

NUTRACEUTICALS, HEALTHY FOOD OR MEDICINE: A REVIEW**Swati Rawat***

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431007. MS.**ABSTRACT**

Research in nutrition is constantly developing with new discoveries and innovative technologies. One such advancement that bridges the gap between nutrition and medicine is nutraceuticals. Drugs show many side effect and adverse reactions due to which consumers moved towards food supplements to improve health. In recent years there is a growing interest in nutraceuticals which provide health benefits and are alternative to modern medicine. Nutraceutical--rich vegetables and fruits are an important component of a healthy diet is regarded as the bio active substance and the constituents are either of known therapeutic activity or are chemically defined substance generally

accepted to contribute substantially to the therapeutic activity of the drug. Phytochemical screening involves botanical identification, extraction with suitable solvents, purification and characterization of the bioactive constituents of pharmaceutical importance. Quality control for the official and safely of herbal product is essential. A portmanteau, of these words “nutrition” and “pharmaceutical”, is a food or food product that reportedly provides health and medical benefits, including the prevention and treatment of disease. A product isolated or purified from foods that is generally sold in medicinal forms not usually associated with food. A nutraceutical is demonstrated to have a physiological benefit or provide protection against chronic disease. This article discusses what nutraceuticals are, the role they play in the overall health of the body, and how you can incorporate them into your diet.

KEYWORDS: Nutrition, Disease, Pharmaceutical, Healthy food.**1. INTRODUCTION**

A nutraceutical product may be defined as a substance, which has physiological benefit or provides protection against chronic diseases.^[1] Nutraceuticals may be used to improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the

structure or function of the body.^[2] Unfortunately, the definition of nutraceuticals varies from country to country depending on how they are categorized and regulated. At the moment there is no clear internationally accepted definition of a nutraceutical. Nutraceuticals even include everyday foods like pre- and probiotics, fortified cereals, processed foods, and beverages. Nutraceuticals can improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the structure and functioning of the body. They are also used in the prevention and treatment of mental health issues and disorders. Nutraceuticals are products derived from food sources that provide both nutrition and medicinal benefits. A dietary supplement is considered as a product that bears or contains one or more of the following dietary ingredients: A mineral, a vitamin, an amino acid, a medical herb or other botanical, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients. Nutraceuticals are of these nutritional supplements which are used for health purposes other than nutrition.^[3]

Some popular nutraceuticals include ginseng, Echinacea, green tea, glucosamine, omega-3, lutein, folic acid, and cod liver oil. Majority of the nutraceuticals possess multiple therapeutic properties. Nowadays, nutraceuticals have received considerable interest due to potential nutritional, safety and therapeutic effects. A market research recently proposed that the worldwide nutraceuticals market is expanding and would reach US \$250 billion by 2018.^[4,5] Recent studies have shown promising results for these compounds in various pathological complications such as diabetes,^[6,7] atherosclerosis,^[8,9] cardiovascular diseases (CVDs),^[10,11] cancer,^[12,13] and neurological^[14,15] disorders. These conditions involve many changes, including alterations redox state.^[16,17] Most of nutraceuticals have antioxidant activity with the ability to counteract this situation.^[18,19] Hence, they are considered as healthy sources of health promotion, especially for prevention of life threatening diseases such as diabetes,^[20,21] infection,^[22,23] renal,^[24,25] and gastrointestinal^[26,27] disorders. In the present review much effort has been devoted to present new concepts about nutraceuticals based on their diseases modifying indications. Emphasis has been made to present herbal nutraceuticals effective on hard curative disorders related to oxidative stress, including allergy, alzheimer, cardiovascular, cancer, diabetes, eye, immune, inflammatory and Parkinson's diseases, as well as obesity.

Nutraceuticals are also known by the following terms:

- Functional foods
- Medical foods
- Designer foods
- Phytochemicals
- Nutritional supplements.

These products include dietary supplements, diets, herbal products, genetically engineered foods, and vitamins. They contain a high concentration of bioactive compounds, derived from a natural source and have physiological benefits and aid in the prevention and treatment of disease. Nutraceuticals even include everyday foods like pre- and probiotics, fortified cereals, processed foods, and beverages. Essentially, a nutraceutical is a substance that has a physiological benefit or provides protection from chronic disease. Unfortunately, the definition of nutraceuticals varies from country to country depending on how they are categorized and regulated. At the moment there is no clear internationally accepted definition of a nutraceutical. Nutraceuticals can improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the structure and functioning of the body. They are also used in the prevention and treatment of mental health issues and disorders.

