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Functional Foods: Hopefulness to Good Health

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Abstract: Functional foods will be hopeful to good health in the future because it have been classified either as preventive or therapeutic purpose and used alone or mixed together for prevention some of certain diseases. Therefore, functional foods help the rights of protection from many modern diseases that we see today. However, increasing and varieties of the functional foods are a challenging perspective for promotion and formulation of healthy food and which can be useful for enhancements of the human health.

Key words: Functional foods, protective and therapeutic food, certain diseases, enhancements of the human health

INTRODUCTION

In light of the tremendous development in the technology industry and the competition between nations to catch up with civilization and technology led to environmental changes and change in human behavior and food habits and was surrounded by a set of risks resulted from the environmental pollution or caused by excessive use of agricultural techniques and pesticides and heavy metals pollution. The interest in developing functional foods is thriving, driven largely by the market potential for foods that can improve the health and well-being of consumers. Historically, long-established food traditions and the knowledge of what foods are and how they should be eaten have neutralized the food-related anxieties. Nowadays, medical science, food science and nutrition have replaced those traditions and set up new rules for our eating (Beardsworth and Keil, 2001).

Functional foods includes foods or food ingredients that exert a beneficial effect on human health and/or reduce the risk of chronic disease beyond basic nutritional functions (Huggett and Schliter, 1996).

For healthy growing and life, must daily diet contain a healthy functional food ingredients. Consumers judge food products not only in terms of taste and nutritional needs, but also in terms of the ability to improve their health and well-being. Functional foods and functional food ingredients exert a beneficial influence on body functions to help improve well-being and health and/or reduce the risk of chronic diseases. Functional food can be produced by addition of health-promoting component(s), by reducing/removing harmful components and/or by modifying the nature or the bioavailability of specific components. On the road to optimize nutrition that will be one of the major challenges of nutrition in the twenty-first century, functional foods have their own role to play. But the development of claims for already existing food products, as well as the development of new products and their own claims, should remain first a scientific challenge and not only a marketing challenge. This is the condition for success to the benefit of both human health and the food industry (Verschuren, 2002).

There are indications for some beneficial effects of functional foods on the developing immune response, for example induced by antioxidant vitamins, trace elements, fatty acids, arginine, nucleotides and altered antigen contents in infant foods. Peak bone mass at the end of adolescence can be increased by dietary means, which is expected to be of long-term importance for the prevention of osteoporosis at older ages (Koletzko *et al*., 1998).

This study is concerned with the trend towards the development of functional foods as a preventive or therapeutic purpose for prevention some of certain diseases and for promotion the human health in developed countries and related with food in the ancient world.

Definition of Functional Foods

Expanding knowledge of the role of physiologically active food components, from both plant (phytochemicals) and animal (zoochemicals) sources, has notably changed the role of diet in health. This led to the development of a new generation of foods termed functional foods. These foods provide health benefits beyond the basic nutrition needs (National Academy of Sciences, 1998). The term Functional Foods was first introduced in Japan during the eights of the last Century with the development of a special seal to denote Foods for Specified Health Use (FOSHU) which refers to processed foods containing ingredients that enhance specific body functions, in addition to being nutritious. FUFOSE developed a working definition for a functional food as Food that satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and wellbeing and/or reduction of risk of disease. In the context of this working definition, a target function is a specific biological activity in the body targeted by the intervention to maintain or improve health, well-being and/or reduction of risk of disease.

The American Dietetic Association (ADA) takes one of the most inclusive views to define functional foods. The American Dietetic Association (1999) described functional foods as any potentially healthful food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains" and also made the following very important points:

- Functional foods may be whole, fortified, enriched, or enhanced foods
- It's likely that all foods are functional at some physiological level
- To have a beneficial effect on health, a functional food should be consumed as part of a varied diet on a regular basis, at effective levels

In the nineties, the European Commission (EC) funded an activity to establish a science-based approach to explore the concept of functional foods. This Concrete Action i.e., Functional Food Science in Europe (FUFOSE), involved a large number of European experts in nutrition and related sciences. The FUFOSE produced a consensus report that has become widely used as a basis for discussion and further evolution of thinking on the topic. A working definition of functional food has been developed by FUFOSE that a food that beneficially affects one or more target functions in the body beyond adequate nutritional effects in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease.

