



# ROLE OF NUTRACEUTICALS IN VARIOUS DISEASE: A COMPREHENSIVE REVIEW

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**Abstract:** Dr. Stephen L. Defelice, the author and president of the Foundation of Innovation Medicine (FIM) in Crawford, New Jersey, handed the first description of the term nutraceutical. In recent times health experts and the public have shown particular interest in the pharmaceutical product Nutraceuticals. These include colorful food products similar to salutary fibre, antioxidants, polyunsaturated adipose acids (PUFA), probiotics, prebiotics, and other herbal/natural food kinds due to their nutritive supplements. Nutraceuticals are foods, or portions of foods, that have health and remedial parcels that can help and treat complaints. Fruits and vegetables high in nutrients are essential to a balanced diet. Nutraceuticals are vital for maintaining health, precluding complaints, and perfecting quality of life. Their main ingredients include nutrients, botanicals, and salutary supplements. These nutraceuticals aid in the fight against several of the century's most burning health issues, including diabetes, cholesterol, osteoporosis, cancer, heart complaints, and rotundity. This composition's thing is to bandy current exploration on the use of different nutraceuticals in uncommon diseases.

**Key Words:** Nutraceuticals, Dietary supplements, Various disease

## Introduction

Stephen De Felice coined the term "nutraceuticals" in 1989, defining as food or corridor of food that give medical or health benefits, similar to the capability to help or treat complaints. A different description handed by Health Canada describes a product prepared from foods but vended in form of capsules or maquillages or in other medicinal forms, not generally associated with foods. The name "nutraceutical" is a combination of the words "pharmaceutical" and "nutrition." Our bodies need nutrition, but for it to be effective a complex interplay of numerous rudiments must be present. Nutraceuticals are those kinds of composites that fill the gap by offering the right rate of vitamins and other essential rudiments. Phytochemicals similar to alkaloids, different terpenoids, and polyphenols (anthocyanins, flavones, flavanols, isoflavones, ellagic acid, etc.) are a major source of these nutraceutical products and have the capability to treat and help a wide range of degenerative and habitual ailments. Exploration suggests that bioactive phytochemicals serve well as antioxidants and cell defenders and may indeed boost the vulnerable system. Thus, a substance is classified as a food component if it helps to maintain healthy Apkin's and organs; nonetheless, if it modifies the body's physiological processes, it's classified as a remedial substance. There are two main sections to this review. The numerous forms of nutraceuticals are described in the first section, which is arranged according to their origins and chemical structures. The function and manner of action in common mortal conditions are the main motifs of the other section.

## Classification of Nutraceuticals

### *Dietary Supplements:*

dietary supplements are products with a nutritional component designed to improve the flavour of the food you consume. Dietary supplements include glucosamine/chondroitin for arthritis, ginkgo biloba for memory loss, and black cohosh for menopausal symptoms. Additionally, they serve specialized functions such as sports nutrition, weight loss supplements, and meal replacements. Supplement ingredients may include vitamins, minerals, botanicals, herbs, organ tissues, gland extracts, amino acids, enzymes, or other nutritional components. They come in a variety of dosage forms, including pills, capsules, liquids, powders, extracts, and concentrates.

### *Micro- nutrients:*

The immune system depends on five micronutrients: zinc, magnesium, vitamin B6, vitamin C, vitamin E, and vitamin B6. Immune-booster tablets sometimes contain quantities of these minerals that are far greater than the recommended daily allowance (RDA). However, there is no evidence to support the claim that consuming these supplements is any more beneficial than maintaining a healthy diet. Instead of taking pills to get these micronutrients, it is best to use a variety of meals to boost your immune system.

### *Functional Foods:*

Dietary components offer benefits beyond just basic sustenance, which have spurred the creation of functional foods and nutraceuticals. A functional meal could serve as a nutraceutical for one customer. Nutraceuticals include citrus fruits and fortified dairy products (like orange juice). Numerous food substances that are found naturally have been studied as possible cancer therapies. Nutraceuticals like vitamin E, selenium, vitamin D, green tea, soy, and lycopene have a wealth of studies on their benefits on human health.