The term nutraceutical is being commonly used in marketing but has no regulatory definition. The proposed definitions can help distinguish between functional foods, nutraceuticals, and dietary supplements discussed. Many nutraceuticals, functional foods and naturally occurring compounds that have been investigated and reported in various studies revealed that these products are extremely active, have profound effect on cell metabolism and often have little adverse effect. It is natural that people's focus is shifting to positive approach for prevention of diseases to stay healthy. Nutraceuticals is scientific area generated all over the world. The nutraceuticals market in India is expected to grow from \$4 billion in 2017 to \$18 billion in 2025. This comes in the backdrop of rising demand for dietary supplements from upper and middle class. However, currently, the Indian market imports more than it exports. It has been shown that people consuming healthy diets, living active lifestyles, not smoking and not indulging in excessive alcohol consumption tend to have a reduced risk of CVD. There has been an explosion of consumer interest in the health enhancing role of physiologically-active specific nutraceuticals. Such products include food supplements, dietary supplements, value-

added processed foods as well as non-food supplements such as tablets, soft gels, capsules etc. The explosive growth, research developments, lack of standards, marketing zeal, quality assurance and regulation will play a vital role in its success or failure.

2. ANTIQUITY

Throughout history, civilized societies have devoted a deep interest in, and concern about, the integrity of food supply. Long before the development of the distinct scientific discipline of nutrition, philosophers and later physicians paid close attention to the role of the daily diet in individual and public health. Interestingly, during the last 2000 years, from the time of Hippocrates(460–377 BC) to the dawn of modern medicine, there was little distinction made between food and drugs. The practice of medicine itself consisted largely of the wise choice of natural food products. Hippocrates clearly recognized the essential relationship between food and health and emphasized that “...differences of diseases depend on nutriment”

Dr Stephen De Felice coined the term "Nutraceutical" from "Nutrition" and "Pharmaceutical" in 1989. De Felice defined a nutraceutical as a: “Food, or parts of a food, that provide medical or health benefits, including the prevention and treatment of disease.”² The idea of using food for both nutrition and medicinal purposes has been ingrained in many ancient cultures. In fact, the concept of nutraceuticals is nearly 3,000 years old! It began to catch on when Hippocrates, the father of modern medicine, recognized the relationship between food and health. Traditionally, the people of India and China consume various natural foods that are considered to be medicinal. Countries like Germany, France, and England were the first to consider one's diet more important than both exercise and hereditary factors in people's attempt to achieve good health.³ Today, nutraceuticals have evolved from their traditional background to a highly scientific field where the efficacy and safety of the products are backed by evidence, new research, and developing technologies.

RATIONALE FOR USE OF NUTRACEUTICALS

Dietary factors play an important role in premature chronic disease appearance, disease progression, morbidity and mortality. Approximately 40-50% proportion in cardiovascular disorders, 35-50% proportion in cancers, and 20% proportion in osteoporosis is attributable to dietary factors. Use of food as medicine for treatment and prevention of various disorders is not a recent development. Fortification of table salt with iodine and wheat flour with iron/folic acid has been used with specific aims of prevention of iodine deficiency goitre and

anaemia for long. Similarly, food fortified with vitamin A has been found to be a feasible and cost-effective approach to reduce vitamin A deficiency

3. REGULATION OF NUTRACEUTICAL INDUSTRY IN INDIA

The Indian definition (as per Food Safety and Security Act passed in 2006, yet to be implemented) lists down the ingredients a nutraceutical product must have and its general properties. A traditional medicine is not a part of nutraceuticals. Foods for special dietary use are specifically processed or formulated to satisfy particular dietary requirements which exist because of a physical or physiological condition or specific disease and disorder. These are presented as such, where in the compositions of these foodstuffs must differ significantly from the Indian Standard (IS) composition of ordinary foods of comparable nature. FSSAI: The new ray of hope! Food Safety and Security (FSS) Act was passed by the parliament in 2006. In 2008, Food Safety and Standard Authority of India (FSSAI) came into existence. The FSSAI has prepared the draft rules and regulations for implementation of FSS Act 2006 which is going through process of prepublication consultation.

