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Nutraceuticals and their Role in Disease Prevention

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ABSTRACT

The word or term "Nutraceutical" is a combination of two words i.e. "Nutrition" and "Pharmaceutical". The term nutraceutical was coined in 1989 by DeFelice. Basically nutraceutical is a food or part of food and it has huge historical background regarding to treatment of various disease. Nutraceuticals plays a significant role in normal physiological function, which helps to maintain human health.

In recent period, all people are conscious about their daily diet as well as health. In India many people have preconception or prejudice about nutrition and health. India is a developing country. So many people of rural areas are suffering from non-communicable diseases and disorders due to lack of proper knowledge about nutrition, food and diet. The present article provides some information about "Nutraceuticals and human health. In recent years there is a growing interest in nutraceuticals has been seen in market place. This article mainly helps to provide essential knowledge of nutraceutical with its numerous uses in various ailments. This article also contains important legal requirements that are necessary for register a nutraceutical product.

Keywords; Nutaceuticals, disease.

Introduction

Nutraceuticals are bioactive compounds that lie between food and pharmaceuticals, offering significant health benefits, including disease prevention and treatment. The term "nutraceutical" was coined in 1989 by Dr. Stephen L. DeFelice, combining "nutrition" and "pharmaceutical." These products include whole foods like garlic and soy, food components such as omega-3 fatty acids, and dietary supplements. They are often consumed without prescription and are considered safe, with potential nutritional and therapeutic properties.

Functional foods are natural food products consumed as part of the regular diet, which provide health benefits beyond basic nutrition. Unlike nutraceuticals in supplement form, functional foods must remain in food form and show effects at normal consumption levels. They may help reduce the risk of disease or improve physical and mental performance.

Nutraceuticals are classified into several categories. Dietary fibres, found in fruits, vegetables, and grains, aid digestion and lower disease risk. Probiotics are live microorganisms beneficial for gut health, while prebiotics are non-digestible fibres that feed probiotics. Polyunsaturated fatty acids (PUFAs), such as omega-3s, are essential for brain and cardiovascular health. Antioxidants, including vitamins C and E, help neutralize free radicals and reduce oxidative stress. Polyphenols, present in foods like tea, berries, and wine, exhibit antioxidant, anti-inflammatory, and anticancer properties.

Nutraceuticals offer several health benefits. They help in preventing chronic diseases such as diabetes and cardiovascular disorders, improve immune function, reduce inflammation, support gut health, slow the aging process, and enhance mental and physical performance. Additionally, they contribute to reproductive health and hormonal balance. As interest in natural and preventive healthcare grows, nutraceuticals and functional foods are becoming vital components of a healthy lifestyle and disease management.

NUTRACEUTICALS ON DISEASE PREVENTION

Nutraceuticals play an important role in preventing different disease onset and minimize complication of the disease. It provides protection against non communicable diseases, delay ageing process, increases life expectancy and improves function of the body.[14]

Cardiovascular Diseases

Cardiovascular disease (CVD) refers to a group of disorders that affect the heart and blood vessels. These include conditions such as coronary artery disease, heart failure, stroke, hypertension, and peripheral artery disease.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Garlic	*Allium sativum*, Amarydillaceae	Allicin, alliin, Vitamins:C, B1, B6	Reduces blood pressure, lowers cholesterol, inhibits platelet aggregation
Colchicine	*Colchicum autumnale*, Liliaceae.	Colchicine Colchicoside	Anti-inflammatory; reduce cardiovascular inflammation

Table no.1 Nutraceuticals in cardiovascular diseases

Cancer Prevention

Cancer is a disease in which abnormal cells grow uncontrollably and can invade or spread to other parts of the body. It may form a lump (tumor) and can affect almost any tissue or organ.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Curcumin	*Curcuma longa*, Zingiberaceae.	Curcumin, dimethoxy curcumin, Volatile oils: Turmerone, zingiberene	Reduces inflammation and oxidative stress, Inhibits cancer cell proliferation and metastasis.
Tomato	*Solanum lycopersicum*,Solanaceae	Lycopene, Beta-carotene, Vitamin C, Flavonoids (e.g., quercetin)	Antioxidant activity, Inhibits cell proliferation, Reduces oxidative DNA damage

Table no.2 Nutraceuticals in cancer

Diabetes Management

Diabetes is a chronic metabolic disorder in which the body either does not produce enough insulin or cannot effectively use the insulin it produces, leading to high levels of glucose (sugar) in the blood.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Cinnamon	*Cinnamomum verum*,Lauraceae.	Cinnamaldehyde, Eugenol, Cinnamic acid, Essential oils	Regulate blood sugar level, Improves insulin sensitivity.
Neem	*Azadirachta indica*, Meliaceae.	Azadirachtin, Nimbin, Nimbidin, Flavonoids	Reduces blood glucose levels, Management of diabetic neuropathy.

Table no.3 Nutraceuticals in diabetes

Obesity Control

Obesity is a medical condition characterized by excessive accumulation of body fat that presents a risk to health. It is commonly defined using Body Mass Index (BMI) — a BMI of 30 or above is classified as obese.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Green Tea	*Camellia sinensis*, Theaceae.	Catechins, Caffeine, Amino acids, Flavonoids Tannins	Aids in weight loss, reduces body fat, Enhances fat metabolism.
Fenugreek	*Trigonella foenum-graecum*, Fabaceae.	Alkaloids (e.g., trigonelline), Flavonoids, Coumarins, Essential oils (e.g., diosgenin)	Aids in weight management by suppressing appetite, Helps reduce body fat and cholesterol levels.