### *Polyphenols:*

Polyphenols are abundant in red grapes and their byproducts, as well as in other naturally occurring food sources. These compounds have been associated with the prevention of diseases caused by oxidative stress. This study covers the potential health benefits of grape polyphenols as well as newly developed polyphenol-rich compounds intended for use as nutraceuticals. Among its many benefits, grape polyphenols have been demonstrated to preserve endothelial function, increase antioxidant capacity, and guard against LDL oxidation. Recent polyphenol patents show a preference for a right-on-target approach, and the new patented medications are meant to treat and prevent certain illnesses.

### *Terpenoids:*

Terpenoids are useful in the treatment and prevention of many diseases, including cancer, because of their antibacterial, antifungal, antiparasitic, antiviral, anti-allergenic, antispasmodic, antihyperglycemic, anti-inflammatory, and immunomodulatory properties.

### *Glucosinolates:*

Glucosinolates are one of the most distinctive nutraceutical ingredients in cruciferous vegetables, like broccoli. Their considerable potential to prevent chronic diseases, including cancer, has prompted a great deal of research.

## Health Benefits of Nutraceuticals

### *Cardiovascular diseases:*

Antioxidants, dietary fibres, omega-3 fatty acids, vitamins, and minerals are among the nutraceuticals utilized in the prevention and treatment of cardiovascular disease. Grape polyphenols prevent and manage artery-related illnesses.

### *Diabetes:*

Pseudostellate dietary fibres have been utilized to help diabetic people control their blood sugar levels. Antioxidant lipoic acid is used to treat diabetic neuropathy. For diabetic people, n-3 fatty acid ethyl esters may be helpful.

### *Obesity:*

herbal stimulants ephedrine, for example. Green tea, chitosan, ma huang-guarana, and caffeine all help with weight loss.

### *Cancer:*

Because flavonoids obstruct the enzymes that produce estrogen, they lessen the malignancies caused by estrogen. Foods made from soy are a good source of isoflavones, curcumin from curries, and soy itself.

### *Anti-inflammatory activities:*

Turmeric's polyphenol curcumin has anti-inflammatory, antioxidant, and anti-carcinogenic qualities. Linoleic acid, found in green leafy vegetables, almonds, and vegetable oils, is used to alleviate inflammation and autoimmune illnesses.

### *Vision improving agents:*

Lutein, also called helenien, is found in foods like tomatoes, corn, sweet potatoes, carrots, squash, and mangoes and is used to treat visual impairments.

## **Nutraceuticals and disease**

It has been suggested that nutraceuticals offer physiological benefits or offer protection against several ailments, including cancer, allergies, osteoarthritis, cardiovascular disease, diabetes, obesity, Parkinson's disease, eye disorders, immune system problems, and inflammations.

### *Cardiovascular disease*

Chronic heart and blood vessel abnormalities are the basis of cardiovascular diseases (CVD), which include high blood pressure (hypertension), heart attacks (heart attacks), strokes (cerebrovascular disease), heart failure, peripheral vascular disease, and others. Atherosclerotic plaques, which restrict the lumen and lower blood flow, develop on the inside surface of arteries in coronary heart disease. It would also be the main cause of death in underdeveloped nations. Most of these illnesses would be avoidable and under control. Antioxidants, dietary fibers, omega-3 poly unsaturated fatty acids, vitamins, and minerals are examples of nutraceuticals utilized in the treatment and prevention of cardiovascular disorders. Gamma linolenic acid (GLA), found in milk and eggs, offers several advantages, including the management and prevention of cardiovascular illnesses. Grape polyphenols are known to prevent and regulate vascular disorders. Onions, veggies, grapes, red wine, apples, and cherries all include flavonoids, which block the ACE and fortify the tiny capillaries that supply all cells with vital nutrients and oxygen.

## *Diabetes*

Diabetes mellitus is a condition marked by excessively high blood glucose levels that is brought on by either insufficient or poor insulin synthesis. Type 1 diabetes, which affects 5% of people, is an autoimmune disease. Type 2 diabetes, which affects 95% of people, is linked to obesity. It is anticipated that there will be 366 million diabetics worldwide in 2003, up from 171 million in 2000. The cornerstone of managing gestational diabetes mellitus is diet therapy. Few adequately planned randomized trials have demonstrated the beneficial effects of herbal dietary supplements on type 2 diabetes mellitus, despite their widespread usage. An antioxidant called lipoic acid is utilized in nutraceuticals to treat diabetic neuropathy in people with diabetes. For diabetic people, n-3 fatty acid ethyl esters may be helpful. Insulin resistance is modulated by docosahexaenoic acid, which is also essential for neurovascular development. Pseudosylvian dietary fibres have been utilized to lower cholesterol in hyperlipidaemia and to help diabetic people control their blood sugar levels. Green tea, chitosan, ma hang-guarana, ephedrine, and caffeine are examples of herbal stimulants that aid in weight loss. Individuals with diabetes are more vulnerable to free radical-induced blood vessel damage. The flavonoids in the quercetin class, also referred to as flavanols, act as antioxidants by scavenging harmful molecules in the body called free radicals.