The International Food Information Council (IFIC, 1998) defines functional foods as foods that provide health benefits beyond basic nutrition. The nutritional science evolved from identifying and correcting nutritional deficiencies to design foods that promote optimal

health and reduce the risk of chronic disease. Focus group research showed that functional foods was recognized readily and was preferred by consumers over other terms such as nutraceuticals or designer foods (IFIC, 2002a). This definition is similar to that of the International Life Sciences Institute of North America (ILSI), which has defined functional foods as foods that, by virtue of physiologically active food components, provide health benefits beyond basic nutrition (ILSI, 1999).

The Food and Nutrition Board of the National Academy of Sciences described a functional food as, any modified food or food ingredient that may provide a health benefit beyond that of the traditional nutrients it contains (Food and Nutrition Board,1994). A variety of terms have appeared world-wide such as nutraceuticals, medifoods, vitafoods and the more traditional dietary supplements and fortified foods. However, the term functional foods has become the predominant one even though several organizations have attempted to differentiate this emerging food category. Health Canada, for instance, defines a functional food as similar in appearance to a conventional food, consumed as part of the usual diet, with demonstrated physiological benefits and/or to reduce the risk of chronic disease beyond basic nutritional functions and a nutraceutical as a product isolated or purified from foods that is generally sold in medicinal forms not usually associated with foods (Health Canada, 1998). In Korea, functional foods are defined as dietary supplement whose purpose is to supplement the normal diet and have to be marketed in measured doses, such as in pill, tablets. However, functional foods are generally considered as those foods which are intended to be consumed as part of the normal diet and that contain biologically active components which offer the potential of enhanced health or reduced risk of disease.

Examples of Functional Foods

Functional foods include foods that contain specific minerals, vitamins, fatty acids or dietary fibre, foods with added biologically active substances such as phytochemicals or other antioxidants and probiotics that have beneficial effects on life. According to this definition, unmodified whole foods such as fruits and vegetables may be considered as the simplest form of a functional food. For example, broccoli, carrots, or tomatoes would be considered functional foods because they are rich in physiologically active components such as sulforaphane, β-carotene and lycopene, respectively. Also, modified foods, including those that have been fortified with nutrients or enhanced with phytochemicals or botanicals fall within the realm of functional foods. In addition, food biotechnology will continue to provide new venues for functional food development. Table 1 show examples of some functional foods and their potential health benefits (American Dietetic Association, 1999; Mazza, 1998; Wildman, 2001).

Functional Foods and the Ancient Civilizations

Wheat has been used as a food grain since the last Stone Age. It can be considered the oldest domesticated crop grown for food-dating from 8,000-10,000 B.C. In fact, the ancient civilizations such as Egyptian, Babylonian, Greek, Cretan and Roman were highly dependent on wheat and barley as the principal food. Einkorn, Emmer, Khorasan/Kamut and Spelt are among the earliest cultivated wheat and are commonly referred to as ancient wheat. Some of the oldest and most complete written records about the use of herbs as supplements were recorded thousands of years ago in Egyptian hieroglyphics. The most famous of these writings is known as the Papyus Ebers, which note the medicinal uses of over 700 herbs and plants. Many of the herbs recorded in this document back in 1500 B.C. are still in use today, *aloe vera* being one well-known example.

Table 1: Examples of some functional foods and their potential health benefits

Functional food	Potential health benefits
Whole foods	
Black and green tea	Reduce risk for cancer
Broccoli	Reduce risk for cancer
Fish	Reduce risk for heart disease, reduces cholesterol and triglycerides
Fruits and vegetables	Reduces risk of certain cancers and heart disease, reduces hypertension
Garlic	Reduces risk of heart disease and certain cancers, reduces cholesterol
Flaxseed	Reduces risk of heart disease and certain cancers, reduces triglycerides, increases blood-glucose control
Enriched foods with fibers	
Grains	Reduces risk of certain cancers, heart disease, and nutrient deficiencies
Fortified foods	
Juices with calcium	Reduces risk of osteoporosis, reduces hypertension
Grains with folic acid	Reduces risk of heart disease and neural tube birth defects
Infant formulas with iron	Reduces risk of iron deficiency
Grains with added fibre	Reduces risk of certain cancers and heart disease, reduces cholesterol and constipation, increases blood-glucose control
Milk with vitamin D	Reduces risk of osteomalecia and osteoporosis
Juices with added fibre	Reduces risk of certain cancers and heart disease, reduces cholesterol, hypertension, and constipation
Enhanced foods	
Dairy products with probiotics	Reduces risk of colon cancer and candidal vaginitis, controls inflammation, treatment of respiratory allergies, diarrheal disorders and eczema
Fish oil with omega-3 fatty acids	Reduces risk of heart disease

