

A REVIEW ON RESTORATIVE AND THERAPEUTIC POTENTIAL OF NUTRACEUTICALS

ABHINAY KUMAR DWIVEDI*

Department of Pharmacognosy, Bansal College of Pharmacy, Bhopal, Madhya Pradesh, India. Email: abhinavnbri@gmail.com

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ABSTRACT

The food products basically known for its nutritional profile and nutraceuticals are food or food-derived products with additional characteristic to minimize occurrence and prevention of certain chronic diseases. The rational use of these nutraceuticals not merely gives us nutrition and restoration but also supports to fight against diseases and overcome illness. Wide variety of food and dietary supplements, i.e., dietary fiber, probiotics, prebiotics, polyunsaturated fatty acids, antioxidant vitamins, carotenoids, polyphenols, and spices has proven to potential health benefit and could be used as nutraceuticals. This review primarily focused on food source, health benefit, regulatory challenges, and market potential of nutraceuticals.

Keywords: Nutraceuticals, Dietary supplements, Probiotic, Prebiotic, Antioxidants, Spices, Health supplements.

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INTRODUCTION

The foremost appearance of term nutraceutical was in 1989, the term primarily used and described by Stephen DeFelice as a food or part of food which render medical or restorative health benefits along with prevention and curative potential against diseases. Nutraceutical has grabbed more attention in recent years; pandemic and day-to-day health hazards made the people more conscious for health-related products. Many traditional system of medicine has considered food and diet as important part of their medical treatment. The basic idea of nutraceutical likely to evolve from the extant idea of well-being proposed by great philosopher hippocrates "Let food be thy medicine" who realized the potential of food and explore the medicinal benefit by conscious use of food. In India, people are using concoction of spices in their cuisine; the medicinal and nutritional benefit of these spices has been well proven through various scientific research. As per various definitions, available nutraceutical would be summarized as "food or part of food or products prepared from food or fortified or modified food which provide medical or health benefit in treatment and prevention of certain diseases". Due to requisite obligation of regulatory requirement and form of food, nutraceutical has been described differently in each region by various names such as functional food, dietary supplement, medical food, health supplement, designer food, and nutritional supplements [1-7].

On the basis of source and characteristics of food, nutraceuticals have been subdivided in following category.

Dietary fiber

Dietary fiber found in the plants as thin strands primarily made up of cellulose lignin and hemicelluloses which could not be easily digested or absorbed by our body, it remain unchanged and intact while passing through alimentary canal thus helps to improve bulk of stool and support the growth of microbiome in the intestine. Dietary fibers majorly differentiated in two types, soluble fiber that dissolves in water and form gel-like appearance and insoluble fiber which does not dissolve and remain intact throughout the gastrointestinal tract. The major source of dietary fiber is whole grains, beans, oat, citrus fruit, peas, apple, carrot, barley, psyllium, vegetables cauliflower, green beans, and potatoes [8,9].

Health benefit

Dietary fiber will help to overcome constipation and hardening of stools, reduce cholesterol and blood glucose level that might helpful in

the prevention of heart diseases and diabetes, could be used as effective weight loss agent, and support to growth of beneficial bacteria [10,11].

Probiotics

Probiotics are the form of live beneficial bacteria and yeasts that naturally reside in our body. Diverse group of beneficial microbes presents in our body cavity, i.e., gut, mouth, vagina, skin, lungs, mouth, and urinary tract. The large intestine most abundantly contains such microflora. Each of us has unique set of microbiome combination that might help in various ways to keep our body healthy. Probiotics primarily present in fermented products, i.e., curd, buttermilk, yogurt, and other fermented food [12,13].

Health benefit

Probiotic does help to digest food, improves immunity to fight against diseases, and secreted of vitamins and neutralize toxins [14,15].

Prebiotics

Prebiotics are the food or compounds present in food that prop up the growth and activity of beneficial microorganisms resides in body. The characteristics of fiber could help to work as prebiotic. The most common prebiotic is resistant starch, inulin, beta-glucan fiber, pectin, Glucomannan fiber which found in wide variety of vegetables, herbs, and fruits. They passed undigested through stomach and small intestine and finally fuel and support the microflora present in large intestine. Chicory root, dandelion greens, garlic, onions, leeks, asparagus, bananas, barley, oats, apples, konjac root, flaxseeds, and wheat bran would act as prebiotic [16,17].

