

Nutraceuticals: The futuristic therapy for prevention & control of lifestyle disorders

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ABSTRACT

The central government under National Health Mission has started National programme for prevention & control of cancer, Diabetes, cardiovascular disease & stroke in which blood pressure, blood sugar & other Diagnostic measures have been done for prevention of disease. As we all know that prevention is always better than cure. Nutraceuticals are used in prevention & cure of disease. Nutraceutical is collaborative research effort of pharma, food and chemistry. As growth of nutraceutical is increasing because people want to treat their disease by improving their health. Now “nutraceutical a day may keep the doctor away” replace the old proverb “an apple a day will keep the doctor away” people are turning massively to food supplements to improve well being where pharmaceuticals fail. The main aim of this article is to explore and discuss the role of nutraceuticals to treat or prevent disease. This article outlines nutraceuticals with their therapeutic applications.

Keywords: Nutraceuticals, Functional food, Dietary supplement, Health benefits

INTRODUCTION

The central government under National Health Mission has started National programme for prevention & control of cancer, Diabetes, cardiovascular disease & stroke in which blood pressure, blood sugar & other Diagnostic measures have been done for prevention of disease, As we all know that prevention is always better than cure. Nutraceuticals are food product that provides health as well as medical benefits; including the prevention and treatment of disease. Few nutraceuticals are being used as pharmaceutical and a number of other being used and purchased by the general public as self-medication. Such products may range from dietary supplements to genetically engineered foods, herbal products and processed foods. Clinical research on nutraceutical product is going on for integrating and assessing information [1].

The term “Nutraceutical” was first coined by Dr. Stephen L. Defelice as “a product isolated or purified from foods and sold in medicinal forms. They have physiological benefit”

Nutraceutical is a combination of 2 words

1. Nutrition and
2. Pharmaceutical.

Nutraceuticals are food product that provides health as well as medical benefits; including the prevention and treatment of disease. Phytochemicals and antioxidants are two specific types of nutraceuticals. Research has proved that foods with phytochemicals may help to provide protection from diseases such as cancer, diabetes, heart disease, and hypertension, e.g. carotenoids found in carrots. Antioxidants may be helpful in avoiding chronic diseases, by preventing oxidative damage in our body.

Over the last 20 years, numbers of Nutraceuticals are available for self medication or for sale [2-3].

There has been a boom in sale of Nutraceutical because of -

1. Side effects of pharmaceuticals
2. Increased Aging population
3. Awareness of the people towards health [4].

CLASSIFICATION OF NUTRACEUTICALS

Nutraceutical is a term used to describe product obtained from food sources that provides extra health

benefits as well as basic nutritional value present in food. There are different types of products that comes under the class of nutraceuticals.

DIETARY SUPPLEMENTS: A dietary supplement is a product that contains nutrients derived from food products. The "dietary ingredients" present in these products are: metabolites, vitamins, minerals, vitamins, herbs, and amino acids [5].

FUNCTIONAL FOODS: Functional foods are designed foods which provide enriched foods close to their natural state to consumer, rather than manufactured dietary supplements in liquid or capsule form. A process of making enriched food is called Nitrification. Functional foods provide required amount of vitamins, fat, carbohydrate, amino acid etc to body. Established requirement that functional food should possess are-

1. Functional foods should be in their naturally-occurring form,
2. Functional foods should be an essential part of our daily diet,
3. Functional foods should regulate a biological process in hopes of preventing or controlling disease.

NUTRIENTS

Substances which have established Nutritional functions e.g. Vitamins, Minerals, Amino Acids, Fatty acids, etc [6].

Most common Nutrients used/ supplemented as Nutraceutical are

Minerals and Vitamins or in combination or in combination with other antioxidants

HEALTH BENEFITS OF NUTRACEUTICALS

Health Benefits of different common nutraceuticals are as follows-

VITAMINS

Fat Soluble Vitamins

- Vitamin A: Acts as antioxidant, essential for growth and development, maintains healthy vision, skin and mucous membranes, may aid in the prevention and treatment of certain cancers and in the treatment of certain skin disorders.
- Vitamin D: Essential for formation of bones and teeth, helps the body to absorb and use calcium

- Vitamin E: Antioxidant, helps to form blood cells, boosts immune system
- Vitamin K: Essential for blood clotting [7].

