

A REVIEW ON NUTRACEUTICALS AND ITS ROLE IN TREATMENT OF DISEASE

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ABSTRACT

The term “nutraceutical” combines two words nutrients i.e. nourishing food components & pharmaceutical i.e. a medical drug. Nutraceuticals are used to describe any product which is obtained from food sources that mainly have extra health benefits in addition to essential nutritional values found into foods. The philosophy behind nutraceuticals is to specialize in prevention, consistent with the old saying by a Greek physician Hippocrates, Father of Medicine who said that “let food be your medicine”. Nutraceuticals are also called as medical foods, designer foods, phytochemicals, functional foods and nutritional supplements, which are mainly found in our day to day food products. The primary reasons for the growth of the nutraceutical

market worldwide are the current population and the health trends. The food products which are used as nutraceuticals mainly consists as dietary fiber, prebiotics, probiotics, polyunsaturated fatty acids, antioxidants and other various kinds of herbal/ natural foods. These nutraceuticals help to withstand, various types of health problems likewise obesity, cardiovascular diseases, cancer, osteoporosis, arthritis, diabetes, cholesterol etc. The wheel of time having gone a full circle, today the important role of diet in disease prevention is being increasingly realized in current scientific thinking as well that also played a role in triggering the world’s belief in this. Over the years nutraceuticals have attracted considerable interest thanks to their potential nutritional, safety and therapeutic effects.

KEYWORDS: Dietary fiber, Probiotics, Prebiotics, Polyphenols, Spices, Human diet.

INTRODUCTION

The term “nutraceutical” was coined by Stephen De Felice in 1989, who is the founder and chairman of the Foundation for Innovation in the Medicine. He created statement that the nutraceutical as a “food, or components of the food, that gives medical or health edges conjointly as interferences and treatment of the disease”.^[1-4]

The term nutraceuticals is applied to the compounds that are mainly to be extracted from the herbal products, dietary supplements, specific diets, and processed foods like cereals, soups, and beverages that except from nutrition are to be used as medicament.^[5] Nutraceuticals, in distinction to pharmaceuticals, are those substances that usually haven’t patent protection. Each pharmaceutical and nutraceutical compounds could possibly be accustomed cure or stop diseases, but alone pharmaceutical compounds have government sanction.^[6]

Some well-liked nutraceuticals consists of ginseng, *Echinacea*, green tea, glucosamine, omega-3, lutein, folic acid, and cod liver oil. Majority of the nutraceuticals possess multiple therapeutic properties.^[7]

Recent studies have shown promising results for these compounds in varied pathological complications like diabetes, arthrosclerosis, cardiovascular diseases (CVDs), cancer, and neurological disorders.^[8,9,10,11,12] Most of nutraceuticals have inhibitor activity with an associate degree influence to counteract this situation.^[13] Hence, they’re thought-about as healthy sources of health promotion, notably for interference of life threatening diseases such as diabetes, infection, renal, and duct disorders.^[14,15,16,17]

The reasons to shift towards nutraceuticals^[18-22]

1. Rise in numbers of consumers, concerned relating to care costs.
2. Unsatisfied with the pharmaceutical compounds in promoting health, area unit turning to nutraceuticals to boost their health and forestall chronic malady.
3. Health care provider acknowledge the particular undeniable fact that our heavily processed food provide, coming back from crops full-adult up with chemical fertilizers, pesticides, herbicides, and sometimes genetically modified seeds, lacks ample nutrients necessary for optimum Health.
4. People basic knowledge tons of in interference than a cure.
5. People that have chronic diseases and have found no resolution in medical aid medicines.
6. Economically challenged patients.

Nutraceuticals and functional foods – ayurvedic understanding

Ayurveda consists of varieties of food remedies for the treatment of various types of diseases. Ayurveda is examined as holistic; since it takes into thought body, mind and spirit as a full.^[23,24] It collectively includes the ideas of rejuvenation. Among the eight branches of Ayurveda science, 'Rasayana' is taken into consideration as the primary technique for maintaining health and vigor. Rejuvenation treatment will facilitate the senior to regain vigor and youth, overcome temporary state and fatigueness.^[25] It helps to preserve harmony among the 3 psychobiological dimensions referred as doshas, biological rhythms that regulate the whole functioning of the physiology.^[26,27]

Categories of nutraceuticals

Nutraceuticals might even be organized in several ways in which relying upon its easier understanding and application, i.e. for academic instruction, clinical trial design, purposeful food development or dietary recommendations. A variety of foremost common ways that of classifying nutraceuticals could be supported food sources, mechanism of action, chemical nature etc. The food sources used as nutraceuticals are all natural and will be classified as.^[28,29]

1. Dietary Fiber
2. Probiotics
3. Prebiotics
4. Polyunsaturated fatty acids
5. Antioxidant vitamins
6. Polyphenols
7. Spices