4. USE OF NUTRACEUTICALS IN DIFFERENT DISEASES

Over the past few years, nutraceuticals have become very popular. They're being used an alternative or supplemental treatment along with pharmaceuticals to help prevent and treat a wide range of diseases. They have attracted considerable interest because of their potential nutritional values, safety, affordability, and multiple therapeutic effects and are often seen as an attractive option to conventional treatments. Nutraceuticals can play an important role in the body's various biological processes, which help prevent various diseases and improve overall health and well-being.

4.1 NUTRACEUTICALS IN ALLERGY

Allergy is a hypersensitivity disorder of the immune system. An allergic reaction usually occurs when a person's immune system reacts to normally harmless substances. Allergic reactions are distinctive because of excessive activation of certain white blood cells called mast cells and basophils by a type of antibody called immunoglobulin E. This reaction results in an inflammatory response which can range from uncomfortable to dangerous. Quercetin is beneficial in these patients.

4.2 NUTRACEUTICALS IN ALZHEIMER'S DISEASE

Alzheimer's disease (AD) is the most common form of dementia. There is no cure for the disease and eventually leads to death. Most often, AD is diagnosed in people over 65 years of age. Although the less-prevalent early-onset Alzheimer's can occur much earlier. Nutraceutical antioxidants such as curcumin, lutein, lycopene, turmerin and β -carotene may exert positive effects on specific diseases by combating oxidative stress. There are several recently published papers showing the positive effects of different nutraceutical plants such as *Zizyphus jujube*, *Lavandula officinalis* on AD, learning or memory.^[28]

4.3 NUTRACEUTICALS IN CARDIOVASCULAR DISEASES

CVD is a term which is used 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 is associated with a high mortality in CVD. Majority of the CVD are preventable. Flavonoids are widely distributed in vegetables, onion, endives, cruciferous, grapefruits, apples, cherries, pomegranate, berries, black grapes, and red wine, and are available as flavones, flavanones and flavonols,] playing a major role in prevention and curing the CVD. Flavonoid intake was significantly inversely associated with mortality from coronary heart disease and the incidence of myocardial infarction. Anthocyanins, tannins (pro anthocyanidins), tetrahydro- β -carboline, stilbenes, dietary indoleamines, serotonin and melatonin, in plant foods are hypothesized to impose health benefits. Ginger has potent antioxidant and antiinflammatory activities and recently it has been recommended for various diseases including hypertension and palpitation. Orange juice containing pulp is rich in flavonoids. Hesperidin is a flavanone glycoside which is classified as a citrus bioflavonoid. *Citrus sinensis* and *tangelos* are the richest dietary sources of hesperidin. The peel and membranous parts of lemons and oranges have the highest hesperidin concentrations. Hesperidin is used for the treatment of venous insufficiency and hemorrhoids. Phytosterols compete with dietary cholesterol by blocking the uptake as well as facilitating its excretion from the body. Hence, they have the potential to reduce the morbidity and mortality of CVD. Phytosterols occur in most plant species (Buckwheat seeds) and although green and yellow vegetables contain significant amounts of sterols, Fatty acids of the omega-3 series (n-3 fatty acids) present in fish are dietary components affecting plasma lipids and the CVD, like arrhythmias. Octacosanol, present in whole grains, fruits and leaves of many plants, has lipid lowering property, with no side-effects.^[29]