## *Obesity*

An unhealthy amount of body fat is called obesity, and it is now a global public health concern. Obesity is linked to several conditions, including angina pectoris, congestive heart failure, hypertension, hyperlipidemia, respiratory issues, renal vein thrombosis, osteoarthritis, cancer, and decreased fertility. The WHO defines obesity as affecting 315 million people, and the main reason for this sharp increase in obesity rates is the increased availability of high-fat, high-energy foods. These foods, which include burgers, drinks, snacks, and pizzas, can promote weight gain and should be limited in addition to sugar and salt in the diet. Large-scale research is now being conducted on nutritional interventions as possible therapies for obesity and weight control. When it comes to obesity, nutraceuticals are the crop buckwheat possesses unique biological properties that include decreasing cholesterol, preventing hypertension, and relieving constipation and obesity by functioning similarly to dietary fiber found in food. Green tea extract and 5-hydroxytryptophan have been shown to aid in weight loss, and former illness hunger later in life raises energy expenditure. Green tea, ma huang-guarana, ephedrine, and caffeine are examples of herbal stimulants that aid in weight loss. The nutritional supplement's combination of glucomannan, chitosan, fenugreek, G Silvestre, and vitamin dramatically decreased body weight. Momordica Charantia (MC), capsaicin, and conjugated linoleic acid (CLA) have possible anti-obesity qualities.

## *Parkinson's disease*

Parkinson's disease is a brain ailment or motor disorder that often manifests in mid- to late-life adulthood and is caused by nerve loss in certain brain regions, resulting in muscle rigidity, shaking, and difficulty walking. Although early research on nutritional supplements has produced some encouraging findings, it's vital to keep in mind that there is currently insufficient scientific evidence to support their use for Parkinson's disease. Several of these supplements, known as nutraceuticals, have had encouraging outcomes in early research on Parkinson's disease. Proteins like creatine, glutathione, and vitamin E appear to guard against Parkinson's disease. A decrease in the clinical symptoms of Parkinson's disease indicates how creatine alters its characteristics.

### *Alzheimer 's disease*

Progressive dementia is the hallmark of Alzheimer's disease (AD), with memory loss serving as the primary clinical sign. Dementia with Alzheimer's disease (AD) is the most prevalent type. The illness has no known treatment and ultimately results in death. The majority of AD diagnoses are made in those over 65, while early-onset Alzheimer's can happen considerably earlier and is less common. In 2006, there were 26.6 million sufferers worldwide, and by 2050, it is expected to impact 1 in 85 individuals. Nutraceuticals such as  $\beta$ -Carotene, curcumin, lutein, lycopene, and turmeric, among others, may be used to treat Alzheimer's disease by counteracting the deleterious effects of oxidative stress, mitochondrial malfunction, and several types of brain degeneration.