Adopted from American Dietetic Association (1999), Mazza (1998) and Wildman (2001)

The Egyptians buried their Pharaohs with all kinds of earthly belongings. Three thousand-year-old seed corn found in Egyptian tombs was made to sprout and grow. There are still many tombs that might be discovered to shed more information on this topic. More writings and possibly some preserved herbal remedies could one day be exhumed. One interesting discovery is that ultrasound tests indicate there is a hidden room in the ground underneath the great sphinx. Cereal foods formed the main backbone of their diet from the predynastic period onward. Even for the rich, this staple mean generally consisted of a variety of different breads and barley often with other ingredients mixed. Also, ancient Egyptians ate vegetables, fruit and fish. They often ate beans, chick peas, lentils and green peas, just as modern Egyptians do today. Leeks and Egyptian lettuce was also popular. garlic were eaten, as well as thought to repel agents of diseases and onions were popular, as well as being used for medical purposes. The most popular fruit in ancient Egypt was probably dates of palm, which are rich in sugar and protein. They used the honey as a sweetener. While milk, cheese and butter are not well attested to, at least in text, we certainly believe that the early Egyptians were familiar with all of these dairy products. We do find a number of scenes showing men carrying what appears to be pots of milk or cream and in one Theban tomb from the 19th dynasty, we find a seated woman pulling white cones of what is probably butter or cheese out of a large vessel (Ian, 2000; Eugen, 1992).

The basic food of Sumerian diets were of barley and wheat cakes as the staple diet together with grain and legume soups, onion, leeks, garlic and melon. Besides farmed vegetables, Sumerian food also included fruits. These were apples, fig and grapes. Several culinary herbs and honey and cheese, butter and vegetable oil have also been mentioned in later Sumerian food records (Tannahill, 1988).

In the first century AD, the Greek physician Dioscorides made a thorough record of the medicinal uses of over 500 herbs and plants. This record, named De Materia Medica, informed and influenced herbalists for centuries afterward. Pedanius Dioscorides was an ancient Greek physician, pharmacologist and botanist from Anazarbus, Cilicia, Asia Minor,

who practiced in ancient Rome during the time of Nero. He had the opportunity to travel extensively seeking medicinal substances from all over the Roman and Greek world. Dioscorides is famous for writing a five-volume book in his native Greek that is a precursor to all modern pharmacopeias and is one of the most influential herbal books in history. In fact it remained in use until about CE 1600. Unlike many classical authors, his works were not rediscovered in the Renaissance, because his book never left circulation (Gunther, 1933).

Bread accompanies all meals. It is great variety of foods were available in ancient Greece. They consumed small amounts of mainly simple dishes such as the Melan Zomos (black broth)-a hearty, thick, meatless soup possibly made with special varieties of black chick peas (-or other legumes and vegetables. Bread, olive oil and other foods that are derived from hunting, fishing or simple gathering become basic and necessary products in the Greek diet (Zouraris, 1998).

Pepper appears in medical and literary writers from the fourth century BC to the cookery book of Apicius in late antiquity. The spice was valued both as a flavour and for its heating qualities in medicine. Ginger was a key import from distant lands. The Greeks used incense and myrrh from an early date; pepper and other strong flavours with pharmacological applications were the first mentioned in Hippocrates; imports seem to have developed apace after the time of Alexander through to the Roman imperial period (Miller, 1969).

Herbal remedies were widely used in the Roman Empire, including crushed mint leaves, basil, oregano and mandrake herb. Other early uses of plants in Rome were for the poisoning of political opponents and for antidotes to poisons. Wheat is the main ingredient in bread, which, along with circuses, the public of Rome clamored for, according to Juvenal. Also, Garum was a Roman fish sauce.

An ancient Babylonian burial site that was discovered by archeologists contained various preserved medicinal herbs, including marshmallow root. These are thought to be some 60,000 (or 6000) years old and are the oldest intact examples of herbal remedies. In ancient cultures, people were often buried with treasures and items that would help them in the after life. In later eras, Babylonians recorded their medical uses for herbs onto clay tablets in cuneiform writing. Tablets have been found dating from around 2600 B.C. that record the uses for honey, poppy juice, essential oil of cypress and cedar, myrrh, licorice and other remedies which today are used every day by people all around the world.