Table no.4 Nutraceuticals in obesity

Osteoarthritis and Joint Health

Osteoarthritis is a chronic joint condition characterized by the breakdown and gradual loss of cartilage—the protective tissue at the ends of bones—leading to pain, stiffness, swelling, and reduced joint movement. It most commonly affects the knees, hips, hands, and spine.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Ginger	*Zingiber officinale*, Zingiberaceae.	Gingerol, Zingiberene, Curcumin	Reduces inflammation, pain, and stiffness in the joints.
Capsaicin	*Capsicum annuum*, Solanaceae.	Capsaicin, Dihydrocapsaicin, Nordihydrocapsaicin, Homocapsaicin	Reduces joint pain and discomfort, Improves joint mobility.

Table no.5 Nutraceuticals in osteoarthritis

Oral Health and Dental Diseases

Oral diseases refer to a group of conditions that affect the mouth and surrounding structures, including the teeth, gums, tongue, and jaw. Common oral diseases include dental caries (tooth decay), periodontal (gum) disease, oral infections, and oral cancers.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Aloe Vera	*Aloe barbadensis*, Liliaceae.	Polysaccharides, anthraquinones, vitamins	Healing, antimicrobial, reduces plaque
Clove Oil	*Eugenia caryophyllus*, Myrtaceae.	Eugenol	Analgesic, antiseptic, dental pain relief

Table no.6 Nutraceuticals in oral diseases

Alzheimer's Disease and Cognitive Health

Alzheimer's disease is a progressive neurodegenerative disorder that causes memory loss, cognitive decline, and behavioral changes. It is the most common cause of dementia, resulting from the buildup of abnormal proteins in the brain that damage nerve cells.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Ginkgo Biloba	*Ginkgo biloba*, Ginkgoaceae.	Flavonoids ,terpenoids (ginkgolides, bilobalide)	Enhances cognitive function, neuroprotective, improves circulation
Vitamin D	Sunlight (synthesized in skin), fatty fish	Cholecalciferol (D3), Ergocalciferol (D2)	Modulates immune response, supports neurogenesis

Table no.7 Nutraceuticals in alzheimers disease

Parkinson's Disease Management

Parkinson's disease is a progressive neurological disorder that affects movement. It is caused by the loss of dopamine-producing brain cells, leading to symptoms such as tremors, stiffness, slow movement, and balance problems.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Caffeine	Coffee, tea, cocoa	Methylxanthine (caffeine)	Improves motor function, neuroprotective, promotes dopamine release
Vitamin E	Nuts (Almonds), seeds, vegetable oils	Tocopherols (α-tocopherol, γ-tocopherol)	Neuroprotective, reduces oxidative stress and dopaminergic cell death

Table no.8 Nutraceuticals in parkinsons disease

Eye Health and Vision Preservation

Eye disease refers to any disorder or condition that affects the eye or vision. This includes a wide range of problems such as infections, injuries, degenerative conditions (like cataracts and glaucoma), and refractive errors (like myopia or astigmatism) that can impair sight or cause blindness.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Vitamin A (Beta-carotene)	Carrots, sweet potatoes, spinach	Retinoids (retinol, retinal), provitamin A carotenoids	Essential for night vision, prevents dry eyes
Saffron	*Crocus sativus*, Iridaceae.	Crocin, crocetin, safranal	Protects photoreceptor cells, improves visual acuity in early AMD

Table no.9 Nutraceuticals in eye disorders

Stress Management and Mental Resilience

Stress management refers to a variety of techniques and strategies used to control and reduce stress levels in order to improve overall well-being and mental health. It involves identifying stressors, developing coping skills, and practicing relaxation methods.

Nutraceutical	Biological Source	Chemical Constituents	Therapeutic Role
Ashwagandha	*Withania somnifera*, Solanaceae.	Withanolides, alkaloids	reduces cortisol, improves anxiety, improves memory
Ginseng	*Panax ginseng*, Araliaceae.	Ginsenosides	Adaptogen; improves energy, reduces stress and fatigue

Table no.10 Nutraceuticals in stress management

Conclusion

Nutraceuticals area potentially growing sector and are engaged in both the fields, either medical treatment or nutrition so as to assure integrated medical assistance. These act as potential dietary supplements, prevention of diseases such as CVD, the support and treatment of various types of cancer, and other healthcare benefits.

Therefore, nutraceutical industries now understand and perceive extensively about the potential success of nutrients that affect people in healthcare. At present, medical care is assessed to be the domain of drugs. On the contrary, nutrition is only appraised to be a product for healthy living. In the forthcoming years, it is anticipated that work will be performed, as they both interact and complement each other. The implementation of newer technologies such as the application of genetically modified technology in the food industry, nanotechnology-based nutraceuticals, etc., leads to better medical treatment and health care benefits, which further extended the increase in the nutraceuticals revenue market.

The scientific research ratifies that the improved safety and potential effects of newly developed nutraceutical products will further stimulate the investments in newer technologies, such as nutrigenomics, converging techniques, varied imaging technologies and its applications in nutrition development and healthcare.

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