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Role Of Nutraceutical In Disease Therapy.

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ABSTRACT

The present review has been devoted towards better understanding of the nutraceutical role in disease therapy. Some popular nutraceuticals include ginseng, folic acid, green tea, cod liver oil etc. Nutraceutical has led to the new era of medicine and health. The “nutraceutical” coined from “Nutrition” and “Pharmaceutical”. Nutraceuticals are products, which other than nutrition is also used as medicine. About 2000 year ago, Hippocrates correctly focus on “Let food be your medicine and medicine be your food”. The food product used as nutraceuticals can be categorized as prebiotics, dietary fiber, PUFA, probiotics, antioxidants etc. Nutraceutical is used to improve health, prevent chronic disease, delay the aging process, increase life expectancy, or support the structure or function of the body.

Keywords Nutraceutical; Polyunsaturated fatty acids; Probiotics; Disease.

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INTRODUCTION

The nutraceutical term was considered as in 1989 by Dr. Stephen De Felice, founder and chairman of the founding foundation Medical Innovation, an American organization based in Cranford, New Jersey. Drs. Stephen De Felice coined the term "Nutraceutical" from "Nutrition" (a nourishing food or food component) and "Pharmaceutical" (a medical drug) in 1989 [1, 2].

Nutraceutical is used to achieve the desired treatment results that reduce side effects. Chemicals and food play an important role in the normal functioning of the body. It can help preserve individual health and reduce the risk of various diseases. An Ayurvedic proverb states, "If food is bad, medicine is useless; where food is needed medicine is not needed" [3]. Nutraceutical used in health care, prevention of chronic diseases, slowing down the aging process, prolonging life, or supporting or performing physical activity. [4]. The Greek physician Hippocrates embraced the philosophy of diet as a medicine, with his famous saying "Let food be medicine and medicine be food". Nutraceutical are known as bioactive substance that are present in common food. Nutraceuticals are faster growing in sector of industry and the global Nutraceutical market is estimated as USD 117 billion [5]. Nutraceutical cover most of the therapeutics areas such as anti- arthritic, cold and cough, sleeping disorders, osteoporosis, blood pressure, digestion and prevention of certain cancers, cholesterol control, blood pressure, pain killers, diabetes, and depression (Fig. 1). The leading countries having nutraceutical markets include USA, UK, and Japan (Fig. 2) (BCC Research)

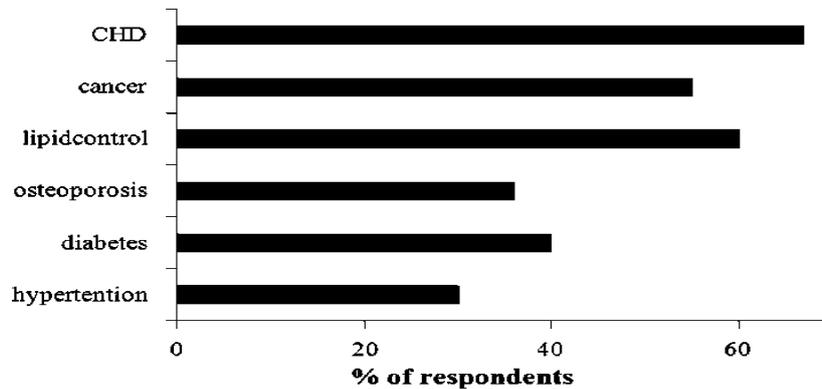


Figure 1: Therapeutic areas covered by nutraceutical products

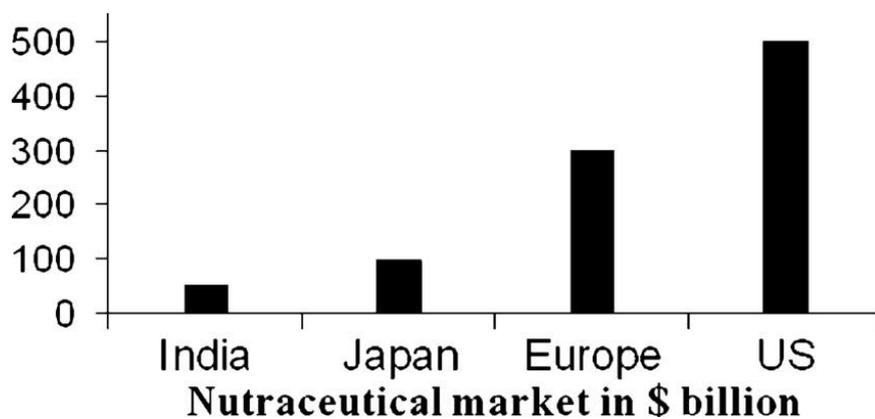


Figure 2: Nutraceutical market in \$ billion

Concepts Of Nutraceutical

It is a process of drug development, in which we study clinical trials and the effects of animal validation. In nutraceutical there is no way to ensure food in the prevention of diseases in the past. Over

the years however as the composition of food has been scientifically proven to cause lifestyle- related diseases [6].