Functional properties of barley was used in ancient Arab as a protective and therapeutic food. They have formulated from barley the Talbina. It is a meal made from satoo, formed by adding milk and honey to the dried barley powder. They reported Talbina could to be very nutritious, beneficial in coughs and inflammation of the stomach and to have the ability to expel toxins from the body and act as a good diuretic. It gives rest to the heart of the patient and makes it active and relieves some of his sorrow and grief (Ibn al-Qayyim Aljouzi in 1292-1350CE; Ibn Khaldun, 1867).

Chinese medicine is famous for its extensive use of herbs and plants. For over five thousand years, Chinese herbalists have used ginkgo biloba tree leaves, ginseng roots, Cordyceps mushrooms, teas and many other herbs and health tonics to support good health. The Chinese have been treating illnesses and disease with functional ingredients of herbs as far back as the 3rd century BC; the same tradition is widely used today. Herbal medicine is based on the theory of Yin and Yang where everything has an equal, for example for good there is bad, light there is dark. This theory correlates to the body in that elements in the body are out of harmony and body may lack vitality. Chinese herbal medicines are mainly plant based, but some preparations include minerals or animal products. They can be packaged as powders, pastes, lotions or tablets, depending on the herb and its intended use.

Different herbs have different properties and can balance particular parts of the body. Prescribing a particular herb or concoction of herbs means the practitioner's diagnosis has to take into account the state of the patient's Yin and Yang and the elements that are governing the affected organs. Chinese herbal remedies are made up of one or two herbs that are said to have the greatest effect on major aspects of the problem being treated. The other herbs in the formula treat minor aspects of the problem, direct the formula to specific parts of the body and help the other herbs work more efficiently (Wright, 2004).

Recently, there has been a shift in universal trend from synthetic to herbal medicine, which we can say Return to Nature. Medicinal plants have been known for millennia and are highly esteemed all over the world as a rich source of therapeutic agents for the prevention of diseases and ailments. Countries with ancient civilizations are still using several plant remedies for various conditions. The demand for plant based medicines, health products, pharmaceuticals, food supplement, cosmetics etc are increasing in both developing and developed countries, due to the growing recognition that the natural products are non-toxic, have less side effects and easily available at affordable prices (Kalia, 2005).

Functional Foods and Health

Food has long been associated with health. Every individual requires, roughly, the right combination of foodstuffs at the right time and in the right amounts in order to maintain health and enjoy broader human flourishing. Functional foods could potentially be used for improved health or well-being in a range of areas, including cardiovascular system, gastro-intestines, growth, metabolism, defense against free radical oxidation and to enhance psychological functions. Although safety issues are paramount in food production and nutrition, functional foods differ from more traditional products, as they also raise issues of efficacy. Whilst the avoidance of food-borne pathogens, allergens and toxins is an issue for all foods, the achievement of a health or well-being benefit is not. Usually this benefit is restricted to drugs for which stringent efficacy tests apply (Dawson, 2007).

There are a wide range of products and developments that provide examples for the changing relationship between food and health because of the increasing attention to the health-diet interaction. The idea that food habits have direct influence on one's health is certainly not new, but the attention paid to this relation is increasing. Ongoing research yields new insights regarding the relation between food habits and the increase or decrease of the incidence of varies aliments, such as certain types of cancer and different forms of cardiovascular diseases. These scientific developments have not only resulted in extensive literature on the impact of food habits on health, but also in practical dietary advice. The daily recommended intake of 200 g vegetables and 2 pieces of fruit is a good example of an effective guideline to decrease the risk of these ailments. On the other hand, there is an increased attention to the health-diet interaction as a result of the combination of enough safe but unhealthy food in the Western world and lifestyle habits of many individuals which resulted, for example, in the problem of obesity. In spite of the clear and practical general dietary advices, compliance rates are very low and even if they are followed, they are often combined with all kinds of other unhealthy (food) habits. The epidemic character of obesity has alarmed different groups and organizations within society all over the World and has resulted in a strongly increased awareness of the health aspect of food products and dietary patterns (Meijboom, 2007; WHO, 1998; Astrup, 2004).