4.4. NUTRACEUTICALS IN CANCER

A healthy lifestyle and diet can help in prevention of cancer. Carotenoids are a group of phytochemicals responsible for different colors of the foods. They have antioxidant activities and effective on cancer prevention. Recent interest in carotenoids has focused on the role of lycopene in human health, especially in cancer disease. Plants rich in daidzein, biochanin, isoflavones and genistein, also inhibit prostate cancer cell growth. Because of the unsaturated nature of lycopene it is considered to be a potent antioxidant and a singlet oxygen quencher. Lycopene concentrates in the prostate, testes, skin and adrenal where it protects against cancer. Lycopene contained vegetables and fruits exert cancer-protective effect and is one of the major carotenoids and is found exclusively in tomatoes, guava, pink grapefruit, water melon and papaya. β -carotene has antioxidant activity and prevents cancer and other diseases. Nowadays, phytochemicals with cancer-preventive properties have been on high attention. A broad range of phyto-pharmaceuticals with a claimed hormonal activity, called "phyto-estrogens," is recommended for prevention of prostate and breast cancers. Citrus fruit flavonoids are able to protect against cancer by acting as antioxidants. Soyfoods are a unique dietary source of isoflavones, the polyphenolic phytochemicals exemplified by epigallocatechin gallate from tea, curcumin from curry and soya isoflavones possess cancer chemo preventive properties. Soybean seems to offer protection against breast, uterine, lung, colorectal, and prostate cancers. β -carotene found in yellow, orange, and green leafy vegetables and fruits such as tomatoes, lettuce, oranges, sweet potatoes, broccoli, cantaloupe, carrots, spinach, and winter squash has anticancer activity. Saponins are reported to possess antimutagenic and antitumor activities and might lower the risk of human cancers, by preventing cancer cells from growing. Saponins are phytochemicals which can be found in peas, soybeans, and some herbs with names indicating foaming properties such as soapberry, soapwort and soapbark. They are also present in tomatoes, potatoes, alfalfa, spinach, and clover. Commercial saponins are extracted mainly from *Yucca schidigera* and *Quillaja saponaria*. Tannins also scavenge harmful free radicals and detoxify carcinogens. Tannins present in grapes, lentils, tea, blackberries, blueberries and cranberries is a proven anticarcinogen is used in alternative medicine and to prevent cancer. Ellagic acid, present in walnuts, pecans, strawberries, cranberries, pomegranates and red raspberry seeds, is an anticancer agent. Pectin is a soluble fiber found in apples has been shown to prevent prostate cancer metastasis by inhibiting the cancer cells from adhering to other cells in the body. Several studies have shown that pectin decreases serum cholesterol levels. Naturally occurring phenolic acid derivatives are reported to possess potential anticancer properties.

Phenolic compounds such as curcumin, gallic acids, ferulic and caffeic acid are reported to possess anticancer activity. Glucosinolates and their hydrolysis products, including indoles and isothiocyanates, and high intake of cruciferous vegetables has been associated with lower risk of colorectal and lung cancer. Bio-transformation products of glucosinolates include dithiol thiones, isothiocyanates, and sulforaphane. They block the enzymes that promote tumor growth, particularly in liver, colon, lung, breast, stomach and esophagus.[75] The sulfur compounds, in garlic have been found to boost the immune system and reduce atherogenesis and platelet stickiness and cancer. Sulforaphane rich in broccoli is a potent phase 2 enzyme inducer. It produces D-glucarolactone, a significant inhibitor of breast cancer. Sulforaphane is an antioxidant and stimulator of natural detoxifying enzymes. Sulforaphane has been reported to reduce the risk of breast cancer and prostate cancer. Curcumin is a polyphenol derived from the plant *Curcuma longa*, commonly called turmeric. Curcumin has been reported to possess antioxidative, anticarcinogenic, and antiinflammatory properties. Consumption of fruits and vegetables having cysteine, glutathione, selenium, Vitamin E, Vitamin C, lycopene, and various phytochemicals elevates the levels of antioxidative capacity. However, more investigations are needed to determine their beneficial effects in cancer prevention or treatment. Large scale clinical trials suggest that some agents such as green tea, Vitamins D and E, selenium, lycopene, soy, antiinflammatory and inhibitors of 5 α -reductase are effective in preventing prostate cancer. Cancer was not prevented by β -carotene, N-acetylcysteine, α -tocopherol, retinol, retinyl palmitate, or isotretinoin in smokers. Ongoing trials may help define new avenues for chemoprevention. Several studies have shown the values of alternative and complementary medicine as adjuvant to chemotherapy or radiotherapy. Complimentary therapy may be reliable and useful supportive measure for prostate cancer patients. Majority of the studies have shown a preventive role for nutraceuticals in cancer, however more elaborate studies are needed.^[30,31]