From point of view in consumers, functional foods and nutraceutical may offer many benefits:

- May benefit in psychological from doing something for one self.
- May benefits in delay the aging.
- Prevent in chronic disease.
- Provide protection against chronic disease.
- Support the structure or function of the body.
- May present food for populations with special needs (e.g., nutrient-dense foods for the elderly).

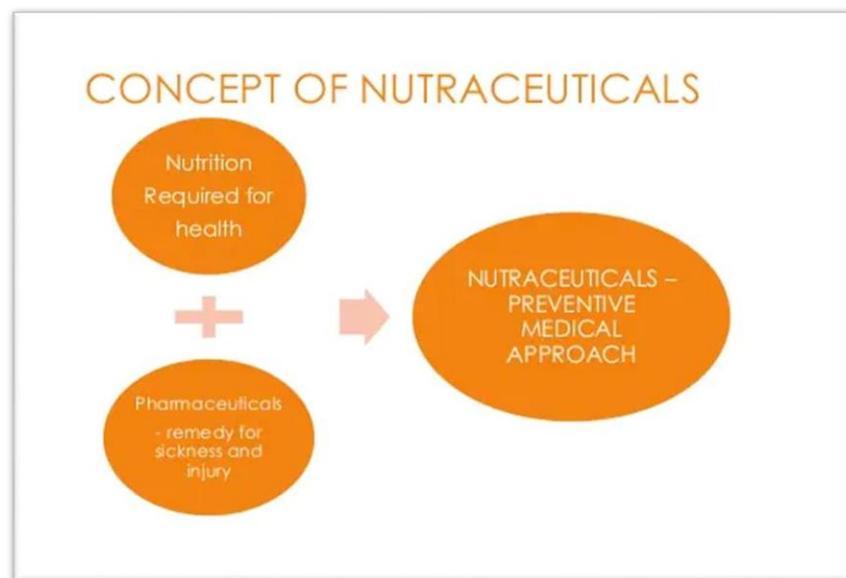


Figure 3: Concept of nutraceuticals

Classification Of Nutraceutical

The food source [7] used as nutraceutical are all natural and can be categorized as.'

- Probiotics
- Prebiotics
- Polyunsaturated fatty acids (PUFA)
- Polyphenols
- Dietary fibers (DF)
- Antioxidant vitamin

Probiotics

Probiotics are found naturally in your body. Bifidobacterial and Lactobacillus bacteria are very important and form probiotic. This is not affected by digestive acid and pH of the stomach. Those living insects can form small intestines. Probiotics suggest that they help with digestive problems. Probiotics come in the following categories of viruses [8].

1. Lactobacilli such as Lactobacillus casei, Lactobacillus acidophilus, Lactobacillus brevis, Lactobacillus delbrueckii subsp.
2. Bifidobacterium such as Bifidobacterium Bifidum, Bifidobacterium thermophiles, ad

Bifidobacterium adolescentis, B. longum, Bifidobacterium infantis.

3. Gram-positive cocci such as Lactococcus lactis, Enterococcus faecium, Streptococcus salivarius subsp. thermophilus.

Probiotics are available in types such as powder form, capsule form, gel or paste or granule form, liquid form etc. Special probiotics are used to treat intestinal (GI) conditions such as lactose intolerance, severe diarrhea, and GI side effects.

Prebiotics

These are non-digestive ingredients that induce the growth of productive microorganism. Example of the prebiotics is Fructo-oligosaccharides and inulin. Ingredients of prebiotics consisting of short chain carbohydrates that improve the probiotics activity. All prebiotics are fiber, not all fiber is prebiotics. Vegetable like tomato, banana, chicory roots, alliums are rich in fructo- oligosaccharides. A daily intake of 5-20g of insulin and oligosaccharides induced the growth of bifidobacterial [9].

Large amounts of taken the oligosaccharides causes abdominal distension, diarrhea, and flatulence. Prebiotics is beneficial in improving lactose tolerance, dyslipidemia, and detoxification, relief from constipation and in certain tumorsxi.

