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Functional Foods and its Role in Human Health - A Review

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Abstract

The relationship between food and health has grown significantly, since there is growing evidence that eating a good food lower the chance of developing deadly diseases. Foods are classified as functional, therapeutic are those nutraceuticals that not only contain the primary and necessary nutrients to meet the needs of the human body, but also have the potential to reduce the risk of a number of chronic diseases in humans. As such, they are considered the new trendsetters in the fields of food nutrition and medicine. They are probiotics, prebiotics, synbiotics, Phytosterols, phytochemicals, antioxidants have the capacity to reduce the risk of cardiovascular diseases, diabetes, cancer and degenerative diseases. These functional foods will not only have basic nutrition like protein, vitamin, minerals for regular basic body functions but also have the phytochemicals, bioactive compounds and antioxidants to prevent from certain diseases and providing better health.

Keywords: Functional foods, Phytochemicals, Fortification, Omega-3 Fatty Acid, Bioactive Compounds, Health

Introduction

In the modern era, two main factors that contribute to the development of diseases at a very young age are food choices and health ignorance. A food that possesses benefits above and beyond its fundamental nutritional value is referred to as a functional food. This is due to the presence of specific chemical compounds, which will help the food act as a functional food. It falls into the category of modified and conventional functional foods. Whole grains, vegetables, fruits, milk that has been fortified with calcium, vitamin D, and vitamin C, fruit juices that have been fortified with vitamin C, probiotics, prebiotics, and eggs enhanced with omega-3 produced by modifying chicken feed are well-known examples of functional foods. A functional component can be found in some foods either naturally or by adding a functional ingredient and become functional. These foods may improve overall health or lower the risk of certain diseases. Functional foods are designed to promote the general well-being of humans and preventing diseases. They are becoming more and more commonly recognized and are an integral part of individuals' diets (1).

Classification of Functional Foods

These are foods which offer more health benefits than just meeting the recommended daily intake. They can lower the risk of disease and

promote health because they contain biologically active ingredients, which can be whole, processed, fortified, enriched, and enhanced with nutrients, phytochemicals, dietary supplements, prebiotics and probiotics, or other processed food ingredients that impart or promote health (2). Functional foods can be classified based on their origin, functions, functional ingredients and according to their action.

Table 1 Classification of Functional Foods (Based on Functionality)

S.No	Based on Functionality	Example	Reference
1	Antioxidant properties	Allyl Sulfides-Garlic	(2)
		Carotenoids-Carrot	
		Polyphenols-Tea	
		Flavonoids- Fruits and Vegetables	
2	Hormonal Action	Isoflavones-Soybean	
		Indoles-Cabbage	
		Terpenes-Citrus Fruits	
3	Physical Action	Proanthocyanidins-Cranberries	
		Probiotic-Fermented Foods	
		Allicin-Garlic	

Table 2 Classification of Functional Foods (Based on Origin)

S.No	Based on Functionality	Example	Reference
1	Plants	β-glucan-Oats	(2)
		Tannins-Cranberries	
		Allium Sativum-Garlic	
2	Animals	Omega-3 fatty acids-Fatty fish	
		Probiotic-Fermented foods	
		Conjugated linoleic acid-Beef and some cheese	

Table 3 Classification of Functional Foods (Based on Bioactive Compounds)

S.No	Based on Bioactive Compounds	Example	Reference
1	Unmodified	Lycopene-Tomato	(2)
		Quercetin-Onion	
		Soluble fiber-Grains	
2	Modified	Omega-3 fatty acids enriched eggs	
		Vitamin D added fruit juice	
		Fortified Cereals	

Table 4 Classification of Functional Foods (Based on their Action)

S.No	Based on their Action	Example	Reference
1	Vitamins and Mineral Fortification	Vitamin-C, folic acid, calcium, iron	(2)
2	Cholestrol Reduction	Omega-3 fatty acid, phytosterols	
3	Phytochemicals	Carotenoids, lycopene	
4	Probiotic, prebiotic	Yogurt, Fruits	

Functional Compounds - Health Benefits

The demand and acceptance of functional foods is raising in present days and encompasses a wide range of foods that lower blood pressure, cholesterol, diabetes and cardiovascular disease. The two main benefits of functional foods on health are the improvement of physiological processes and reduce the risk of certain disease (3).

Probiotics

Probiotics are live microorganisms that, when consumed in appropriate amount, improve the balance of the intestinal microbiota. These organisms include *Lactoba cecillus* species, *Bifidobacterium* species, and yeasts. The harmless bacteria that normally live in the human gastrointestinal tract are usually the ones used to make probiotics. It has been demonstrated that some strains, when taken in sufficient amounts, have a good impact on human health. These effects include those related to cancer, hypertension, inflammatory bowel disease, diarrhoea, irritable bowel syndrome, and immune system activation (3).

Prebiotics

Certain food components that may benefit the host by enhancing the intestinal flora are referred to as prebiotics. These pass through digestion and end up in the colon. They promote some bacteria's activity and growth. Prebiotics provide benefits such as lowers the lipid level, anticarcinogenic, , glucose-modifying, and anti-osteoporotic properties. They can also be used to treat inflammatory bowel disease, hepatic encephalopathy, and constipation (4).