4.5 NUTRACEUTICALS IN DIABETIS

In recent years a wide range of herbal dietary supplements and herbal medicines have scientifically proven to benefit type 2 diabetes mellitus in preclinical studies, however, few have been proven to do so in properly designed randomized clinical trials. Isoflavones, are phytoestrogens which have structural/functional similarities to human estrogen. Soy isoflavones have been studied most and their consumption have been associated with lower incidence and mortality rate of type II diabetes, heart disease, osteoporosis and certain cancers. Omega-3 fatty acids have been suggested to reduce glucose tolerance in patients

predisposed to diabetes. For the synthesis of a long chain n-3 fatty acids, insulin is required; the heart may thus be particularly susceptible to their depletion in diabetes. Ethyl esters of n-3 fatty acids may be potential beneficial in diabetic patients. Lipoic acid is an antioxidant which is used for the treatment of diabetic neuropathy and seems to be effective as a long-term dietary supplement for protection of diabetics from complications. Dietary fibers from psyllium have been used extensively both as pharmacological supplements, food ingredients, in processed food to aid weight reduction, for glucose control in diabetic patients and to reduce lipid levels in hyper lipidemia. A lot of plants extracts such as Toucrium polium, cinnamon and bitter melon have been shown to prevent or treat diabetes.^[32,33]

4.6 NUTRACEUTICALS IN EYE DISORDER

Patients with eye disorders and conditions like age-related macular degeneration, glaucoma, and visual disorders can benefit from certain nutraceuticals.⁷ Nutraceuticals like lutein, zeaxanthin, vitamin C, and vitamin E reduce the risk of cataracts. Essential fatty acids like omega-3s are important for visual development and retinal function.⁸ Healthy lifestyle with a diet containing foods rich in antioxidants, such as n-3 fatty acids, lutein and zeaxanthin appears beneficial for age-related macular degeneration (AMD). Herbs or herbal extracts, such as 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. Astaxanthin is an important naturally occurring carotenoid in the marine world such as sea bream, salmon, trout, and shrimps. It possesses a number of essential biological functions such as protecting against oxidation process, protecting against ultra violet light effects, immune response and pigmentation, in aquatic animals. It is also a very potent antioxidant. Astaxanthin offers powerful protection for the eyes and prevents macular degeneration. Astaxanthin protects heart from oxidative damage, protects the nervous system from degenerative diseases like AD and boosts immune system function. Lutein is a carotenoid which is found in many vegetables and fruits including sweet potatoes, carrots, squash, tomatoes, mangoes, corn, and leafy greens such as kale and collards. Lutein and Zeaxanthin are used for the treatment of visual disorders. Food sources of zeaxanthin, include egg yolks, corn, green vegetables and fruits, such as brussel sprouts, cabbage, kale, broccoli, green beans, green peas, lettuce, kiwi, collard greens, spinach, and honeydew lutein and zeaxanthin also occur in plants in the form of mono- and diesters of fatty acids. A new source of these carotenoids is marigold flower (*Tagetes erecta*) that contains approximately 86% by weight of the carotenoids zeaxanthin and lutein.

4.7 NUTRACEUTICALS IN IMMUNE SYSTEM

A wide variety of nutraceuticals have been shown to impose crucial roles in immune status and susceptibility to some diseases conditions. Nutraceuticals that belong to the category of immune boosters are useful to improve immune function. They include extracts from the coneflowers, or herbs of the genus Echinacea, such as Echinacea angustifolia, Echinacea pillida, Echinacea purpurea. The coneflowers in particular are a popular herbal remedy used in the central United States, an area to which they are indigenous. Astragalus mongolicus, Astragalus membranaceus, and other herbs of the Astragalus genus are also effective immune boosters. Astragalus stimulates development and transformation of stem cells in the marrow and lymph tissue to active immune cells. Phytoestrogens mostly are recommended for prevention of various diseases related to hormonal imbalance. There is a special interest in soy isoflavones as potential superior alternatives to the synthetic selective estrogen receptor modulators, which are currently applied in hormone replacement therapy. Garlic and morphine also are good example of the nutraceuticals, which respectively stimulate and suppress immune system.^[34] The effect of herbal medicines and bacteria on the immune system and intestinal epithelial cell function has led to new credence for the use of nutraceuticals and probiotics in clinical settings. Probiotics are effective in conditions such as infectious diarrhea in children and recurrent Clostridium difficile induced infections. Supplementation with probiotics (live viable microbial organisms) may provide maturational signals for the lymphoid tissue and improve the balance of pro and antiinflammatory cytokines. Probiotics manipulate the intestinal microflora to maintain a normal balance between pathogenic and nonpathogenic bacteria. Usage of these agents in the treatment of specific diseases has evolved into the ability to very high index of safety, reduction of antibiotic use and the public's positive perception about “alternative” or “natural” therapies. Most probiotic preparations are comprised of one or more lactic acid bacteria. Within this group, strains of Lactobacillus, Bifidobacterium sp. and occasionally Streptococcus are most commonly used.^[35,36]