Health benefit

Prebiotics used to improve digestion, boost immunity, and could be used as weight loosening agent [17,18].

Polyunsaturated fatty acid (PUFA)

PUFAs are essential fatty acids which would not produce by our body; we must to take it by external food source. They broadly divided in two major class omega-3 fatty acid and omega-6 fatty acid; the number indicates the position of first double bond. Alpha-linolenic acid, eicosapentaenoic acid, and docosahexaenoic acid are the types of omega-3 fatty acid while linoleic acid, gamma-linolenic acid, and arachidonic acid are representing omega-6 fatty acid. These essential fatty acids are imperative to body function, cardiac health, brain function, and normal growth of tissue. Soybeans, flaxseed, sunflower

oil, safflower oil, corn oil, cod liver oil, chia seeds, walnuts, fish, meat, and eggs are the major source of PUFAs [19,20].

Health benefit

PUFA would be useful in the prevention of depression and anxiety, vision impairment, brain growth and development, heart disease, metabolic syndrome, autoimmune diseases, premature aging, and sun damage [18,20].

Antioxidant vitamins

The compound presents in plants which have ability to neutralize free radicals or reactive oxygen species and prevents the body from enormous deleterious effect of free radicals by scavenging and neutralizing them known as antioxidants. Free radicals generated in our body as a normal product of various metabolic processes that would cause insidious health hazards by damaging DNA, protein, lipid at the cellular level. Vitamin C and Vitamin E found in multiple fruits, and vegetables could be used as potential antioxidant agent to check the oxidative damage. Oranges, kiwi, lemon, grapefruit, bell peppers, strawberries, tomatoes, broccoli, cabbage, and cauliflower are the good source of Vitamin C. Vegetable oils such as wheat germ oil, sunflower oil, safflower oils, and certain nuts, i.e., peanuts, hazelnuts, almonds are among the best sources of Vitamin E [21,22].

Health and medical benefit

Antioxidant vitamins could help to reduce the risk of heart diseases, cancer, diabetes, cataracts, arthritis and gout, age-related degeneration, and immunity booster [23,24].

Carotenoids

Carotenoids are the diverse group of naturally occurring pigments found in plant, algae, and some bacteria. They are primarily responsible of colors; we are seeing in fruits vegetables. They get easily absorbed when consumed with fat due to their solubility. Some carotenoids could be used as source of retinol due to the ability to get converted into Vitamin A known as provitamin, α -carotene, β -carotene, and β -cryptoxanthin which are provitamins, and other common dietary carotenoids are lutein, zeaxanthin, and lycopene. These carotenoids are well known for their antioxidant, therapeutic, and protective potential against various diseases. Yams, kale, watermelon, cantaloupe, bell peppers, tomatoes, carrots, mangoes, oranges, spinach, pumpkin, avocado, yellow fleshed fruits, corn, and egg yolks marked as good source of carotenoids [21,25,26].

Health benefit

Carotenoids would be used to reduce the risk of cardiovascular diseases, cancer, diabetes, and age-related degeneration. They have been used to improve eye and skin health and boost immunity [27,28].

Polyphenols

Polyphenols are structurally diverse group of phenolic compound found profusely in plants. They are generally involved in defense against ultraviolet radiation or aggression by pathogens, phenolic acids, flavonoids, stilbenes, and lignans which are the types of polyphenols found in variety of fruits, vegetables, and beverages. These compound biosynthesized by plant in the form of various secondary metabolite, i.e., *p*-coumaric, caffeic, ferulic and sinapic acids, quercetin, myricetin, catechins, resveratrol, cyanidine, and kaempferol. The polyphenolic compound is known to have potent antioxidant property that could help to reduce the oxidative stress by neutralizing free radicals and help in promoting and restoring good health. Cereals, dry legumes and chocolate, tea, coffee, grapes, apple, pear, cherries and berries, red onion, spinach, olives, nuts, cloves, cocoa powder, plums, and soy products have substantial polyphenolic compounds [11,18,29-33].

Health benefit

Polyphenols would provide efficient protection against certain pernicious chronic diseases such as cardiovascular diseases, cancer, diabetes, neurodegenerative diseases, aging, asthma, and infections [34-39].

