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Review Article

A Compressive Review on Nutraceuticals

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ABSTRACT

3Products known as nutraceuticals are utilized as medicines in addition to being used for nourishment. A substance that has physiological benefit3s or offers protection against chronic disease might be referred to as a nutraceutical pr6oduct. Nutraceuticals can be used to prolong life, prevent chronic diseases, promote health, slow down the aging process, or support the body's structure or function. These days, there is a lot of interest in nutraceuticals because of their possible medicinal, safety, and nutritional benefits. These medicines have demonstrated encouraging outcomes in a few problems in recent investigations. Much work has gone into presenting novel ideas regarding nutraceuticals based on their indications for changing diseases in the current review. Herbal nutraceuticals have been highlighted as being useful in treating oxidative stress-related hard-to-cure conditions such as obesity, immunological, inflammatory, Parkinson's, cancer, diabetes, heart disease, allergies, and Alzheimer's. We searched scientific websites including Medline, PubMed, and Google Scholar for recently published publications discussing various facets of nutraceuticals as a pharmaceutical substitute. Nutraceutical, allergy, cardiovascular, cancer, diabetes, eye, immunological, inflammatory, or Parkinson were among the phrases utilized.

INTRODUCTION

The terms "nutrition" and "pharmaceutics" are combined to form the phrase "natriuretic." The phrase refers to items that are separated from herbal goods, dietary supplements (nutrients), certain diets, and processed meals like cereals, soups, and beverages that are used as medicines in addition to being used for nourishment. The phrase "nutraceutical" items are regulated in the United States as dietary supplements, food components, and medications. varied countries have varied definitions for the phrase, but generally speaking, it refers to a substance that is separated from food and offered in medical forms that are not typically connected to food. A substance that has

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physiological benefits or offers protection against chronic diseases might be categorized as a nutraceutical product. Nutraceuticals may be applied to prolong life, prevent chronic illnesses, promote health, slow down the aging process, or maintain the body's structure or function. Unlike pharmaceuticals, nutraceuticals are compounds that typically lack patent protection. Although both pharmaceutical and nutraceutical substances may be used to treat or prevent illnesses, only pharmaceutical substances are approved by the government. Any product bearing or containing one or more of the following nutritional components is regarded as a dietary supplement: A nutritional substance that humans can utilize to augment their diet by increasing their daily consumption, a mineral, a vitamin, an amino acid, a medicinal herb or other plant, a concentration, metabolite, constituent, extract, or mixtures of these substances. These dietary supplements that are utilized for health reasons other than nourishment are called nutraceuticals. Ginseng, Echinacea, green tea, glucosamine, omega-3, lutein, folic acid, and cod liver oil are a few well-known nutraceuticals. The majority of nutraceuticals have several therapeutic benefits.These days, there is a lot of interest in nutraceuticals because of their possible medicinal, safety, and nutritional benefits. According to a recent market study, the global nutraceuticals market is growing and is expected to reach $250 billion by 2018. According to recent research, these chemicals have shown encouraging outcomes in a number of pathological consequences, including diabetes, athrosclerosis, cardiovascular diseases (CVDs), cancer, , neurological disorders, , and athrosclerosis. Redox state changes are among the several changes associated with these diseases. The majority of nutraceuticals can reverse this condition because of their antioxidant action. As a result, they are regarded as beneficial sources of health promotion, particularly for the prevention of serious illnesses including diabetes, infections, kidney, and gastrointestinal 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.

Benefits of Nutraceuticals:

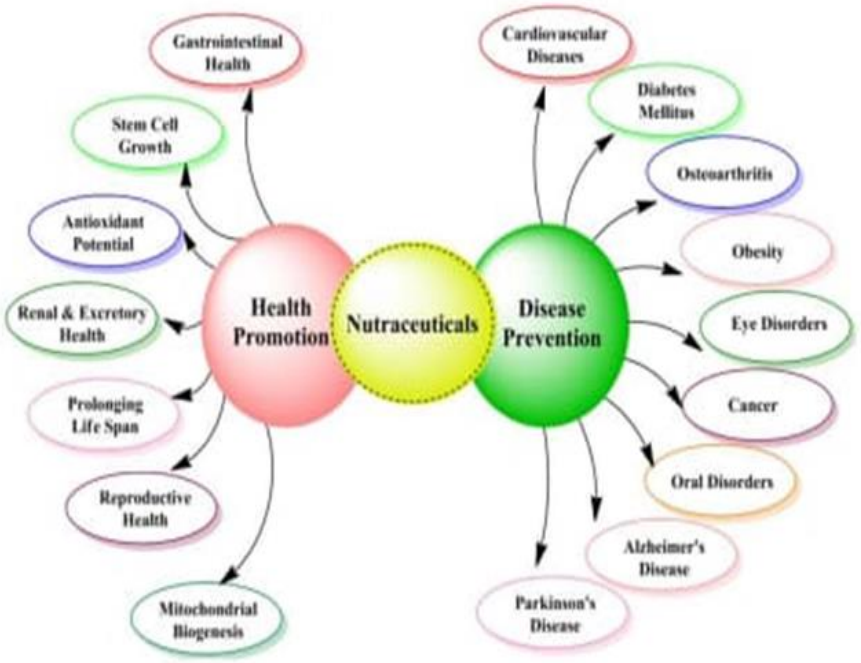

Figure 3. Role of nutraceuticals in disease prevention and health promotion.

Table 2. List of nutraceuticals with health benefits.

METHODS:

Using scholarly websites like Medline, PubMed, and Google Scholar, current publications addressing various facets of nutraceuticals as a pharmaceutical substitute were found. Nutraceutical, allergy, Alzheimer's, cardiovascular, cancer, diabetes, eye, immunological, inflammatory, or Parkinson's were among the phrases utilized.

Allergy and nutraceuticals:

Allergies are immune system hypersensitivity disorders. When a person's immune system reacts to generally innocuous chemicals, an allergic reaction typically happens. The hallmark of allergic reactions is the over-activation of specific white blood cells, known as mast cells and basophils, by an antibody type known as immunoglobulin E. An inflammatory response is the outcome of this reaction, and it can be uncomfortable or even harmful. Quercetin prevents damage to low-density lipoprotein (LDL-C), particularly to blood arteries. The root cause of heart disease is LDL-C, whereas quercetin scavenges free radicals and functions as an antioxidant. Patients with diabetes are more vulnerable to oxidative stress-induced blood vessel damage. Consequently, quercetin also helps these patients.

Alzheimers disease and nutraceuticals:

The most prevalent type of dementia is Alzheimer's disease (AD). The illness has no known treatment and ultimately results in death. Alzheimer's disease is often diagnosed in adults over 65 , while early-onset Alzheimer's disease, which is less common, can manifest considerably younger. In 2006, there were 26.6 million victims worldwide, and by 2050, it is expected to impact 1 in 85 individuals. At a ratio of nearly 2:1, women are more impacted than men. Numerous lines of

evidence imply that oxidative stress may be connected to AD and other neurodegenerative diseases. Nutraceutical antioxidants such as curcumin, lutein, lycopene, turmerin and β-carotene may exert positive effects on specific diseases by combating oxidative stress. The growing trends in nutraceutical usage are due to the belief that these compounds are able to postpone the development dementias like AD. Numerous recently released studies demonstrate the beneficial effects of various nutraceutical herbs, including Ziziphus jujube and Lavendera officinalis, on AD, memory, and learning.

Cardiovascular diseases and nutraceuticals:

The prevalence of CVD is rising globally, as are the studies conducted in this field. [35–39] Heart and blood vessel abnormalities are collectively referred to as cardiovascular disease (CVD). These conditions include heart failure, hypertension, peripheral vascular illnesses, coronary heart disease (heart attack), and cerebrovascular disease (stroke). Low consumption of fruits and vegetables is thought to be linked to a higher death rate from CVD. The vast majority of CVD can be avoided. A diet high in fruits and vegetables has been shown in numerous trials to protect against CVD. Nutraceuticals in the form of vitamins, minerals, antioxidants, dietary fibers and omega-3 polyunsaturated fatty acids (n−3 PUFAs) together with physical exercise are recommended for prevention and treatment of CVD. The molecules such as polyphenols alter cellular metabolism and signaling, which is believed to reduce arterial disease.

Cancer and nutraceuticals:

Cancer has become a significant public health issue in developing nations. The World Cancer Report states that cancer rates are rising and that there will be 15 million new cases in 2020, a 50% increase. Cancer can be avoided with a nutritious food and way of life. A class of phytochemicals known as carotenoids is what gives meals their various hues. They effectively prevent cancer and have antioxidant properties. Recent research on carotenoids has concentrated on lycopene's function in human health, particularly in relation to cancer. Prostate cancer cell proliferation is also inhibited by plants high in genistein, biochanin, isoflavones, and daidzein. Due to lycopene's unsaturated state, it is regarded as a strong antioxidant and an oxygen quencher for singlets. Lycopene is concentrated in the skin, testes, prostate, and adrenal glands, where it provides anti-cancer protection. The connection between carotenoids and CAD and cancer prevention has increased the significance of fruits and vegetables in a person's diet.