4.9 NUTRACEUTICALS IN INFLAMMATION

Inflammation is characterized by swelling, pain, redness and heat, and is the response of body tissues to irritation or injury. Nutraceuticals that their influence on osteoarthritis has been tested are ginger, soybean, unsaponifiable, glucosamine, chondroitin, S-adenosylmethionine. Although they are safe and well tolerated, however, the results are hampered by heterogeneity of the studies and inconsistent results. Vitamins C and D are micronutrients for

which evidence of benefit exists. Cat's claw is a potent antiinflammatory agent. Scientists have attributed the efficacy of cat's claw to compounds called oxindole alkaloids; however, water-soluble cat's claw extracts that do not contain significant amounts of alkaloids do not possess strong antioxidant and antiinflammatory effects. Resveratrol that is present in the fruits of *Vaccinium myrtillus*, *Vaccinium angustifolium*, *Vaccinium ashei*, and *Vaccinium corymbosum* shows the strongest sirtuin-like deacetylase action of any known phytochemical. Sirtuins are chemicals that inhibit cyclooxygenase-1 enzyme and can extend the lifespan of yeast and fruit flies. They possess antiinflammatory and antifungal activities. The omega-3 and omega-6 series have a significant role on diseases by generating potent modulatory molecules for inflammatory responses, including prostaglandins, leukotrienes, and interleukins. Gamma linolenic acid (GLA) is produced in the body from linoleic acid, an essential fatty acid of omega-6 series. GLA is a nutraceutical used for treating problems with inflammation and autoimmune diseases. Preformed GLA is present in trace amounts in nuts, green leafy vegetables, vegetable oils, such as seed oil, borage oil, *Oenothera biennis* oil, blackcurrant and hemp seed oil. GLA is metabolized to dihomogamma linolenic acid which undergoes oxidative metabolism by lipoxygenase and cyclooxygenase enzymes to produce antiinflammatory eicosanoids. Herbal nutraceuticals with antiinflammatory activity are also available. Gentianine, present in Gentian root, is an effective antiinflammatory agent. Bromelain, a proteolytic enzyme found in extracts of stinging nettle, turmeric, pineapple, teas and extracts of turmeric or curcumin has antiinflammatory activity. Osteoarthritis is a debilitating joint disorder which affects the number of population. In 2004, the costs associated with all forms of arthritis were approximately 86 billion dollars. Joint discomfort from any joint disorders may reduce physical activity in subjects, resulting in energy imbalance and weight gain. Increased weight can exacerbate existing problems, through additional stress on joints. Glucosamine and chondroitin sulfate are widely used to alleviate symptoms of osteoarthritis. These nutraceuticals seem to regulate gene expression and synthesis of NO and PGE₂, providing a plausible explanation for their antiinflammatory activities.^[36]

4.10. NUTRACEUTICALS IN OBESITY

Obesity is, nowadays, a global public health problem with about 315 million people involved. Obesity is a risk factor for many disorders such as hypertension, congestive heart failure, angina pectoris, hyperlipidemia, respiratory disorders, osteoarthritis, cancer, renal vein thrombosis and reduced fertility. One of the primary causes of obesity is the increased

availability of high-fat, energy-dense foods. There is a very high prevalence of obesity globally and hence nutrition and exercise play a key role in its prevention and treatment. Nutraceutical interventions are currently being investigated on a large-scale basis as potential treatments for obesity and weight management. Nutraceuticals such as capsaicin conjugated linoleic acid, Momordica charantia and Psyllium fiber possess potential antiobese properties. Although excessive consumption of energy-rich foods such as snacks, processed foods and drinks causes weight gain, however, caloric restriction and increased physical activity has been shown to be only moderately successful in managing obesity. Therefore, researchers and obese individuals are seeking the help of nutraceuticals and pharmaceuticals to prevent or treat obesity. An effective nutraceutical that can increase energy expenditure and/or decrease caloric intake is desirable for body weight reduction. Herbal stimulants, such as caffeine, ephedrine, chitosan, ma huang-guarana, and green tea are effective in facilitating body weight loss. However, their use is controversial due to their ability to cause side-effects. Green tea extract and 5-hydroxytryptophan may promote weight loss, while the former increases the energy expenditure, the latter decreases appetite.^[37]