Synbiotics

synbiotics are combinations of probiotics and prebiotics that specifically stimulate the growth of living microbial food supplements in the gastrointestinal system, hence boosting their survival and implantation having a positive effect on the host. It enhance host wellbeing by stimulating the metabolism of one or a number of bacteria that promote health. Synbiotics have anti-microbial, anti-carcinogenic, anti-diarrheal, and anti-allergenic properties. They also prevent osteoporosis, lowers blood sugar and fat levels, regulate the immune system, and treat liver related brain dysfunction(5).

Carotenoids

The type of naturally occurring fat-soluble pigments called carotenoids are mostly found in plants, fruits, flowers, algae, and photosynthetic microorganisms. Carotenoids are essential for maintaining human health. Carotenoids have been shown to have preventive properties against major conditions like cancer, heart disease, and degenerative eye disease in more recent times (4)

Dietry Fiber

Dietary fibre is most frequently linked to promoting the health and preventing the disease. The potential to lower cholesterol, prevent obesity and diabetes, prevent colon cancer, and reduce the incidence of coronary and circulatory cardiac diseases are the health benefits associated with the consumption of dietary fibre (5).

Phytosterols

phytosterols are naturally occurred in a wide range of plants, including grains, legumes, fruits, vegetables, nuts, seeds, and vegetable oils. Sterols are structurally similar to cholesterol, but cholesterol is mostly derived from animals sources. Sterols are crucial parts of plant cell membranes. It is linked to a decrease the amount of cholesterol absorbed by the human intestinal tract and have the ability to lower blood cholesterol in humans. Plant sterols not only reduce cholesterol levels but also exhibit anti-inflammatory, anti-oxidative, anti-atherosclerosis, and anti-cancer properties (6).

Isothiocyanate

A group of phytochemicals known as isothiocyanates, which contains sulphur, is composed of a variety of distinct compounds. Glucosinolate conjugates, or isothiocyanates, are naturally occurring compounds found in cruciferous vegetables, which include cabbage, broccoli, cauliflower. Research has demonstrated that isothiocyanates and their metabolites reduce the incidence of lung, breast, liver, oesophagus, stomach, small intestine, and colon cancer (7).

Tocopherols

It is phenolic chromanol ring-containing lipid-soluble functional components. Nuts, vegetable oils, and the germ of cereals are excellent providers of tocopherols. They have the potential to be chemopreventive and immunomodulatory because they neutralise reactive oxygen species (8).

Flavonoid

The majority of plants contain flavonoids, which are known to have antiinflammatory, anti-carcinogenic, and antiallergic effects. Myricetin, chrysin and quercetin are the most significant flavonoids. Cereals are low in flavonoids, with the exception of barley, which has significant levels of di- and tri-procyanidins and catechin (9).

Increased fruit consumption enhances defence mechanism against oxidative damage and lipid peroxidation, two processes that may contribute to the development of cancer and other chronic illnesses. Citrus fruits have been shown to contain bioactive substances including limonene and flavonoids like hesperidin, quercetin, rutin, tangeritin, which may have anti-cancer properties. Pomegranates are rich in hydroxycinnamic acid which effective in preventing breast, prostate, and colon cancer. Red wine, berries, and grape skin all contain ellagic acid and resveratrol, which are known to have anti-inflammatory properties and to prevent the production of prostaglandins, which promote the growth of tumour cells (10).

Fortified or Enriched Functional Foods

The goal of food fortification/enrichment is to address any nutritional deficiencies that may exist in the general population both collectively and in vulnerable subgroups, whether a nutrient is found naturally in food or not. Minerals and vitamins can also be added to food to make up for deficiencies or to replace things that are thought to be substitutes (11).

Omega-3 Enriched Eggs

Commercial eggs are a poor source of omega-3 fatty acids but high in omega-6 fatty acids. The easiest method is to create eggs that are higher in linolenic acid, a precursor to DHA that is also thought to offer protection against deadly ischemic heart disease is hens are often fed with flaxseeds and linseeds, so the yolk of the egg is enriched with alpha-linolenic acid and has a higher concentration of DHA. Likewise eggs were also enriched with selenium, vit-D, E, B12 and folic acid will improve the functional property of eggs (12).

Oil fortified with Omega-3 Fatty Acid

Unsaturated fatty acids, or omega-3 fatty acids, can be found in nuts, seafood, green leafy vegetables, and fish oil. The most prominent types of omega-3 fatty acids in diets consist of DHA, EPA, and long-chain PUFA. Omega-3 fatty acid intake through diet lowers the risk of rheumatoid arthritis, osteoarthritis, and cardiovascular disease. Micronutrient-enriched rapeseed oil, such as phytosterols, tocopherols, and polyphenols useful in preventing atherogenesis. When it comes to improving the absorption of calcium by increasing the amount of soluble calcium in the small intestine, phenol enrichment of olive oils and vegetable oils fortified with palmitic acid has a synergistic effect on absorption of calcium and is therefore beneficial for baby foods, especially infant formula (13).