### *Cancer*

A significant public health issue in arising nations is cancer. The peril of habitual inflammation is identified with an increased threat of cancer. also connected to vulnerable repression, a known carcinogen, is habitual inflammation. Free revolutionaries and aldehydes, which are created during prolonged inflammation, have the molecular capacity to beget dangerous gene mutations and alter important proteins linked to cancer. nasty excrescences reckoned for 12 of the roughly 56 million global deaths in 2000 due to allcauses.The World Cancer Report estimates that there will be 15 million new cases of cancer in 2020, a 50 increase in cases. Lycopene, which has cancer- preventative attention in the skin, testes, adrenal glands, and prostate, is one of the nutraceuticals employed in cancer treatment. Lycopene, a prominent carotenoid in Western diets, is nearly only present in tomatoes, watermelon, papaya, guava, and pink grapefruit. also, phytochemicals attained from sauces and spices may haveanti-mutagenic andanti-carcinogenic parcels. It's advised to use a variety of" phytoestrogens" with purported hormonal exertion to help bone and prostate cancer. Citrus fruit flavonoids appear to serve as antioxidants to help cancer. Curcumin from curries and soy isoflavones could help cancer through chemotherapy. Soy foods are a source of isoflavones. Among theanti-carcinogens set up in walnuts, cranberries, and strawberries is ellagic acid. At the top of the game, it has been observed that turmeric rhizomes, spinach leaves, cucumber fruits, and beet roots haveanti-tumor parcels. Blackberries, blueberries, cranberries, grapes, lentils, tea, wine, and other foods include tannins, which have the capability to scavenge dangerous free revolutionaries and detoxify carcinogens. Turmeric's polyphenol curcumin, also known as diferuloylmethane, Hasanti-inflammatory, Anti-carcinogenic, and antioxidative rates. Pectin, set up in apples, stops prostate cancer cells from attaching to other body cells.

### *Allergy*

typically, the result of the immune system of an individual reacting to a normally harmless substance. The excessive activation of specific white blood cells known as mast cells and basophils by a kind of antibody known as immunoglobulin E is what makes allergic reactions unique. An inflammatory response is the result of this reaction and can be either uncomfortable or harmful. Using nutraceuticals to treat allergies is Quercetin (QR) is a member of the flavonoid class of polyphenolic compounds. Onions, red wine, and green tea all contain quercetin, a natural antihistamine that acts against the body's histamine production.

### *Osteoarthritis*

Osteoarthritis is a degenerative condition characterized by loss of articular cartilage in joints and a decrease in the protein that connects the bones. The most prevalent type of arthritis in the US, affecting an estimated 21 million people, is osteoarthritis (OA), a crippling joint condition. People with joint diseases may be less active, which can lead to an imbalance in energy and weight gain. To alleviate the symptoms of osteoarthritis, glucosamine (GLN) and chondroitin sulphate (CS) are two common nutraceuticals. In order to assist cure or prevent osteoarthritis or other joint disorders, methyl sulfonyl methane (MSM) is used with glucosamine and chondroitin.



## Eye disorders

Maintaining a healthy life and eating a diet high in antioxidant-rich foods including omega-3 adipose acids, lutein, and zeaxanthin may help help age-related macular degeneration (AMD). Nutraceuticals with high polyphenolic flavonoid attention have been demonstrated to exhibition antioxidant parcels. Sauces or herbal excerpts, including coenzyme, green tea, Alliums., polyphenols, carotenoids (primarily lycopene and  $\beta$ -carotene), vitamins C and E, and antioxidants, are useful in treating AMD. In the marine terrain, astaxanthin is a naturally being carotenoid that's set up in shrimp, ocean bream, salmon, and trout. It performs several vital natural tasks, including defending submarine brutes' saturation, immunological response, and oxidation process against the dangerous goods of ultraviolet light. It has strong antioxidant parcels as well. Astaxanthin inhibits macular degeneration and provides effective eye protection. Astaxanthin strengthens the vulnerable system, guards against oxidative stress on the heart, and securities the neurological system from degenerative conditions like Alzheimer's complaint. The vitamin lutein, generally appertained to as Helenian, is used to cure visual impairments. It can be set up in mangoes, sludge, sweet potatoes, carrots, squash, tomatoes, and dark, lush vegetables like bok choy, kale, and collards. discovered in sludge, egg thralldom, and green foods (similar as Brussel sprouts, spinach, kale, collard flora, broccoli, green sap, green peas, lettuce, kiwi, and honeydew) that are substantially employed in traditional Chinese drug to cure visual diseases.