Eyedisorders and nutraceuticals:

Age-related macular degeneration (AMD) may benefit from a healthy lifestyle and diet high in antioxidant-rich foods including n-3 fatty acids, lutein, and zeaxanthin. Nutraceuticals with high levels of polyphenolic flavonoids have been demonstrated to have antioxidant properties. Green tea, Allium species, vitamins C and E, polyphenols, carotenoids (primarily lycopene and β-carotene), coenzyme Q10, and other herbs or herbal extracts have antioxidant qualities and are useful in AMD.

Nutraceuticals and the immune system:

Numerous nutraceuticals have been demonstrated to play important roles in immune function and vulnerability to certain illnesses. Immune boosters are a class of nutraceuticals that help strengthen the immune system. Coneflower extracts and herbs from the genus Echinacea, including Echinacea angustfolia, Echinacea pillida, and Echinacea purpurea, are among them. Particularly

in the central United States, where they are native, coneflowers are used as a common herbal treatment. Other herbs of the Astragalus genus, such as Astragalus mongolicus and Astragalus membranaceus, are similarly powerful immune-stimulating agents. Astragalus promotes the growth and conversion of stem cells into functional immune cells in the lymphatic and bone marrow. Generally speaking, phytoestrogens are advised to avoid a number of illnesses linked to hormone imbalance. Soy isoflavones are of particular interest as possible better substitutes for the synthetic selective estrogen receptor modulators used in hormone replacement therapy. Nutraceuticals that stimulate and depress the immune system, respectively, include morphine and garlic.

Obesity and nutraceuticals:

Nowadays, 315 million people worldwide suffer from obesity, making it a public health concern. Numerous conditions, including hypertension, congestive heart failure, angina pectoris, hyperlipidemia, respiratory issues, osteoarthritis, cancer, renal vein thrombosis, and decreased fertility, are associated with obesity. The growing availability of foods high in fat and energy density is one of the main causes of obesity. Because obesity is so common around the world, diet and exercise are crucial to both preventing and treating it. Large-scale research is now being done on nutritional interventions as possible treatments for weight management and obesity. Nutraceuticals with putative anti-obesity qualities include Psyllium fiber, Momordica charantia, and capsaicin conjugated linoleic acid. While eating too many energy-dense meals, like snacks, processed foods, and beverages, can lead to weight gain, it has been demonstrated that calorie restriction and increased physical activity can only significantly reduce obesity. In order to prevent or treat obesity, researchers and obese people are turning to medications and nutraceuticals. For body weight loss, an efficient nutraceutical that can raise energy expenditure and/or lower calorie intake is preferred. Herbal stimulants including green tea, ma huang-guarana, chitosan, ephedrine, and caffeine are efficient at helping people lose weight. However, because they can have negative side effects, their use is debatable. 5 hydroxytryptophan and green tea extract may help people lose weight; the latter reduces hunger while the former raises energy expenditure.

Specialised Medical Products- Nutraceuticals:

Dietary meals and supplements used for specific medicinal objectives are considered specialized medical products under the legal foundation. In addition to the many national protocols issued, usually by the "Ministry of Agriculture" and/or "Ministry of Health" of various nations worldwide, these dietary supplements should be regulated in accordance with regulatory bodies like the "European Food Safety Authority" and the "U.S. Food and Drug Administration" Non-specific biological medicines called nutraceuticals are used to control symptoms, prevent cancer, and enhance well-being. A flow chart illustrating the role of nutraceuticals in illness prevention and health promotion is presented in Figure 3. Table 2 provides a summary of the many nutraceuticals used in health promotion.

Formulations And Difficulties Presented

Numerous obstacles must be overcome to create a high-quality nutraceutical formulation that is safe, effective, technologically feasible, and still affordable. Botanicals are complex substances having various chemical elements, and typically multiple classes of compounds are contained in a single product, in contrast to medication molecules, which are well defined chemical

entities. The majority of these plants are sensitive to alkaline pH, heat, light, oxygen, and high humidity. These typically have variable particle size distribution, low bulk density, and poor flow. Therefore, understanding the basic physicochemical characteristics of the various ingredient types, using appropriate manufacturing techniques, choosing the right excipients, and adding appropriate manufacturing overages based on critical stability studies are all necessary for the successful development of nutraceutical formulations Here, focus is placed on:

• Difficulties with different dosage forms;

• Methods for addressing formulation issues;