Polyunsaturated fatty acids (PUFA)

PUFAs are also called “essential fatty acids”. PUFAs are divided in two types: omega-3-(n-3) fatty acid and omega-6-(n-6) fatty acid. Omega -3 fatty acid shown beneficials in various stages of life. Omega -6-PUFAs consist mainly of linoleic acid (LA), Arachidonic acid (ARA) [10].

FDA suggest a maximum 3g/day intake of EPA and DHA omega-3 fatty acid, with not more than 2g per day from a dietary supplement [11]. ARA is found in animal products such as meat, eggs, and poultry. Dietary PUFA affect a wide variety of physiological processes [12]. Cold water fishes, fish oil, tuna, nuts, oysters, groundnuts, flaxseeds are rich sources of essential fatty acids. Omega -3 polyunsaturated fatty acids have decreases production of inflammatory eicosanoids, cytokines, and reactive oxygen species, possess immunomodulatory effects and attenuate inflammatory disease. The main omega -3 fatty acids in fish oil are Eicosapentaenoic acids (EPA) and Docosahexaenoic (DHA).

Polyphenols

Polyphenols are secondary metabolites of plants and involved in defense against ultraviolet radiation. Polyphenols are around 8000 different classes, most important are like flavanols, flavones, flavanones, flavan-3-ols and anthocyanin. Polyphenols can reduce and help control your blood sugar level. Polyphenols are easy to get in diet from foods like fruits, teas, and species. Polyphenols form a large group of phytochemicals. Bioavailability of polyphenols is an important factor determining their biological activity. Depends on the chemical properties of polyphenol, conjugation and reconjugation in the intestines, intestinal absorption, and enzymes available for metabolism [13, 14].

Dietary Fibers

DF mostly include non-starch polysaccharides (NSP) such as cellulose, lignin, gums and pectin, resistant dextrin, and resistant starch. DF are carbohydrates in nature that cannot be digested by endogenous enzymes. Leafy vegetables, dried peas, lentils, and grains are rich in dietary fibers. Dietary fibers may be divided into two forms.

- Insoluble dietary fibers, it includes cellulose, lignin, some hemicellulose which is fermented to a limited extend in the colon.
- Soluble dietary fibers (SDF) which includes gums, pectin, mucilage, and hemicellulose that are fermented in the colon

The adequate intake for fibre defined by Dietary Reference Intake (DRI) is 25gm/day for adult women and 38gm/day for adult men.

Antioxidant Vitamin

Vitamin like vitamin E, vitamin C, and carotenoids are collectively known as antioxidants vitamin. Antioxidants are first line defense against free radical damage and are critical for maintaining optimum health and wellbeing. These vitamin act independently as well as synergistically to avoid oxidation of cellular organelles, membranes, biochemical pathways leading to several degenerative disease including cardiovascular disease, cancer, cataracts. Antioxidants are present in fruits, fishes, and vegetable.

- **Nutrient-derived antioxidants** are such as like ascorbic acid, carotenoids, vitamin E, and low molecular weight compounds.
- **Antioxidant enzymes**, like glutathione peroxidase, superoxide dismutase and glutathione reductase, which catalyze free radical quenching reactions.
- **Numerous other antioxidant phytonutrients** present in different variety of plant foods.

Additional physiological antioxidants are-

Endogenous Antioxidants

- Bilirubin
- Thiol e.g., lipoic acid, N- acetyl cysteine, glutathione
- Uric acid
- NADPH and NADH
- Ubiquinone (coenzyme Q10)

Dietary Antioxidant

- Vitamin E
- Vitamin C
- Polyphenols
- Proanthocyanidins
- Beta carotene and other carotenoids and oxycarotenoids

Metal Binding Proteins

- Albumin (copper)
- Metallothionein (copper)
- Ceruloplasmin(copper)
- Transferrin(iron)
- Ferritin(iron)
- Myoglobin(iron)

Nutraceutical And Disease

Cardiovascular disease

Cardiovascular diseases are the name for the group of disorder of the heart and blood vessels and include high blood pressure (hypertension), coronary heart disease (heart attack), cerebrovascular disease (stroke), heart failure, peripheral vascular disease, etc. Antioxidants, PUFA, Dietary fibers, Vitamins, minerals for prevention and treatment of CVD disease. Polyphenol control and prevent the arterial diseases. Rice brans help to control cholesterol level in the blood and level increase the cardiovascular health. Lutein and Zeaxanthin are found in rice bran, which expand eyesight and reduces the change of cataracts. Many research studies have identified a protective role for a diet rich in fruits and vegetables against CVD [15]. CVD are controllable and preventable. Low intake of fruits and vegetables is linked with a high mortality in cardiovascular disease [16]. Polyphenol (in grape) prevent, and control arterial disease Flavonoids (in onion, vegetables, apples, grape, red wine, and cherries) block the ACE and strengthen the tiny capillaries that carry oxygen and essential nutrients to all cells.