4.11. NUTRACEUTICALS IN PARKINSON'S DISEASE

Parkinson's disease is a degenerative disorder of the central nervous system, which its motor symptoms result from the destruction of dopamine-generating cells in the substantia nigra, with unknown causes. The most obvious symptoms are movement-related including rigidity, slowness of movement, shaking and difficulty with walking and gait. The symptoms in advanced stages of the disease include thinking and behavioral problems. Depression is the most common psychiatric symptom and symptoms include sensory, emotional and sleep problems. Parkinson's disease is more common in older people, with most cases occurring after the age of 50. Although at present there are not sufficient scientific data to recommend nutritional supplements for Parkinson's disease, some of these supplements have shown some promising results in preliminary studies. Vitamin E, glutathione, and creatine seem to be protective against Parkinson's disease.^[38]

4.12. NUTRACEUTICALS IN MISCELLANEOUS COMPLICATIONS

Angiogenesis is an enzymatic process that is generally down-regulated in healthy individuals. Antiangiogenic compounds are selective against newly formed blood vessels while sparing existing ones may not lead to side effects even after prolonged exposure. Antiangiogenic compounds may prevent diseases involving degenerative process such as multiple sclerosis,

arthritis, osteoporosis, diabetes, cancer, AD and Parkinson's diseases. Some bioactive compounds such as curcumin, flavins, isoflavones and catechins, resveratrol, proanthocyanidins, flavonoids, Saponins, terpenes, Chitin, chitosan, Vitamins B3 and D3, Fatty acids, peptides and amino acids are potentially effective angiogenic compounds.^[109] Moringa oleifera Lam has an impressive range of medicinal uses and is a good source various amino acids and phenolics, protein, vitamins, β -sitosterol, caffeoylquinic acid, kaempferol and β -carotene with high nutritional and therapeutic values. Various parts of this plant like leaves, seed, bark, fruit, roots, flowers and immature pods act as cardiac and circulatory stimulants, possess antitumor, antipyretic, antiepileptic, antiinflammatory, diuretic, antihypertensive, antidiabetic, cholesterol lowering, antiulcer, antispasmodic, antioxidant, hepatoprotective, antibacterial, and antifungal activities.^[39]

4.13. NUTRACEUTICALS IN TOXICITY

A large number of people believe that nutraceuticals, especially medicinal plants, are important remedies to address health issues with no side-effects. This belief has been raised from the fact that they have been used for a long period without serious toxicities. Although this is true for a wide variety of nutraceuticals and they generally have less side effects in comparison to pharmaceuticals, but conventional medicine is considered that if a drug is to be effective, inevitably, it will have toxic or side-effects. The medical establishment considers herbal medicines as drugs, and as such, they must have side effects. Therefore, they need to be prepared with correct ingredients and use with caution, too.^[40]

People consume thousands of species of plants and other nutraceuticals to meet their basic nutritional needs, but only a limited number of them have received significant safety studies. Many remain poorly understood and largely undeveloped, and their wild relatives are threatened with extinction and in need of conservation attention. Stewardship of these valuable plant resources will require rigorous science combined with an approach that respects and values traditional knowledge systems.^[41]

4.14. NUTRACEUTICALS IN ANTITOXICITY

Most of the synthetic drugs possess toxicity properties, and nutraceutical compounds, particularly herbal nutraceuticals have been investigated for their potential in combating the toxic effects of toxins and other medications. Although the toxicology of drugs is complex, there is great evidence for involvement of oxidative stress in the toxicity of a wide variety of drugs. Most of plants possess antioxidant activity and other than various specific ways to

combat toxins and synthetic drugs, they generally may reduce their toxicity by reduction of oxidative stress. Kidney and liver are two organs which more than others are involved in toxic effects of other drugs as well as toxins. In this regard there are a wide variety of studies investigating the protective activities of nutraceuticals, especially medicinal plants against toxins and other drugs and promising results have been achieved.^[42,43]

5. OTHER USES OF NEUTRACEUTICALS

Here's a look at other benefits of nutraceuticals.

- Improve overall health
- Increase energy
- Improve sleep
- Regulate bodily functions
- Enhance skincare
- Improve mental clarity
- Reduce cravings
- Improve Mental Health
- Prolong Life
- Enhance Sports Medicine
- Improve Immune Function
- Improve Gut Health

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