• Selection of excipients

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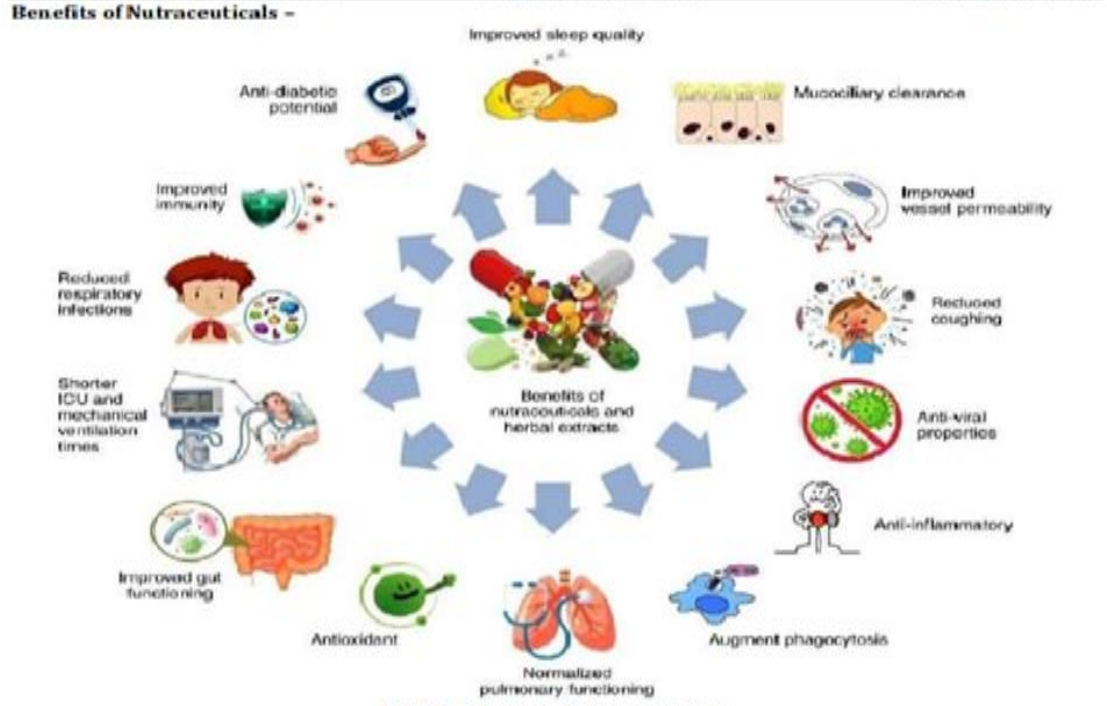

Figure 6: Benefits of Nutraceuticals

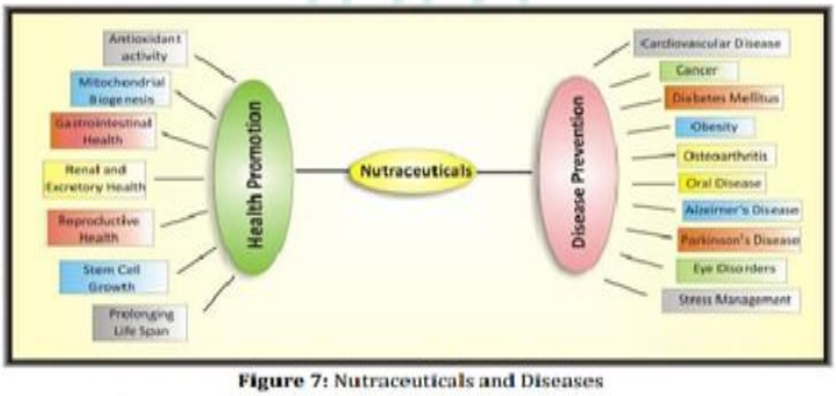

Figure 7: Nutraceuticals and Diseases

Difficulties in Formulating Dietary Supplements and Nutraceuticals

The high melting point, poor water solubility, and chemical instability of active ingredients provide challenges when creating nutraceuticals. For instance, curcumin, oil-soluble vitamins, carotenoids, and omega-3 fatty acids are all highly nutritious but poorly soluble. Therefore, developing these as innovative delivery methods is one feasible strategy. They are expensive because of these new distribution methods. Therefore, work is required to make these formulations economical. The high melting point of nutraceuticals presents another difficulty in their formulation. For instance, the high melting points of carotenoids, fatty alcohols, and phytosterols could make formulation unstable. Thus, making a solid dispersion or dissolving it in a high-grade solvent and adding it to meals as suspended nanocrystals is one conceivable strategy. But once more, the problem is that it results in poor stability and shelf life, an unpleasant look, and an unpleasant mouthfeel and odor, all of which have an impact on market value and consumer demand. Cost-effective technology development is therefore necessary. Another problem is chemical instability. For instance, oils high in omega-3 fatty acids, such flaxseed oil, fish oil, and cod liver oil, as well as carotenoids like lycopene or curcumin, all have stability problems. The bioactive product's composition, the ambient factors (temperature, pH, pressure, etc.), and the presence of metals or other oxidation-promoting substances all affect how much chemical degradation occurs. The creation of nanoscale products is crucial for these compounds in order to prevent their degradation. Furthermore, certain, selective bacterial strains are required for the creation of probiotics. Choosing the right strain and then incorporating it into meals is a current difficulty. In addition to their careless handling, the application of any mismatched bacterial or poisonous cultures can have disastrous results. Solid dose formulation and process design for medication and nutrition items that are similar but have different purposes and regulatory requirements are additional factors to take into account in addition to these difficulties. Last but not least, creating nutraceuticals and dietary supplement dosage forms that are appropriate for various aging population groups—particularly children and older adults—presents a problem. This is due to their dysphagia, which limits their ability to swallow solid dosages like tablets or capsules. Therefore, when administering nutraceuticals and dietary supplements, advanced dosage forms such orodispersible tablets, quick dissolving films, and easy-swallowing gels—typically utilized in pharmaceutical applications—must be taken into account 888

