes a separate role for foods in addition to their being simply nutrient providers. Recently, scientists have become focused on the health-promoting effects of foods and there is now abundant evidence that supports the role of various foods/food components in promoting human health. Such health-promoting foods or compounds are generally classified into 2 major categories:

Functional foods are often conventional foods that are consumed as part of a usual diet, but apart from supplying nutrients they can also reduce the risk of chronic diseases such as cancer, hypertension, kidney malfunction, etc. A typical example of a functional food is tomato, which is rich in the antioxidant lycopene and helps to remove toxic compounds from our bodies, thereby

preventing damage to essential organs. Other typical examples of functional foods include soybeans, fish, oat meal, cereal bran (wheat, rice), and tea (green and black).

Nutraceuticals are health-promoting compounds or products that have been isolated or purified from food sources. A good example is a group of compounds called isoflavones.

Lycopene

This is a compound that is very abundant in tomatoes and other brightly coloured foods such as papaya, watermelon, carrot, pink guava and pink grapefruit. Lycopene provides health benefits by neutralizing hazardous waste products such as reactive oxygen species (ROS) that our bodies normally produce during conversion of nutrients into energy. ROS are dangerous compounds that can damage DNA and promote cancer formation. They also damage lipids that are vital to keeping our hearts and blood vessels functioning properly; such damage can lead to development of hypertension. Research has shown that increased consumption of lycopene-containing food products can reduce blood pressure in hypertensive patients by reducing plaque development (hardening of blood vessels).

Lipids (Fatty Acids)

Fish oil has long been recognized as a functional food because of its ability to reduce blood pressure and lower the risk for other cardiovascular disorders such as abnormal heart beat and blockage of blood vessels by cholesterol. The health-promoting effect of fish oil is now known to be due to the omega-fatty acids, especially omega-3 and omega-6. The main omega-3 fatty acids in fish oil are docosahexaenoic (DHA) and eicosapentaenoic acids (EPA). DHA in particular has been shown to be an important structural component of the brain and contributes to improved memory functions. Other omega-fatty acids such as linoleic and linolenic acids also provide increased cardiovascular benefits; they are abundant in fish oil, vegetable oils (soybean, and sunflower) and nuts such as peanuts and almonds.

Catechins

The active component has been identified as catechin, which is very abundant in green tea, although black tea also contains sufficient quantities. Catechins are strong antioxidants that inhibit damage to DNA and blood vessels, thereby reducing the risks of cancer development and cardiovascular diseases, respectively.

Indigestible Carbohydrates

Dietary intake of plant fibres is important for maintaining a healthy gut and reducing glucose absorption, which can be beneficial to diabetic patients. Plant fibres are highly concentrated in the bran of seeds and this has led to promotion of whole grain consumption as a way of maintaining a healthy lifestyle; such fibres are also abundant in fruits and vegetables. Consumption of insoluble fibres such as cellulose and hemicellulose, as found in bran, leafy vegetables or fruit skins (e.g. apples and pears), serve as roughage and help to reduce the caloric value of diets, which is important in obese and diabetic conditions. Soluble fibre (also called gums and pectin) is abundant in whole grain barley and oats, as well as in fruits such as ripe strawberries and bananas; this type of fibre forms a viscous indigestible mass in the gut and helps trap digestive enzymes, cholesterol, starch, glucose, and toxins that are then expelled through the faeces. In this way, soluble fibre can help obese people reduce the amount of calories they absorb from their food and help diabetics by reducing the rate of starch digestion and glucose absorption.

Oats

Oat beta-glucans play an important role in promoting health and prevention against diseases. They are known to be able to reduce total and low density lipoprotein (LDL) cholesterol, and improve HDL cholesterol, regulate blood pressure and improve the blood lipid profile, regulate blood postprandial glycemic and insulin responses, and reduce and maintain body weight.