Spices

Spices are adjuncts of food to improve the palatability by imparting peculiar color, flavor aroma, and taste to food products. India has accolade as land of spices. Spices have been used with food since very long time, many of them have proven therapeutic benefit and could be used for their curative effect. India and some other tropical countries are prominent user and producer of spices, wide range of spices is being used in Indian cuisine, i.e., turmeric, fenugreek, garlic, onion, cumin, caraway, fennel, coriander, mint, asafetida, cinnamon, mustard, black pepper, red pepper, clove, and cardamom used to enhance the organoleptic properties of food, apart from popular use as spices [33-35,40].

Health benefit

Spices have significant role as carminative, antioxidants, chemoprotective, anti-inflammatory, cholesterol lowering, anti-diabetic, anti-cancer, and immune stimulant.

Minerals and trace elements

Minerals are the important elements to rhythmic function of various biological activity calcium, magnesium, iron, phosphorus, chromium, cobalt, copper, iodine, selenium, and zinc which will help to catalyze various enzymatic reactions in our body. Nuts, seeds, seafood, meat, whole grains, dairy products, eggs, seaweed, legumes, green vegetables, and oats are good source of minerals [18,20].

Health benefit

Minerals and trace elements would help to reduce oxidative stress, abnormal function of various organs, and UV-induced cytotoxicity. Some of them are also helpful in DNA synthesis and repair, cell apoptosis, and wound healing [41-44].

REGULATORY CHALLENGES

Enormous challenges on the regulation and guidelines have been observed throughout the world. Nutraceutical have not been officially recognized as a drug by most countries across the globe. Most of the regulatory agencies would not ready to accept therapeutic claim regarding nutraceuticals due to the lack of clinical data. The production, marketing, and sell of these products governed by different law enacted by the different government. In United States of America, FDA has framed separate law to food products, the dietary supplement health, and education act, 1994, which stated that it is the duty and responsibility of the manufacturer to assure the safety of nutraceuticals before it has been sold in the market. In European Union European Food Safety Authority, regulate such products with the guideline stated that health claim of the product should approved prior it is assessed at a national or European level for introduced in the market. In Canada, nutraceuticals are regulated as a type of food than a drug. In India, the Food Safety and Standards Authority of India is the regulatory body which regarded functional foods, nutraceuticals, and dietary supplements as the same with special dietary application. FSSAI reviews with favorable health claim to be equivalent to "food." In Japan nutraceuticals regulated under food for specified health use (FOSHU) Japan has become the first country which have proper regulation on nutraceuticals. Any product came to the level of FOSHU standards, food with positive health claim would be approved even though sufficient scientific claim has not been available. In Australia and China, nutraceuticals are legalized as type of food and national food law and regulations has been applied, a stringent approach with animal or human scientific study is needed before the registration in countries such as China and Taiwan. In certain countries, Columbia, Brazil, and Argentina, basic registration method has been required. In Mexico and Chile, a notification method has been adopted to register. As per the current scenario and demand of nutraceutical in the market more stringent, harmonized and scientific approaches needed to assure the quality safety and efficacy of nutraceuticals [45-56].

MARKET POTENTIAL

Many factors upsurge the demand of nutraceuticals; the most important among all is increasing awareness to restore health by natural mean,

increasing rate metabolic disorders, increase in geriatric population which are some other cause to enhance the uses of nutraceuticals. As per global market insight, nutraceuticals market was recorded USD 396.29 billion in 2021 and projected to reach USD 636.60 billion by 2030. The prognosticated growth rate of nutraceuticals would be CAGR of 5.2% between 2022 and 2030 [57-60].

CONCLUSION

Nutraceuticals have unambiguous potential to treat various symptoms and diseases which facing many regulatory challenges all over the world. Comprehensive, cumulative, scientific, and harmonious approach required to promote the new research and development in the area of nutraceuticals, which might help to maintain the quality, safety, and efficacy. Common accepted standard parameter according to product should be designed for evaluation of product. More focused and corroborated research needed to unravel the facts on health and medical benefit of nutraceuticals. Stringent regulation required to proscribe the substandard and adulterated nutraceuticals. Government should take necessary action to ensure the quality of nutraceuticals available in the market.

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