Methods for handling formulation challenges

The manufacture or isolation of nutraceutical concentrates from natural sources is one of the most used methods. The majority of herbal nutraceuticals are beneficial because intended to be taken in high doses every day. Furthermore, different sources include different "active ingredients." Within a single dosage form, the compression and flow properties of the active component vary greatly. Within a same composition, components' susceptibility to heat and moisture varies greatly. With so many chances for engagement, there are serious stability issues. Maceration, percolation, microwave-assisted extraction, countercurrent extraction, and Soxhlet extraction are some of the several extraction techniques. Herbal concentrates, fruit, vegetable, and specialized concentrates, plant extracts, and microbial and fungal components that are added to feedstock to create concentrates (a process known as bio-fermentation) are examples of natural bioactive chemicals. Excipients utilized in

manufacture, such as spray-dried carriers, may be included in concentrates *-.

3.2.1. Nanoemulsions and Liposomes

Because they can concurrently encapsulate both hydrophilic and lipophilic components, liposomes and nanoemulsions—also known as bilayer phospholipid vesicles—have higher potential for the nutraceutical business. This guarantees a synergistic effect and aids in safeguarding extremely sensitive bioactive chemicals, guaranteeing improved bioavailability, sustainable release, and storage stability. Because of its special qualities, nanoliposomes can be utilized both to promote health and to avoid diseases. Lipid-based nanocarriers, or nanophytosomes, are one of the most recent examples that facilitate the transport of botanical nutraceuticals. They could be utilized in a variety of culinary products to create innovative functional drinks and food items.. A study shows that when rutin complexes were created in the form of phytosomes, rutin's chemical and physical stability enhanced. With a molar ratio of rutin: PC of 1:3, a particle size of less than 100 nm, and a 99% encapsulation efficiency, these phytosome complexes of rutin were created with the aid of phosphatidylcholine (PC), which was able to conceal the unpleasant characteristics of rutin. They were referred to as phosphatidylcholine (PC)—rutin complexes or phytosomes.

3.2.2. Carriers Based on Lipids

The controlled release, solubility, and bioavailability of phenolic compounds can be effectively improved by using lipid formulations in the form of micronized carriers and nanocapsules. For instance, because of their physical stability, β-Car nanocapsules (>300 nm) only slightly changed throughout storage, indicating that they can be employed as nutraceutical goods and functional foods and drinks.

3.2.3. Matrices of Polysaccharides

Numerous enzymatic exposures in these matrices ensure breakdown at particular locations in the large and small intestine. When applied as a coating of nanoparticles, they can successfully delay the nonspecific release of the bioactive substances contained therein until the coating is exposed to the environment in which it was designed to be released. It may be possible to use these coated nanoparticles to target different GI tract organs in order to increase oral bioavailability.

3.3. Selection of Excipients

The next strategy for addressing nutraceutical formulation issues is to adjust formulation parameters through sensible excipient selection. When it comes to nutrition, the finished formula needs to be strong enough to handle the different physical properties of natural ingredients in a complicated recipe. Both the maker and the materials must adhere to internal safety and quality standards as well as performance requirements. The dysfunctionality of one formulation may be the functioning of another. Only in relation to a specific formulation and manufacturing method can excipient functioning be accurately evaluated. Excipient functionality in a given formula for natural product development is greatly impacted by the intricate interplay of several active component properties. Sometimes excipients that appear to be identical in functionality are not.

Safety And Quality Control of Nutraceuticals

Users consume nutraceuticals, which are sold as over-the-counter products, as supplements. As a result, their safety is crucial because failure to do

so could have fatal consequences. Contamination, unintentional or deliberate adulteration, and deceptive labeling are the most frequently noted problems. Three distinct detection techniques can be used to show adulteration: (1) the existence of an undeclared drug;

(2) a component's deviation from its normal level (content);

(3) the likelihood of a profile.