Water Soluble Vitamins

- Vitamin C: Antioxidant, necessary for healthy bones, gums, teeth and skin. Helps in wound healing, prevent from common cold
- Vitamin B 1: Helps in carbohydrate metabolism, essential for neurological function.
- Vitamin B 2: Energy metabolism, maintain healthy eye, skin and nerve function.
- Vitamin B 3: Energy metabolism, brain function
- Vitamin B 6: Helps to produce essential proteins, convert proteins to energy
- Vitamin B 12: Help in producing genetic material, formation of RBC, maintenance of CNS, synthesis of amino acids, involved in metabolism of protein, fat and carbohydrate.
- Folic acid: Helps in RBC formation, formation of genetic material of cell, very much essential during pregnancy
- Pantothenic acid: Aids in synthesis of cholesterol, steroids, and fatty acids, crucial for intraneuronal synthesis of acetylcholine [8].

Vitamins like Compounds

- L- Carnitine: Helps in oxidation of fatty acids, role in oxidative phosphorylation,
- Choline: Lipotropic agent, used to treat fatty liver and disturbed fat metabolism,
- Inositol: For amino acid transport and movement of Potassium and sodium,
- Taurine: Helps in retinal photoreceptor activity, bile acid conjugation, WBC antioxidant activity, CNS neuromodulation, platelet aggregation, cardiac contractibility, sperm motility, insuline activity [9].

Minerals

- Calcium: essential for bone and teeth, maintaining bone strength, nerve, muscle and glandular function, blood clotting,
- Iron: energy production, Hb, oxygen transport,
- Magnesium: for healthy nerve and muscle function, bone formation,
- Phosphorous: energy production, phosphorylation process, bone and teeth, for genetic material,

- Cobalt: component of Vit. B 12 and B 12 coenzymes,
- Copper: Hb and collagen production, function of heart, energy production, absorption of Iron,
- Iodine: proper function of Thyroid gland,
- Chromium: with insulin it helps in conversion of carbohydrate and fat into energy, treatment of diabetes,
- Selenium: Antioxidant, functioning of heart muscle, part of GPX enzyme,
- Zinc: Essential for cell reproduction, for development in Neonates, wound healing, production of sperm and testosterone hormone [10].

HERBALS

- Herbals/ Phytochemicals: Herbs or Botanical products
- Aloe vera: Anti-inflammatory, emollient, wound healing,
- Evening Primrose oil: Dietary supplement of linoleic acid, treatment of atopic eczema,
- Garlic: Antibacterial, antifungal, antithrombotic, antiinflammatory,
- Ginger: carminative, antiemetic, treatment of dizziness
- Ginseng: Adaptogen,
- Green tea: Antioxidant, reduces risk of CVD, enhances humoral and cell mediated Immunity,
- Vegetables, fruits, whole grain, herbs, nuts and various seeds contain an abundance of phenolic compounds, terpenoids, sulphur compounds, pigments etc. that has been associated with protection / treatment of certain disease conditions,

PHYTOCHEMICALS

Phytochemicals: Phytochemicals obtained from plants provide health benefits as:

1. Substrate for biochemical reactions
2. Cofactors of enzymatic reactions
3. Inhibitors of enzymatic reactions
4. Absorbents that bind to & eliminate undesirable constituent in the intestine
5. Scavengers of reactive or toxic chemicals
6. Enhance the absorption and / or stability of essential nutrients
7. Selective growth factor for beneficial bacteria
8. Fermentation substrate for beneficial bacteria

9. Selective inhibitors of deleterious intestinal bacteria

DIETARY SUPPLEMENTS

A dietary supplement is a product that contains nutrients derived from food products. The "dietary ingredients" present in these products are: metabolites, vitamins, minerals, vitamins, herbs, and amino acids. Dietary Supplements also includes Probiotics, Prebiotics, Antioxidants, Enzymes, etc.

RELATIONSHIP BETWEEN NUTRACEUTICALS, FUNCTIONAL FOOD AND MEDICINE

Pharmaceuticals are usually classified as medicines by law.

1. Herbal remedies may be classed as medicines because of their perceived risk with self-medication e.g.-Digitalis
2. Functional food are closely related to nutraceuticals consumed as a part of normal diet, e.g. Carotenoid
3. Vitamins are classed as medicine but are freely available.

EXAMPLES OF NUTRACEUTICALS CURRENTLY AVAILABLE IN MARKET

1. FORTIFIED CEREALS-various cereals contain vitamins and minerals.
2. VITAMIN AND MINERAL SUPPLEMENTS-Vitamin A (Beta- Carotene), lycotenforte (lactonova India)
3. ADDITIONAL SUPPLEMENTS-supplements other than vitamin and minerals which have beneficial effect on health for example-cod

NUTRACEUTICAL AND HEALTH

List of Nutraceutical components along with their source & potential benefits

Class / components	Source	Potential benefit
1. n-3 FA(DHA, EPA)	Fish oils, berseem & maize fodder, mustard, linseed, rapeseed	Reduce CVD improve mental, visual function
2. Polyphenols Anthocyanidine	Fruits	Neutralises free radicals, reduce risk of cancer, Diabetes, CVD etc

liveroil, primrose oil, flaxseed oil (omegapure) etc.