Polyphenols

Polyphenols are highly present in the plant kingdom, including plant foods (such as vegetables, fruits, cocoa, nuts, some whole grains, among others). Polyphenols can be divided in various subgroups and, in plant foods, mainly in three subgroups: phenolic acids, flavonoids and non-flavonoids. They have been related to health promoting properties, mainly for their antioxidant activity.

Source of foods	Health benefits
1- Garlic	Prevention of Arteriosclerosis, lowering of cholesterol in blood arteries is shown
2- Red or Bell pepper	Natural antioxidant, stimulant, dietary antioxidants , It prevents the blood clots in heart attack problem
3- Ginger	Help in Indigestion with antioxidant property ,Also help in the treatment of liver fibrosis
4- Amla	Diuretic and utilized in diabetes
5- Turmeric	Helping in Inflammation and indigestion problem with antioxidant property and help in treatment of multiple chronic diseases and has antibacterial agent

Functional foods	Bioactive compounds	Potential mechanism
- Nuts	- Tocopherols, omega-3 fatty acids	Lowering blood cholesterol
- Legumes	- Fiber and polyphenols	
- Fruits and vegetables	- Fiber (pectin)	
- Margarine	- Phytosterols	
- Fish oil	- Omega-3 fatty acids	
- Whole grains	- Fiber and phytochemicals	
- Soy proteins	- Genistein and daidzein	
- Dark chocolate	- Flavonoid	
- Fish	- Omega-3 fatty acids	Inhibition of LDL-C oxidation
- Green leafy vegetables, fruits	- Carotenoids	
- Citrus fruits and vegetables	- Vitamin C	
- Tomato	- Lycopene	
- Extravirgin olive oil	- Polyphenolics and oleic acid	
- Green tea	- Tea polyphenolics	
- Soy proteins	- Genistein, daidzein, and glycitein	
- Dark chocolate	- Flavonoid	

Functional foods	Bioactive compounds	Potential mechanism
- Pomegranate	- Polyphenols	
- Fish	- Omega-3 fatty acids	Lowering blood triglycerides
- Fish	- Omega-3 fatty acids	
- Legumes	- Fiber	
- Whole grains	- Fiber and phytochemicals	
- Citrus fruits	- Ascorbic acid	
- Onion and garlic	- Quercetin	
- Green and black teas	- Tea polyphenols	
- Grapes and red wines	- Grape polyphenols	
- Dark chocolate	- Flavonoid	
- Fruits and vegetables	- Folate - Phytochemicals	Lowering blood homocysteine
- Whole grains	- Fiber and phytochemicals	
- Citrus fruits and vegetables	- Vitamin C	
- Nuts, seeds, and oils	- Vitamin E	

Functional foods	Bioactive compounds	Potential mechanism
- Tomatoes	- Lycopene	Antioxidant action
- Green leafy vegetables, fruits	- Carotenoids	
- Vegetable oils	- Tocopherol, tocotrienols	
- Citrus fruits and vegetables	- Vitamin C	
- Soy proteins	- Genistein and daidzein	
- Green and black teas	- Tea polyphenols	
- Grapes and red wines	- Anthocyanins, catechins, cyanidins, and flavonols, myricetin and quercetin	
- Nuts, seeds, and oils	- Vitamin E	Anti-inflammatory action
- Fish	- Omega-3 fatty acids	
- Legumes	- Polyphenols	
- Grapes and red wines	- Anthocyanins, catechins, cyanidins, and flavonols, myricetin, and quercetin	
- Fish	- Omega-3 fatty acids	Endothelial function
- Nuts	- Polyphenols	
- Citrus fruits and vegetables	- Vitamin C	
- Grapes and red wines	- Anthocyanins, catechins, cyanidins, and flavonols, myricetin, and quercetin	

Functional foods	Bioactive compounds	Potential mechanism
- Dark chocolate	- Flavonoid	
- Grapes and red wines	- Anthocyanins, catechins, cyanidins, and flavonols, myricetin and quercetin	Platelets aggregation