Intentional or unintentional adulteration are also possible. A variety of circumstances can lead to unintentional adulteration. For instance, contamination with fertilizers, heavy metals, fertilizers, or microbiological agents may occur throughout the various stages of plant growth, during the formulation and manufacture of nutraceuticals, or during storage. Along with synthetic medications, substitute species, dust, pollens, insects, rodents, parasites, germs, fungi, mold, poisons, and heavy metals, adulteration can also occur. Any kind of contamination has the potential to cause infections or even more serious problems including liver damage, gastritis and its complications, or even life-threatening diseases. As a result, quality control of raw materials and final products is necessary and can be established by following guidelines provided in specific monographs, as well as stability of the active component or compounds and microbiological control. Intentional adulteration in supplements or herbal treatments might have serious negative effects. Usually unreported, it happens with synthetic substances. It typically takes place with the goal of changing the pharmacological reaction and yields financial gains. Nutraceuticals derived from plants are frequently very hard to find, and making extracts takes a lot of time and money. Consequently, regulatory bodies are not permitted to use these adulterations.

The sections below quote a few instances of adulterations.

(a) One typical adulterant is ibutramine hydrochloride monohydrate, a medication that acts as an anti-obesity medication by blocking serotonergic and noradrenergic reuptake. Eleven of the twenty-two nutritional supplement samples in a Chinese investigation were found to be tainted with sibutramine, N-mono-desmethylsibutramine, and phenolphthalein. Four of the fifteen samples used in a related investigation conducted in China included sibutramine and N-di-desmethylsibutramine . Additionally, it has been claimed that two pregnant Turkish ladies lost their wombs as a result of consuming tainted Chinese herbal medicine called "meizitanc". Additionally, sibutramine has been documented as a solvent in slimming preparations (Nutrients 2022, 14, 4637 15 of 28). Two ladies in Hong Kong have had mania-like psychosis as a result.

(b) Fenfluramine is another drug that was present in many slimming products and employed as an adulterant in Chinese traditional remedies. It resulted in valvular heart disease and primary pulmonary hypertension. In 1997, this medication was taken off the market .

(c) It has been shown that adulterants such as ephedrine, norephedrine, caffeine, and furosemide are present in several weight-loss programs that use orexigens, diuretics, stimulants, and laxative agents.

(d) Another prevalent form of adulteration that can have major negative health effects is the use of morphological substitutes. For instance, "Asian or Korean ginseng," or Panax ginseng (Araliaceae), is utilized in traditional medicine. It has been discovered to be

contaminated with the roots of Eleutherococcus senticosusmaxim (Siberian ginseng) and Panax quinquefolius L. (American ginseng), which could be harmful to one's health . Another such instance is the use of Panax ginseng as an adulterant in Mandragora officinarum L. (Solanaceae) roots, which share a similar morphology but differ greatly in phytochemistry and pharmacological effects . Additionally, the roots of Pfaffia panaculata (Mart.) Kuntze (Amaranthaceae), commonly referred to as "Brazilian ginseng or suma root," share physical similarities with P. ginseng roots; nevertheless, their phytochemical composition and, consequently, their pharmacological effect varies .

(e) A few other species in the Asteraceae family, including Tanacetum parthenium (L.) Sch. Bip., Tanacetum cinerariifolium (Trevir.) Schultz Bip., Tripleurospermum callosum (Boiss. et Heldr.) E. Hossain, Bellis perennis L., and Leucanthemum vulgare L., are also examples of physical similarity between species. Additionally, the European Pharmacopoeia lists the chamomile, Matricaria chamomilla L., and the flower, Anthemisnobilis L., as medicinal plants. Additionally, the phytoconstituents affect the pharmacological activity

The Top 10 Nutraceutical Products

As consumers who are concerned about their health seek out methods to maintain their fitness, this business is still growing and spreading. Here, we've examined the top ten nutraceutical goods currently available on the market in more detail.

1. Prenatal vitamins in liquid form In the nutraceutical sector, liquids are now a popular commodity. Among the top ten nutraceutical goods are still prenatal vitamins. They not only provide the body with enough energy, but they also keep it that way before, during, and after pregnancy.

2. The development and upkeep of strong bones and teeth, as well as general health, depend on vitamin D3. According to certain research, vitamin D3 can also improve your mood and strengthen your immune system. Calcium, vitamin D3, a balanced diet, and frequent exercise can all lower the risk of osteoporosis.