## Immune system

astragals stimulate development and metamorphosis of stem cells in the gist and lymph towel to active vulnerable cells. Phytoestrogens substantially are recommended for forestallment of colorful conditions related to hormonal imbalance. There's a special interest in soy isoflavones as implicit superior to the synthetic picky oestrogen receptor modulators, which are presently applied in hormone relief remedy. Garlic and morphine also are good illustration of the nutraceuticals, which independently stimulate and suppress vulnerable system. Nutraceuticals and probiotics have gained fresh support in clinical settings due to their impact on the vulnerable system and intestinal epithelial cell function, as well as the goods of bacteria and herbal drugs. Probiotics work well for affections including recreating infections caused by *Clostridium difficile* and contagious diarrhea in youths. Probiotic supplements, which include live, living microorganisms, may help balancepro- andanti-inflammatory cytokines and give lymphoid towel maturationalcues. Probiotics work by altering the microbiota in the gut to keep the rate of pathogenic tonon-pathogenic bacteria in check. The capacity to treat certain conditions with these substances has led to a veritably high indicator of safety, a drop in the operation of antibiotics, and a favourable public print of " indispensable " or " natural " remedies. One or further lactic acid bacteria can be set up in the maturity of probiotic phrasings. The most frequently employed strains in this group are those of *Lactobacillus*, *Bifidobacterium*'s., and sporadically *Streptococcus*.

## Inflammation

Inflammation is the body's response to vexation or injury and is characterized by swelling, discomfort, greenishness, and heat. Studies have examined the goods of gusto, soybean, unsaponifiable, glucosamine, chondroitin, and S- adenosylmethionine as nutraceuticals on osteoarthritis. Despite being well- permitted and safe, the results are compromised by the inconsistent and miscellaneous nature of the examinations. There's substantiation of benefit for the micronutrients C andD. Cat claws have stronganti - inflammatoryproperties. Researchers have linked cat's claw's effectiveness to substances known as oxindole alkaloids; still, excerpts of the claw that are answerable in water and do not have a lot of alkaloids do not have a lot of antioxidant oranti-inflammatory parcels. The strongest known phytochemical with sirtuinlike deacetylase exertion is set up in the fruits of *Vaccinium myrtillus*, *Vaccinium angustifolium*, *Vaccinium ashei*, and *Vaccinium corymbosum*. Chemicals called sirtuins have the capability to block the cyclooxygenase- 1 enzyme and increase the life of fruit canvases and incentive. They've antifungal andanti-inflammatory parcels. Because they produce important modulatory notes for seditious responses, similar as prostaglandins, leukotrienes, and interleukins, the omega- 3 and omega- 6 series have a major impact on ails. The body converts linoleic acid, an important omega- 6 adipose acid, into gamma linolenic acid (GLA). A nutraceutical

called GLA is used to treat autoimmune diseases and inflammation-related issues. Nuts, lush green vegetables, and vegetable canvases like hemp, borage, seed, and *Oenothera biennis* oil painting all contain trace situations of produced GLA. GLA is converted to dihomogamma linolenic acid, which is also oxidatively degraded by the enzyme's cyclooxygenase and lipoxygenase, performing in the product of eicosanoids with anti-inflammatory parcels. There are other herbal nutraceuticals available that have anti-inflammatory parcels. The emulsion gentianine, set up in gentian root, has potent anti-inflammatory parcels. The proteolytic enzyme bromelain, which has anti-inflammatory parcels, is present in surcharging nettle, pineapple, teas, and turmeric or curcumin excerpts. Numerous people are impacted by osteoarthritis, a crippling common condition. The total cost of arthritis in all its kinds was estimated to be around 86 billion bones in 2004. Any common problem that causes discomfort in the joints may beget cases to come less active, which could lead to an imbalance in energy and weight gain. Gaining weight can make pre-existing conditions worse by putting further strain on joints. Numerous people take glucosamine and chondroitin sulphate to relieve osteoarthritis symptoms. These nutraceuticals' implicit capability to control NO and PGE2 generation and gene expression offers a logical explanation for their anti-inflammatory parcels.

## Conclusion

The usage of nutraceuticals is expanding quickly, and people are accepting of them because they are entirely natural. The demand for fewer synthetic medications is driving this interest and motivating companies to develop and promote new products with promising health claims. One major obstacle is the lack of a unified regulatory framework for nutraceuticals, which are sometimes mistaken with other preparations derived from food, including dietary supplements. This gap should be filled by acknowledging the distinct qualities of nutraceuticals as pharmafoods and specifically pointing out to them an additional benefit in therapy and prevention. Nutraceuticals can be a potent, extremely useful tool for the treatment and prevention of pathological diseases, even though they cannot entirely replace medications. To clearly distinguish them from pharmaceuticals and every other food-derived product already available on the market, a regulation is essential (such as functional foods, pre and probiotics, dietary supplements, and botanicals).

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