Preparation and evaluation of formulated functional cheese cake and yoghurt cake for diabetics to assess benefits on health have been studied by Abdel-Salam and Ahmed (2007) and Abdel-Salam *et al.* (2009a). The obtained data showed that formulated functional cheese

cake with fructose, whole wheat, egg white, skimmed milk, kareesh cheese and olive oil or yoghurt-cake containing hot water extract of stevia, whole wheat flour, egg white, skimmed milk, yoghurt, orange peels, lemon rind and olive oil would be a great meal replacement diet for diabetics.

Many studies have highlighted the food in relation to the public's health. For example, Meijboom (2007) focused on the nature and importance of trust as a value in relation to food issues. Trust is a social value: it can only exist where people relate to each other in an appropriate way within the context of some form of social grouping, such as a community or population. Meijboom (2007) explored the difficulties of information provision in relation to functional foods and personalized diets and argues that the complexity of such information means that trust is more important in relation to food than it has ever been. Doris Schroeder also focuses on recent technological developments through a discussion of a set of issues relating to so-called functional foods: that is food that seeks to perform an additional role beyond the mere nutritional, such as enhancing health, delivering medicines, or preventing disease (Dawson, 2007).

Few other aspects of food supply and metabolism are of greater biological importance than the feeding of mothers during pregnancy and lactation and of their infants and young children. Nutritional factors during early development not only have short-term effects on growth, body composition and body functions but also exert long-term effects on health, disease and mortality risks in adulthood, as well as development of neural functions and behaviour, a phenomenon called 'metabolic programming'. The evaluation of dietary effects on child growth requires epidemiological and field studies as well as evaluation of specific cell and tissue growth. Novel substrates, growth factors and conditionally essential nutrients (e.g., growth factors, amino acids, polyunsaturated fatty acids) may be potentially useful as ingredients in functional foods and need to be assessed carefully. Intestinal growth, maturation and adaptation as well as long-term function may be influenced by food ingredients such as oligosaccharides, gangliosides, high-molecular-mass glycoproteins, bile salt-activated lipase, pre- and probiotics.

Functional Dairy Products and its Beneficial Effect on Human Health

Milk as a nutritional food has recently been the topic of research and discussion related to weight management. In fact, consumption of dairy products has been linked to several health benefits that are the direct antitheses of diseases and complications that arise from overweight and obesity. For example, individuals that consume low-fat dairy products are more likely to have lower weight (Zemel, 2004), lower blood pressure (Moore *et al*., 2005; Vollmer *et al*., 2001) and decreased risk of stroke (Abbott *et al*., 1996), colon cancer (Kampman *et al*., 2000; Holt, 1999) and osteoporosis (Mccabe *et al*., 2004; Savaiano, 2003; Zemel, 2002). Heaney *et al*. (2002) re-examined calcium-related blood pressure and bone studies and reported a strong relationship between dairy consumption and weight reduction. Protein components in milk provide high branched chain amino acid content which help to maintain lean muscle tissue. Several components found in skim milk may have a protective effect against the onset of disease that occurs as a result of obesity. Many of the components found in skim milk can be isolated and used in specific applications for individuals that do not consume dairy or may be lactose intolerant (Dangin *et al*., 2001; Layman, 2003; Layman and Baum, 2004).

Another study concluded that lipid peroxidation induced by lead can be counteracted by ingestion of Capparis, Artemisia and whey proteins (Abdel-Salam *et al.,* 2009b).

Mixtures of probiotics and prebiotics, which favourably modify the gut flora and its metabolism by increasing the survival of health-promoting bacteria, are described as synbiotics. The major applications for probiotics are in dairy foods while prebiotics are added to dairy products, table spreads, baked goods and breads, breakfast cereals and bars, salad dressings, meat products and some confectionery items.

Abdel-Salam *et al.* (2008) showed that probiotic labneh containing garlic and onion oil demonstrated a protective effect and reduced the total worm couple, male and female as well as, ova in liver and intestine in mice infected with *S. mansoni.* Also, probiotic labneh containing garlic or onion oil increased the dead oogram in mice infected with *S. mansoni.* It can be concluded that probiotic labneh containing garlic and onion oil may be play a great role as a protective food against infectious diseases such as Schistosomiasis. Also, another study investigated the biological effects of aqueous herbal extracts (aqueous extracts of fenugreek, greater burdock, goat's rue, colocynth, chicory and lupine) mixed with stirred yoghurt filtrate against alloxan-induced oxidative stress and diabetes in rats and concluded that mixture of medicinal plant extracts and stirred yoghurt filtrate may play a role in protection against alloxan-induced oxidative stress and diabetes in rats (Al-wabel *et al.,* 2008). Probiotic yoghurt displays an immunmoprophylactic effect by stimulating plasma immunoglobulin response, which improved the liver and spleen weight to be nearest to the control. In addition, the activities of aspartate transaminase (AST), lactate dehydrogenase (LDH) and g-glutamyl transferase (gGT) were significantly increased in the infected group compared to the control (Ghanem *et al.,* 2005).