3. Garcinia Cambogia: In the fitness and health sector, weight reduction is a popular product. Consequently, it has elevated Garcinia Cambogia to the top of the list of nutraceuticals. You can burn more calories by increasing your metabolic rate with the aid of garcinia cambogia. Additionally, it might lessen your appetite and boost your mood.

4. Raspberry Ketones: Another dietary supplement, raspberry ketones are a great fat-blocking and thermogenic agent.

5. Green Tea Supplements: The market for green tea supplements is hugely popular. In the nutraceuticals sector, green tea supplements have really surpassed $135 million. In addition to being a potent antioxidant, it's a fantastic substitute for coffee when you want a caffeine rush.

6. Echinacea: this plant is used to treat a variety of illnesses, including as syphilis, herpes, UTIs, and bloodstream infections. Additionally, it is used to treat skin conditions like psoriasis, eczema, sunburn, and bee stings.

7. Probiotics can assist you in keeping your body's beneficial bacteria in check. Probiotics can aid in the passage of food through your digestive system when added to a nutritious diet.

8. Omega 3 Fatty Acids: The body is unable to produce these vital fatty acids, despite their necessity for human health.

In addition to reducing inflammation, omega-3 fatty acids may help lessen the chance of developing chronic illnesses like arthritis, cancer, and heart disease.

9. Alpha-lipoic Acid: This naturally occurring fatty acid has been utilized in alternative medicine to help people lose weight, heal wounds, lower blood sugar, treat rheumatoid arthritis, and relieve diabetic nerve pain.

10. Vitamin B12 has been demonstrated to boost energy levels and aid in metabolism.

Nutraceutical Market in Different Countries

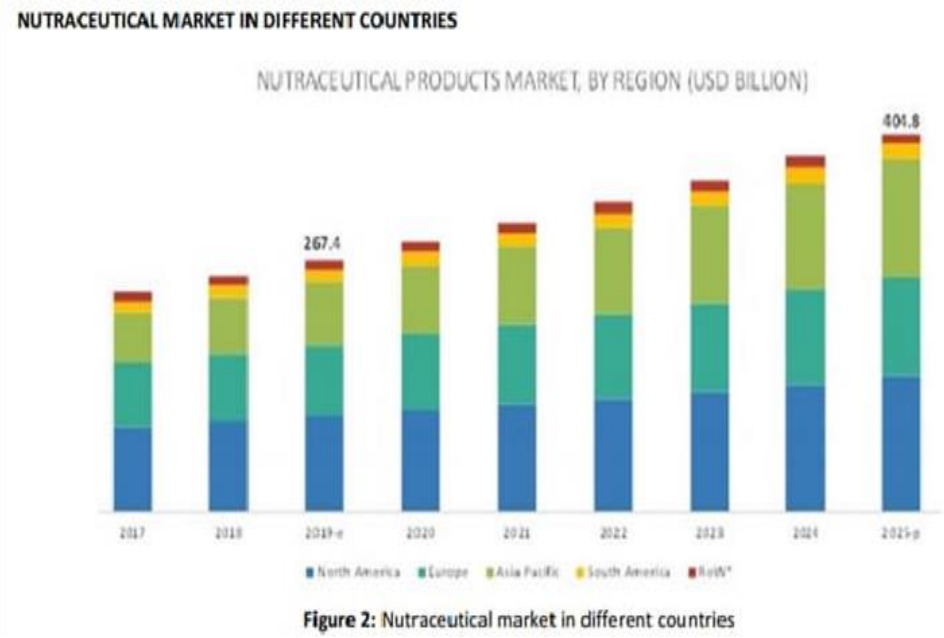

Figure 2: Nutraceutical market in different countries

Convenience food product usage has increased as a result of factors like hectic lifestyles.

Additionally, the region's demand for fortified nutritional food and beverage items has increased due to the fast economic growth of several countries. Rapid urbanization, dietary diversification, and the opening of the food sector to foreign direct investment are all factors contributing to the current transformation of the food and beverage business in this region. Additionally, it is anticipated that factors including growing income, expanding purchasing power, and a spike in consumer demand for nutritious and healthful products will expand the potential opportunities for manufacturers in the region's nutraceutical products market.

Important Players in the Global Market:

Kraft Heinz Company (US), The Hain Celestial Group (US), Conagra (US), General Mills (US), Kellogg's (US), Nestlé (Switzerland), Nature's Bounty (US), Amway (US), Hero Group (US), Barilla Group (Italy), Raisio Group (Finland), Pfizer Inc. (US), and Freedom Food Group Limited (Australia) are important vendors in the global market. These companies have extensive industry coverage, robust financial and operational capabilities, and recent growth in both organic and inorganic ways.