Fortified Milk

For the healthy bones of women's and children's, calcium-fortified milk and cheese are essential. Milk supplemented with calcium, vitamin D, magnesium, and zinc enhances vitamin D status, decreases parathyroid hormone levels, and slows down bone resorption (13). The composition of red blood cell membranes and human milk was enhanced by the consumption of DHA-fortified milk throughout pregnancy and lactation (14). A study also revealed that postmenopausal women who drink milk with a high calcium content are less likely to be overweight or obese (15).

Selenium Fortified Broccoli

Broccoli is considered to be an highly functional food because of its chemopreventive benefits, when it is consumed in moderation the benefits excludes potential hazards. Broccoli that has been fortified with selenium is useful in preventing cancer (16).

Conclusion

Hippocrates, the father of medicine, accepted the maxim, "Let food be thy medicine and medicine be thy food," 2500 years ago. Every food have their own role on supplying nutrients and therapeutic function towards the human body. Any substance that is a food or a component of a food that has health and additional advantages, such as the prevention and treatment of disease, is considered a functional food. Numerous studies have shown that functional foods can help to treat a number of non-communicable diseases, including obesity, diabetes, heart disease, and cancer. Phytochemicals, antioxidants, and bioactive ingredients found in functional foods have anti-microbial, anti-inflammatory, and anti-carcinogenic properties helps to maintain better health.

References

1. Sharma, N., & Sarwat, M. (2022). Functional foods for better health and weight loss. *Annals of Phytomedicine*, 11(2), 114-121.
2. Jibril, H., & Abubakar, S. A. (2021). Basis for classification of functional foods: A review. *Bayero Journal of Pure and Applied Sciences*, 13(1), 138-144.
3. de Pinho Ferreira Guine, R., & Joao Reis Lima, M. (2012). Some developments regarding functional food products (functional foods). *Current Nutrition & Food Science*, 8(2), 102-111.
4. Guiné, R. P. F., Lima, M. J. R., & Barroca, M. J. Functional components of Foods. 2010. *Food, Diet and Health. Past, Present and Future Tendencies* (ed. RPF Guiné). Nova Science Publishers, New York, 59-135.
5. Hasler, C. M. (2002). Functional foods: benefits, concerns and challenges—a position paper from the American Council on Science and Health. *The Journal of nutrition*, 132(12), 3772-3781.

6. Adebawo, O., Salau, B., Ezima, E., Oyefuga, O., Ajani, E., Idowu, G., ... & Osilesi, O. (2006). Fruits and vegetables moderate lipid cardiovascular risk factor in hypertensive patients. *Lipids in health and disease*, 5(1), 1-4.
7. Hecht, S. S. (2004). Chemoprevention by isothiocyanates. In *Cancer Chemoprevention: Promising Cancer Chemopreventive Agents* (pp. 21-35). Totowa, NJ: Humana Press.
8. Sharma, N., & Sarwat, M. (2022). Functional foods for better health and weight loss. *Annals of Phytomedicine*, 11(2), 114-121.8
9. Sidhu, J. S., Kabir, Y., & Huffman, F. G. (2007). Functional foods from cereal grains. *International Journal of Food Properties*, 10(2), 231-244.
10. Bisen, P. S. (2016). Therapeutic and preventive potential of functional food and cancer. *Cancer Med Anticancer Drug*, 1, e101.
11. Sicinska, E., Jeruszka-Bielak, M., Masalska, K., & Wronowski, S. (2013). A survey of foodstuffs fortified with vitamins available on the market in Warsaw. *Roczniki Państwowego Zakładu Higieny*, 64(4).
12. Surai, P. F., & Sparks, N. H. C. (2001). Designer eggs: from improvement of egg composition to functional food. *Trends in food science & Technology*, 12(1), 7-16.
13. Rajasekaran, A., & Kalavani, M. (2013). Designer foods and their benefits: A review. *Journal of food science and technology*, 50, 1-16.
14. Atalah S, E., Araya B, M., Rosselot P, G., Araya L, H., Vera A, G., Andreu R, R., ... & Rodriguez, L. (2009). Consumption of a DHA-enriched milk drink by pregnant and lactating women, on the fatty acid composition of red blood cells, breast milk, and in the newborn. *Archivos Latinoamericanos de Nutrición*, 59(3), 271-277.
15. Angeles-Agdeppa, I., Capanzana, M. V., Li-Yu, J., Schollum, L. M., & Kruger, M. C. (2010). High-calcium milk prevents overweight and obesity among postmenopausal women. *Food and nutrition bulletin*, 31(3), 381-390.
16. HSU, F. C., Wirtz, M., Heppel, S. C., Bogs, J., Krämer, U. T. E., Khan, M. S., ... & Rausch, T. (2011). Generation of Se²⁺-fortified broccoli as functional food: impact of Se fertilization on S metabolism. *Plant, cell & environment*, 34(2), 192-207.