The biological evaluation of a symbiotic fermented milk synergistic with some active ingredients of herbal and honey on the sexual activity, semen characteristics and testosterone levels in Ardhi and Damascus goat's bucks have been studied by Al-Sobayil *et al.* (2008). Results showed that giving goat bucks a mixture of a synbiotic functional syrup enhanced the metabolic activity resulting in improvements in their reproductive performance. The antibacterial effect of labneh containing aqueous extracts of oregano, marjoram, sage and licorice against *E. coli* and *B. subtilis* were demonstrated an inhibitory effect against both organisms (Al-Turki *et al.*, 2008). Probiotic fermented milk containing honey, garlic, ginseng, cod liver oil and chicory was enhanced the role of protection against lead acetate contamination in rats by increasing the activity of the antioxidant enzymes that requires the antioxidant glutathione as substrate, thus protecting the liver against the oxidative damage (Al-Wabel *et al.*, 2008).

Supplementing or administering specific ingredients in hydrolysate form with beneficial probiotic bacteria to ruminant animals were a promising area of a study reported by Al-Sobayil *et al.* (2010). This was evident as to promote the foetal growth and enhance the secretory activity of the corpus luteum in Najdi ewes. They concluded that, the administration of a synbiotic formula to oestrous-synchronized Najdi ewes resulted in increased lamb birth weight and elevated the progesterone pattern throughout pregnancy. Other functional foods and its beneficial effect on health:

Fatty acids found in fish and fish oil have gained interest and publicity for their role in the prevention and management of cardiovascular disease. Holub (2002) described in detail the specific fish oil fatty acids and their use in a variety of clinical trials for the treatment and prevention of atherosclerosis and cardiovascular disease (Holub, 2002). He defined the use of fish oil fatty acids in functional foods that were effective in the prevention of several common diseases. Omega-3 fatty acids, which are found mostly in fish oil, have been recognized for several decades as important in nervous system integrity, particularly during development (Holub, 2002; Uauy *et al.*, 1996). Indeed, fatty acids contained within retinal

Table 2: Diseases affected by omega-3 fatty acid intake and potential mechanisms of action

Disease	Potential mechanisms of action of omega-3 fatty acids	References
Coronary heart disease and stroke	• Prevent arrhythmias (ventricular tachycardia and fibrillation) • Are prostaglandin and leukotriene precursors • Have anti-inflammatory properties • Inhibit synthesis of cytokines and mitogens • Stimulate endothelium-derived nitric oxide • Are antithrombotic • Have hypolipidemic properties with effects on triglycerides and VLDLs • Inhibit atherosclerosis	Connor (1994, 2000)
Essential fatty acid deficiency during development	Are an important constituent of the membrane phospholipids in the brain and retina	Dm *et al.* (2000)
Autoimmnne disorders including lupus and nephropathy	• Ire involved in suppression of cell-mediated immnne responses • Inhibit the fnnction of monocytes • Inhibit the production or action of cytokines and eicosanoids • Stabilize renal function	Hughes and Pinder (2000), Donadio (2000)
Inflammatory bowel disease	• Have anti-inflammatory properties • Inhibit interleukin-1β • Inhibit tumour necrosis factor production • Are free radical scavengers • Decrease platelet responsiveness	Belluzzi *et al.* (2000)
Breast, colon and prostate cancers	Inhibit tumour growth	Sauer *et al.* (2000)
Rheumatoid arthritis	• Alter eicosanoid metabolism • ameliorate inflammation	Kremer (2000)

Adopted from Jones (2002)

membrane phospholipids are made up of over 50% omega-3 polyenoic fatty acids, which means that there is a critical demand for these essential fatty acids at certain developmental stages (Gibson and Makrides, 2000). A diet rich in linoleic acid (an omega-6 fatty acid), but low in linolenic acid (an omega-3 fatty acid), was shown to result in episodes of numbness, paresthesia, weakness, inability to walk, pain in the legs and blurred vision in a 6-year-old girl maintained on total parenteral nutrition for 5 months. When linolenic acid was returned to the diet, the child's neurological symptoms disappeared. It was estimated that the requirement for linolenic acid is about 0.54% of energy intake (Holman *et al.*, 2002). Table 2 shows the diseases affected by omega-3 fatty acid intake and potential mechanisms of action.