- **Dietary fiber:** Dietary fiber is that the food material, tons of precisely the stuff that's not hydrolyzed by enzymes secreted by that of the GI tract, but predigested by microflora inside the gut. Dietary fibers principally embrace non-starch polysaccharides (NSP) like celluloses, hemicelluloses, gums and pectins, lignin, resistant dextrins and resistant starches. Foods rich in soluble fiber embrace fruits, oats, barley and beans. The soluble elements of dietary fiber by virtue of their bulking and consistency producing capabilities, retards the viscous separation of stomach.^[30]

- **Probiotics:** The history of probiotics dates back as way because the 1st intake of sourced milks, over 2,000 years past. The scientific interest throughout this area boosted from the work of Metchnikoff, to remodel the toxic flora of the large intestine into a host-friendly colony of true bacteria bulgaricus.^[31,32] A probiotic may be outlined as live microbic feed supplement, that once administered in adequate amounts beneficially affects the host animal by rising its intestinal microbic balance.^[33,34] Probiotics usually embrace the subsequent classes of bacteria: -
 - a. Lactobacilli such as *L. acidophilus*, *L. casei*, *L. delbrueckii* subsp. *bulgaricus*, *L. brevis*, *L. cellobiosus*.
 - b. Gram-positive cocci such as *Lactococcus lactis*, *Streptococcus salivarius* subsp. *thermophilus*, *Enterococcus faecium*.
- **Prebiotics:** Prebiotics are the dietary ingredients that beneficially have an effect on the host by selectively modifying the composition or metabolism of the gut microbiota.^[35,36] These are the short-chain polysaccharides that have distinctive chemical structures that aren't digestible by humans; in certain fructose-based oligosaccharides that exist naturally in food or are value-added therein food. The prebiotic consumption usually promotes the *Lactobacillus* and *Bifidobacterial* growth inside the gut, thus serving in metabolism. Vegetables like chicory roots, banana, tomato, alliums are wealthy in fructo-oligosaccharides.^[32,37]
- **Polyunsaturated fatty acids (PUFA):** PUFAs are also known as “essential fatty acids” as these are most important to the body's operate and are introduced outwardly through the diet.^[38] PUFAs have 2 subdivisions: omega-3- (n-3) fatty acids and omega-6-(n-6) fatty acids. The foremost omega-3-fatty acids are α -linolenic acid (ALA), eicosapentanoic acid (EPA), docosahexanoic acid (DHA). ALA is that the of precursor of EPA and DHA. EPA and DHA are found principally in fatty fishes like mackerel, salmon, herring, trout, blue fin tuna and in fish-oils. Principal sources of ALA are mostly flaxseed, soybeans, canola, some nuts (e.g. walnuts) and red/black currant seeds.^[39]
- **Antioxidant vitamins:** Vitamins like water soluble vitamin, vitamin E and carotenoids are conjointly as antioxidant vitamins. These vitamins act each separately still synergistically for the prevention of oxidative reactions leading to several degenerative diseases including cancer, cardiovascular diseases, cataracts etc.^[40] These vitamins are rich in several fruits and vegetables and exert their protecting action by free-radical

scavenging mechanisms. Vitamin E which incorporates of tocopherols along side tocotrienols transfer atom and scavenge singlet oxygen and other reactive species thus protecting the peroxidation of PUFA inside the biological membrane and LDL.^[41] Vitamin E and selenium encompasses a synergistic role against lipid peroxidation. Vitamin C, donates hydrogen atom to lipid radicals, quenches singlet oxygen radical and removes molecular oxygen. Scavenging of aqueous radicals by the synergistic impact of vitamin C in conjunction with tocopherol supplementation may be a well-known antioxidant mechanism.^[42]

- **Polyphenols:** Polyphenols kind an oversized cluster of phytochemicals, which are created by plants as secondary metabolites to protect them from photosynthetic stress, reactive oxygen species. There are just about 8,000 completely different categories of polyphenols, the foremost vital being flavonols, flavones, flavan-3-ols, flavanones and anthocyanins. The extremely branched phenylpropanoid pathway synthesizes majority of polyphenols. The foremost unremarkably occurring polyphenols in food consists of flavonoids and phenolic acids.^[43]
- **Spices:** Spices are mysterious food adjuncts that are used for thousands of years to boost the sensory quality of foods. These impart characteristic flavor, aroma, or tang and color to foods, stimulating our appetency still as modify the feel of food. Recent studies states that that dietary spices in their minute quantities has an massive influence on the human health by their antioxidative, chemopreventive, antimutagenic, anti-inflammatory, immunomodulatory effects on cells and a good vary of helpful effects on human health by the action of gastrointestinal, cardiovascular, respiratory, metabolic, reproductive, neural and the other alternative systems.^[44-50]

Diseases and Nutraceuticals

Allergy and Nutraceuticals

Allergy is the hypersensitivity disorder of a immune system. Allergic reactions are distinctive due to excessive activation of certain white blood cells referred to as mast cells and basophils by a kind of antibody called immunoglobulin E. This reaction ends up in associate in nursing inflammatory response which might vary from uncomfortable to severe.^[51]

Quercetin protects beta lipoprotein (LDL-C) from turning into broken, particularly to blood vessels. LDL-C is associate in nursing underlying reason for cardiopathy and quercetin acts as an antioxidant and scavenges free radicals.^[52]