Cancer

A healthy lifestyle and diet can help in cancer disease. People who consume more lutein- rich foods such as chicken eggs, tomatoes, spinach, oranges, and leafy greens experienced the lowest incidence of colon cancer. Nutraceutical are used to treatment of cancer and improve human health. Simple food with low carbohydrate content and moderate amounts of protein, dietary fibers and fat are appropriate for cancer patients. Cancer has emerged as a major public health problem in developing countries. Flavonoids which block the enzymes that produce estrogen reduce the estrogen -induced cancers.

Plant rich in isoflavones, biochanin, daidzein and genistein, also inhibit prostate cancer cell growth [17]. Because of the unsaturated nature of lycopene, it is potent antioxidant and a singlet oxygen quencher. Concentration of lycopene in the skin, testes, prostate, and adrenal where it protects against cancer [18].

Parkinson's disease

Vitamin E is used in Parkinson disease. Canadian researchers focus on vitamin E in food used to prevent the Parkinson's disease [19]. Parkinson's disease is a brain disorder, in this disease nerves damage in some regions of brain and leading to shaking, rigidity, and difficult walking. This disease is common in older people and after the age of 50. There are not sufficient data recommend them nutritional supplements for Parkinson disease [20]. Researches have also premeditated glutathione to determine its effects on nerve and its power antioxidant. Creatine appeared to modify Parkinson's disease feature as measured by a decline in the clinical signs. Parkinson's disease is a degenerative disorder of the central nervous system. Parkinson's disease is more common in older people, with most cases start after the age of 50.

Alzheimer's disease

Alzheimer's disease is also identified as senile dementia. Approximately 4 million people in US were clinically diagnosed with Alzheimer's disease in 1996 [21]. Women are mostly affected than men at the ratio of almost 2:1, due in part in larger population of women who are over 70 [22]. Curcumin, Beta-carotene, lycopene, and turmeric may expert positive effects on specific disease by neutralizing the negative effects oxidative stress, mitochondrial dysfunction, and various forms of neural degeneration. A great deal of research has pointed to deleterious the metal ions in the development of Alzheimer's disease, by the augmentation of oxidativestress by metal ion [23].

Diabetes

Most common form diabetes is type 2 diabetes. Various drugs for prevention and treatment of diabetes have been introduced [24]. Antioxidants Lipoic acid, which is used for treatment of diabetic neuropathy Various plant extracts such as Teucrium polium, cinnamon and bitter melon have been shown to prevent or treat diabetes.

A balanced nutritional management, consists of nutraceutical and abundance of bioactive components like phenolic compounds, Sulphur compounds, natural antioxidants, herbs, are involved in glucose metabolism which may prevent progression of diabetics and associated complications. Number of people with diabetes with various causes is increasing. Diabetes not only imposes considerable economic burdens on individual patients and their families but also places substantial economic burdens on society [25]. Omega-3 fatty acids is reducing the glucose tolerance in patients predisposed to diabetics. For the synthesis of long chain n-3 fatty acids, need insulin; the heart thus be particularly affected to their depletion in diabetics.

Obesity

Nowadays [26] Obesity is a global public health problem with about 315 million people involved. Obesity is a risk factor for many disorders such as congestive heart failure, hyper lipidaemia, hypertension, angina pectoris, respiratory disorders, osteoarthritis, cancer.

Primary causes of obesity are the increased availability of high-fat, energy-dense foods. Excessive eating of energy rich foods such as snacks, processed foods and drinks causes weight gain, however, caloric restriction and physical activity increased has been shown to be only moderately successful in managing

obesity. Obesity is a composite condition, with serious social and socioeconomic groups. Obesity starts from an energy imbalance whereby energy intake exceeds energy expenses [27]. Green tea extract and 5-hydroxytryptophan may promote weight loss, while the former increases the energy expenditure, the latter decreases appetite.

CONCLUSION

Nutraceutical defined as substance that have provide protection against chronic disease. Nutraceutical used to improve health, prevent chronic disease, delay the aging process, support the structure or function of the body. In the present scenario of self-medication nutraceuticals play major role in therapeutic development. Their success depends on maintaining on their purity, safety, quality, and efficacy. Response of nutraceutical varies from person to person. In future, nutraceutical depends on consumer perception of the relationship between diet and disease. Most of the pharmaceutical companies often lack motivation to purse these difficulties in obtaining the patents.

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