4. ENERGY DRINKS AND TABLETS-Tropicana fruit Juice, Minute Maid Pulp, Frooti
5. FOR HEALTHY HEART-Abcor by Nutri-pharma, claimed to reduce cholesterol by 15-20% in 4 months, novomega, carnicare, coq10, lycotenforte (lactonova india).
6. PROTEIN POWDER – Nutral-P, Nutral-D, Nutral-G (Lactonova India)
7. PRO-BIOTICS & PREBIOTICS -Bacteria containing foods that believed to improved health. For example- coloncare capsules & Sachets, A blend of 6 probiotics, 2 prebiotics along with colostrum
8. SPORTS PRODUCTS- Glucon-D (Heinz), Glucose D (Dabur)

SOURCE, MANUFACTURE AND ANALYSIS OF MOST OF NUTRACEUTICALS

Most of nutraceuticals are natural products and obtained from plants and animals.

Example-lycopene extracted from plant, carnitine, creatine and carotenoids produced by fermentation for example-coenzyme Q10 and S-adenosyl glycoside

1. A number of nutraceuticals have GRAS status as defined by FDA, and increasingly manufacturers gain GRAS certification for product. A list of GRAS is published on the internet.
2. Nutraceuticals used same analytical procedure for identification and quantification as pharmaceuticals

Catechins	Tea, babul pods, mustard cake, rape seed, salseed	
Flavonone	Citrus	
Flavones	Fruits, vegetables, soya bean	
proanthocyanidine	Cocoa, chocolate, tea, rape seed	Reduce CVD
3. Saponins	Soybeans, GNC, lucerne, chick pea	Lower cholesterol, anti cancer
4. Probiotics / Prebiotics / Synbiotics		
Lactobacillus	Dahi, yogurt	Improve GI health
Fructo - oligosaccharides	Whole grains, onions, combination of Pro & Prebiotics	
5. Phytoestrogen		
Daidzein , Zenistein	Soybean, flax, lentilseed, maize, berseem, lucerne, subabul fodder	Reduce menopause symptoms, ↑ bone health
Lignans	Flax, rye, vegetables	Reduce cancer and heart diseases
6. Carotenoids		
β- carotene	Berseem, lucerne ,oat & maize fodder, Carrots, vegetabels, fruits	Nutralises free radicals
Luteine	vegetabels	Healthy vision
Zeoxanthine	Eggs, citrus, corn	
Lycopene	Tomatoes	Reduce prostate cancer
7. dietary fiber		
Insoluble fiber	Wheat bran	Reduce breast, colon cancer
β-glucan	Oats	Reduce CVD
Whole grain	Cereal grains	

EFFECTIVENESS AND SAFETY REGULATION

Nutraceutical products also required same level of scrutiny and regulation as "dietary supplements". Companies which involved in nutraceuticals production invest more on scientific research to substantiate their manufacturing standards, products by keeping the view in mind consumer benefits and differentiate their products from "dietary supplements". Now a day many international companies move within the industry, professional organizations, academia, and health regulatory agencies to add specific legal and scientific criterion to the definition and standards for nutraceuticals.

BIOAVAILABILITY

Bioavailability is "absorption rate" of a supplement product. In development of effective nutraceutical products bioavailability play important role. The bioavailability of substance which is in natural state will be more as comparison manufactured product.

SAFETY AND EFFICACY

Nutraceuticals hold great potential, as an alternative to substance obtained by plant. Yet, some time they also cause harmful effect as seen with ephedrine, a widely used botanical ingredient in weight-loss products. Now a days peoples are more conscious about their health and these products offer the promised health benefits. But danger is associated with some product due to lack of solid information about interaction and side effect.

CONCLUSION

Nutraceuticals are present in most of the food ingredients as well as in dietary supplements with varying concentration. Concentration, time and duration of supply of nutraceuticals influence human health. Manipulating the foods, the concentration of active ingredients can be increased. Diet or supplement rich in nutraceuticals along with regular exercise, stress reduction and maintenance of healthy body weight will maximise health and reduce disease risk. Nutraceuticals, have distinctively defined the promising role in health preservation in the future to

make it easier and accessible to people all over the world of all walks of life. Therefore , Nutraceuticals in Nurition and Pharmaceuticals, indeed will be positively sustain better future in therapeutics.

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