Important Companies In Indian Market:

There aren't many pure-play nutraceuticals companies in India; instead, pharmaceutical and fast-moving consumer goods corporations dominate the market. Dabur India,3 GlaxoSmithKline Consumer Healthcare, Cadila Healthcare, Zandu Pharmaceuticals, EID Parrys, Amway, Himalaya Herbal Healthcare, Sami Labs Ranbaxy, and Elder Pharmaceuticals are a few of the leading firms in India that promote nutraceuticals. The global market for nutraceutical products, broken down by North America (the US and Canada). Europe: France, Italy, Spain, Germany, the United Kingdom, and the rest of the continent. China, India, Japan, Australia, New Zealand, and the rest of the Asia-Pacific region make up Asia Pacific.

Latin America: Mexico, Brazil, and the rest of the continent. GCC nations, South Africa, and the rest of the Middle East and Africa comprise the Middle East and Africa.

The market for nutraceutical products has been divided into the following segments based on type:

Food items include snacks, confections, bakery goods, dairy products, and baby supplies.

Drinks: juices, energy drinks, and health drinks. Dietary supplements include tablets, liquids, powders, and other items like chewables and gummies.

The market has been divided into the following segments based on the distribution channel:

Traditional retail establishments include supermarkets, mass merchants, warehouse clubs, and internet merchants. Bakeries, confectioneries, gourmet shops, and health centers are examples of specialty retailers. * The market has been divided into the following segments based on the distribution channel:

India's Growing Nutraceuticals Market

Even though the term "nutritraceuticals" has foreign roots, what it means is native to India. Herbal remedies and vitamins have a long history in India, and our mythology and folklore have reflected this. The Indian market for nutraceuticals is anticipated to increase from $4 billion in 2017 to $18 billion in 2025 due to the growing demand from the upper and middle classes for dietary supplements. The Indian nutraceuticals industry is further subdivided into dietary supplements, functional foods, and drinks. Sports drinks, fortified juices, and glucose are examples of functional beverages, whereas breakfast cereals and fortified flour are examples of functional foods. Products like macronutrients and herbal and nonherbal extracts are included in dietary supplements, which account for more than 65% of the Indian nutraceuticals market. This market attracts a lot of rivalry and is where companies like Amway, Himalaya, Dabur, and Emami are based. Since this market sector is expanding at a rate of 17%, it will propel market expansion. The fact that 15% of Indians are undernourished and that the government has taken steps to lower that number through programs like the National Health Mission (NHM), Integrated Child Development Services (ICDS), and the midday meal program are some of the factors driving the country's demand for nutraceuticals. India loses around US$12 billion in GDP due to malnutrition, according to a World Bank report on "Nutrition in India.". Interventions to reduce the loss, however, would only cost roughly US$ 524 million a year, giving a benefit-to-cost ratio of nearly 23 times. This emphasis on preventative treatment has also been heightened by the rising expenses of healthcare: in India, 60 percent of doctor prescriptions include

supplements, while 62 percent of healthcare expenditures are paid for out of pocket. Additionally, India's wealth has increased, and by 2030, its middle-class and upper-class households will account for nearly US$ 4 trillion of the nation's incremental consumption. Several supply drivers contribute to the Indian nutraceuticals market's robustness, making it one of the world's most robust marketplaces.

A number of the market's supply drivers include:

- India has the lowest labor costs among South Asian and South East Asian nations;
- Its vast coastline, which stretches over 7,500 km and has over 12 major and 200 minor ports, makes it the perfect location for manufacturing along the global value chain;
- Its ability to compete globally is demonstrated by the fact that it is home to the greatest number of US FDA-approved plants outside of the US;

India is the world's second-largest producer of fruits and vegetables, the largest producer of milk, and as of 2016, the third-largest market for active pharmaceutical ingredients. • A notable rise in internet penetration has contributed to the increased availability and visibility of nutraceuticals in the market; as a result, by 2020, digital media will account for nearly 40% of India's total FMCG spending, representing a market opportunity worth over US $45 billion. Since nutraceuticals give pharmaceutical companies the chance to make their products more consumer-focused and food producers the chance to develop brands with a medical image, this intersection of food, medicine, and technology is also expected to boost India's food processing and retail sectors, which are expected to grow to over US$958 billion by 2025 and US$1.7 trillion by 2026, respectively. In addition, the pharmaceutical industry has been greatly opened up to draw in foreign investment. For example, 100% FDI is allowed in the manufacturing sector under the automatic route, and these entities are permitted to sell their products through retail, wholesale, or online channels; pharmaceutical companies are permitted to invest 100% under the automatic route under greenfield investments, while 74 percent goods made in India, 100% FDI with government sanction is permitted in the retail food industry. In addition to providing

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