Hasler (1998), IFIC (1998, 2002b) and American Dietetic Association (1999) reported that many niformations about the other functional foods as follow:

- Garlic has been thought to have medicinal properties for thousands of years and has been used for a wide variety of purposes. Its best-documented effect is its potential ability to lower blood cholesterol levels to a modest extent. Several studies in human volunteers have demonstrated this effect, but experts disagree on whether a clinically meaningful benefit has been proven
- Green Tea contains substances, especially polyphenolic components known as catechins, may reduce the risk of various types of cancer
- Tomatoes and tomato products are the most important sources of the carotenoid lycopene. Like the better- known carotenoid beta-carotene, lycopene is a strong antioxidant. Studies in human populations suggest that high intakes of tomato products or high blood levels of lycopene may be associated with reduced risks of various types of cancer, especially prostate cancer

- Vegetables might help to protect against age-related macular degeneration, an eye disease that is an important cause of blindness among older people
- The health claim that the consumption of soy protein is associated with a reduction in the risk of coronary heart disease is permitted to appear on packaging for soy protein products under the Dietary Supplement Health Education Act (DSHEA). The FDA concluded that soy protein that is included in a diet low in saturated fat and cholesterol may reduce the risk of coronary heart disease by lowering blood cholesterol levels
- Conjugated linoleic acid (CLA), on the other hand, is a zoochemical. It is found primarily in dairy products and in meats from ruminant animals (e.g., beef or lamb). Preliminary research, conducted mostly in experimental animals, suggests that CLA might help to inhibit breast cancer, increase muscle mass, decrease body fat and increase bone density. Only a small amount of research has been conducted on the effects of CLA in humans, however and the results of that research have not been completely consistent. The evidence for a beneficial effect of CLA is therefore regarded as weak
- A great deal of scientific evidence indicates that the consumption of fruits and vegetables is associated with a reduced risk of cancer. Whether certain types of fruits or vegetables are more beneficial than others is less clear. One group of vegetables that has been suggested to be particularly valuable is the cruciferous vegetables. This group includes arugula, bok choy, broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi, mustard greens, radishes, rutabaga, turnip, turnip greens and watercress
- Cranberry juice has been tested for its use to prevent blocking of urinary catheters, to deodorize urine and to heal skin around stomas and for its properties as anticarcinogen, antifungal and antioxidant. Most research has been done on the prevention and treatment of urinary tract infections. First is was believed that cranberry acted by acidifying urine or by the bacteriostatic activity of hippuric acid. Later is was discovered that cranberry juice acted by reducing the adherence of bacteria to the epithelial cells of membranes. Cranberry juice is more effective in preventing bacteria for adhering to epithelial cells than removing bacteria already attached to cell membranes. Therefore, cranberry juice is more effective in preventing than treating urinary tract infections. Traditionally, cranberry has been used for the treatment and prophylaxis of urinary tract infections. Research suggests that its mechanism of action is preventing bacterial adherence to host cell surface membranes. Cranberry is a safe, well-tolerated herbal supplement that does not have significant drug interactions (Schlager *et al*., 1999; Sobota, 1984)
- Cruciferous vegetables have been thought to be especially good cancer-fighters because they contain phytochemicals that may protect against cancer, including isothiocyanates and indoles. These vegetables also provide vitamin C and fiber and some provide vitamin A-precursor carotenes, folic acid, calcium and/or iron as well

Finally, the beneficial effects of functional foods can be concluded (IFIC, 1999, 2002b) that:

- Reduced risk of cardiovascular diseases
- Reduced risk of cancer
- Weight loss/management
- Reduced osteoporosis
- Improved memory

- Reduced risk of other diseases
- Improved mental health
- Quicker reaction time
- Improved fetal health

In conclusion, functional foods will be Hopeful to good health in the future. It have been convincingly demonstrated to be beneficial for their intended purposes when consumed as part of a generally well-balanced and healthful diet. Also, more information must be available to assist consumed for the correct choosing and using the functional foods any to achieve the promised health benefits.

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