Alzheimer's disease and nutraceuticals

Alzheimer's disease (AD) is that the most typical sort of insanity. There's no cure for the illness and eventually ends up in death. Most often, AD is diagnosed in folks over sixty five years of age, though the less-prevalent early-onset Alzheimer will occur a lot of earlier. Nutraceutical antioxidants like curcumin, lutein, lycopene, turmerin and β -carotene might exert positive effects on specific diseases by combating oxidative stress. The growing trends in nutraceutical usage are because of the assumption that these compounds are ready to put off the event of dementias like AD.^[53]

Cardiovascular diseases and nutraceuticals

CVD is a term that is employed for disorders of the heart and blood vessels and includes coronary heart disease (heart attack), peripheral vascular diseases, cerebrovascular disease (stroke), hypertension, heart failure, and so on. It is believed that low intake of vegetables and fruits are related to a high mortality in CVD.^[54]

Nutraceuticals within the sort of vitamins, minerals, antioxidants, dietary fibers and omega-3 polyunsaturated fatty acids ($n-3$ PUFAs) along with physical exercise are suggested for mitigation and treatment of CVD. The molecules like polyphenols alter cellular metabolism and sign that is believed to decrease arterial illness.^[55,56]

Flavonoids are widely distributed in vegetables, onion, endives, cruciferous, grapefruits, apples, cherries, pomegranate, berries, black grapes, and red wine, and are accessible as flavones, flavanones and flavonols, taking part in a serious role in elimination and curing the CVD.^[57-59]

Cancer and nutraceuticals

Cancer has begin as a significant public health problem in developing countries. In line with the World Cancer Report the cancer rates are increasing and it would be fifteen million new cases among the year 2020 that's an rise in 50%.x A healthy fashion and diet can facilitate in interference of cancer.^[60] Carotenoids are a bunch of phytochemicals answerable for fully completely different colors of the foods.^[61]

Lycopene contained vegetables and fruits exert cancer-protective impact via a decrease in oxidative stress and harm to the DNA.^[62] Lycopene is one amongst the key carotenoids and is found alone in tomatoes, guava, pink grapefruit, water melon and papaya.^[63]

Chronic inflammation is expounded with a high cancer risk.^[64]

Eye disorders and nutraceuticals

Healthy lifestyle with a diet still as foods flush in antioxidants, like n–3 fatty acids, lutein and zeaxanthin appears helpful for age-related macular degeneration (AMD). High content of polyphenolic flavonoids in nutraceuticals are shown to possess antioxidant activity. Herbs or herbal extracts, like green tea, *Allium* spp., Vitamins C and E, polyphenols, carotenoids (mainly lycopene and β -carotene), and coenzyme Q10 possess antioxidant properties and effective in AMD.^[65]

Immune system and nutraceuticals

A wide diversity of nutraceuticals is shown to impose key roles in immune standing. Nutraceuticals that belong to the category of immune boosters are useful to spice up immune perform. They embrace extracts from the coneflowers, or herbs of the genus *Echinacea*, like *Echinacea angustifolia*, *Echinacea pillida*, *Echinacea purpurea*.

Astragalus mongolicus, *Astragalus membranaceus*, and completely different herbs of the *Astragalus* genus are effective immune boosters. *Astragalus* stimulates development and transformation of stem cells among the marrow and lymph tissue to active immune cells. Phytoestrogens are largely instructed for hindrance of varied disease associated with secretion imbalance. Soy isoflavones are mostly used as potential superior alternatives to the synthetic selective estrogen receptor modulators that are presently used in hormone replacement therapy. Garlic and morphine are model of the nutraceuticals that severally stimulate and suppress immune system.^[66,67]

Antitoxicity of nutraceuticals

Most of the substitute medication possess toxicity properties, and nutraceutical compounds, specially herbal nutraceuticals are investigated for their potential in resisting the toxicant effects of poisons and completely different medications.^[68,69]

Although the pharmacology of medicine is sophisticated, there's nice proof for involvement of oxidative stress within the toxicity of a wide diversity of medication.^[70,71]

Regulatory aspects

The rule that governs the nutraceutical market comes under the Dietary Supplement Health and Education Act (DSHEA) which was passed in 1994.^[72] The Food Safety and Standard Rule, 2011 are issued. Food Safety and Standard Authority has jointly issued laws with reference to Licensing and registration of food business, producing, packing and labeling, food product standard etc.

The Food Safety and Standard Rule and Regulations become effective from August 2011. This act will encourage manufacturers for marketing Research and Development; develop reliable protocols and frequently carryout clinical studies. Foreign Direct Investment Act passed recently in 2012 that jointly offer new opportunities for international firms to manufacture and sale nutraceutical product in India.

Thus, there is only a single authority which manages production, distribution and promotion of nutraceuticals in India.^[73]

CONCLUSION

Nutraceuticals have proven health benefits and their consumption will keep diseases at bay allow humans to maintain an overall good health. Nutraceuticals are present in most of food ingredients with varying concentration. Diet rich in nutraceuticals alongside regular exercise, stress reduction and maintenance of healthy weight will maximize health and reduce disease risk.

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