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"A REVIEW ON NUTRACEUTICALS AND ITS IMPACT ON HEALTHCARE"

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Abstract: The people are quite concerned about their health in the contemporary environment since lifestyles have changed significantly as a result of longer work hours and numerous psychological stressors, which has raised the frequency of various life-threatening diseases. They are also dissatisfied with the high-tech, pricey approach to managing and treating diseases. Since a few years ago, individuals have been more interested in using nutraceuticals and phytonutrients for a variety of medicinal purposes. The health benefits of nutraceutical products include lowering the risk of cancer, heart disease, and other related conditions, as well as treating or preventing hypertension, high cholesterol, excessive blood sugar, degeneration, cataracts, menopausal symptoms, insomnia, poor memory and concentration, digestive problems, osteoporosis, arthritis, macular degeneration, and constipation. have also discovered a great deal of success in treating stress-related headaches and migraines. Other similar nutraceuticals are marketed as treatments for lethargy, depression, alcoholism, varicose veins, thinning hair, loss of confidence, poor complexion, and varicose veins. We attempted to categorise all varieties of dietary supplements with examples and their uses in this chapter. Additionally, the significance and difficulties associated with creating and developing dosage forms to provide better carriers for the delivery of nutraceuticals have been listed.

Keyword: Nutraceuticals, Lifestyle: Life Trethening Diseases, Therapeutic Outcome, Traditional nutraceuticals

INTRODUCTION

Nutraceuticals have been defined as the phytocomplex if they derive from a food of vegetal origin, and as the pool of the secondary metabolites if they derive from a food of animal origin, concentrated and administered in the more suitable pharmaceutical form. As an example, the recent European Regulation EU 2015/2283 on novel foodstill does not recognize the term nutraceutical, and include them in the category of the food supplements. It should be remarked that while nutraceutical beneficial effect on a health condition must be supported by clinical studies to assess that they capable of providing beneficial health effects, including the prevention and/or the treatment of a disease, the same consideration is not a must for food supplements. Food supplements should be, as per their micro-nutrients content, addressed to improve health if appropriately targeted to those in need but cannot be considered nutraceuticals since there is lack of clinical tests substantiating their efficacy.

Nutraceuticals is derived from the amalgamation of terms nutrition and pharmaceutical and was coined by Stephen De Felice in 1989. He defined nutraceutical as, "a food (or part of a food) that provides medical or health benefits, including the prevention and/or treatment of a disease"[1]. However the terminology is not very popular globally and mostly substituted by the term "dietary supplements" to meet the stringent regulatory requirements. But microscopically cross-sectioning of both the terms reveals some basic differences like nutraceuticals should always aid in disease prevention or treatment rather than only supplementing the diet.

US FDA do not support term nutraceutical and is generally referred as a food derived product which add some extra value to the basic nutritional component present in that specific food. Another term which is often used as a misnomer for nutraceuticals is "functional foods".It can defined as any food which is being cooked or prepared using "scientific intelligence" with or without knowledge of how or why it is being used. Nutraceuticals include a huge product bouquet ranging from isolated nutrients, plant products, diet supplements, processed cereals/ drinks to genetically modified products. A part from life-style disorders nutraceuticals are used in diverse array of

clinical conditions like inflammation, immuno-deficiency, allergy, arthritis, malignancies, indigestion, depression, sleep dysfuctions, hypertension and blood cholesterol control.

Mostly nutraceuticals are associated with more than clinically beneficent effects and this makes them more attractive to consumers. A drug traverses a series of clinical trials involving expenditurein both time and money before reaching the market but nutraceuticals are exempted from such regulatory issues. Thus it is a major attraction for many manufacturers even though they cannot assert that their product can cure/prevent a disease. Besides it is a common belief across the world that all natural products are efficacious and devoid of side effects. This built-in mindset also contributes to great extent to the expanding global market for nutraceuticals which is expected to touch USD 722.49 billion by 2027 with a CAGR of over 8%. Market for nutraceuticals has witnessed significant transf ormations in recent times with advent of newer technologies like nanotechnology as well as development of advanced procedures/ instruments which favour both quantitative an Although most nutraceuticals supply vital nutrients to the body, many details such as dose, drugdrug interaction, nutraceutical effects on individuals under certain clinical conditions remain indescribable.

Besides many patients do not reveal that they while in drug therapy so this enhances chances of nutraceuticald qualitative analysis. drug interaction, and their are consuming nutraceuticals drug interactions which may significantly affect their treatment. Biotechnologists are putting lots of effort to engineer plants and crops in order to improve their nutritional value in order to ma intain homeostasis. Products marketed as functional foods/ dietary supplements/ nutraceuticals may exhibit highly variability in quality and needs to pass through str ingent analysis to ensure proper standards.The present work gives an overview of the history,classification, chemistry, regulations of nutraceuticals and also provides an insight to their role in drug delivery and therapy.

Nutraceuticals are natural medically beneficial foods or bioactive phytochemicals that are healthpromoting, illnessdefeating, rehabilitative, functional foods and beverages that contain specific components (vitamins, lipids, proteins, carbohydrates, minerals, etc.) that have he althful profits. In 1989, the term "nutraceutical" was coined by combining the words "nutrition/nutrients" a nourishing dietary component and "pharmaceutical" a medicine or a chemical used as a drug and implying use for illness prevention and/or therapy.[1]

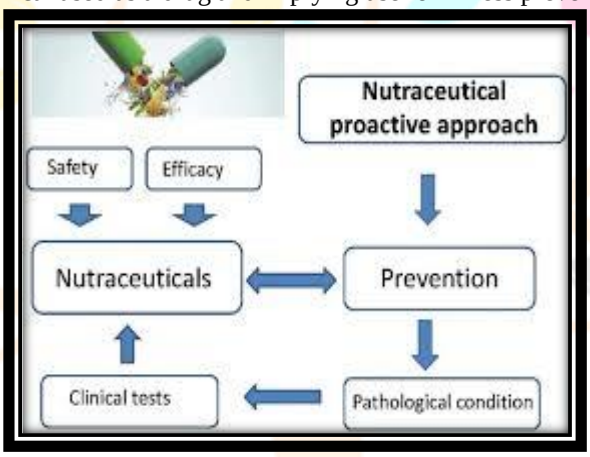

Fig. No:- 1 Nutraceuticals Practice Approach

DEFINATION

The term of the nutraceuticals was coined by Stefan Defelise. “A Neutracuticals is an any substance that is food or a part of food a provides medical and health benefits, including the prevention and treatment of disease ”.[2]

HISTORY

Father OF Nutraceuticals Dr Stephen de Felice {in 1989} Hippocrates (460377 BC), the father of modern medicine paved the foundation stone for modern day nutraceuticals through his epic statement “Let food be thy medicine and medicine be thy food”. He was concept that specific food can also be the solution for the prevention/ treatment of a disease apart from drug moieties. Roman Physician Galen enforced trust in the expertise and knowledge base of his profession to design a the pioneer to bring forward the nd formulate diet regimen which would maintain health standards of the entire population.

Early nineteenth century marked the initiation of nutrition research by François M on experimental evidences provoked the question that whe agendie. His research based ther foods devoid of nitrogen do provide nutrition. This modulated scientific minds to think beyond proteins, carbohydrates, fats, and minerals to achieve proper nutrition. This hypothesis was supported by experiments which pro on mice by Nicolai Lunin duced interesting results. He proved that certain component present in milk was essential for nutrition of mice which cannot proteins, carbohydrates, fats, and minerals.[3] This fact and similar research findings by several researchers be classified as ultimately led to the discovery of the vital nutrient vitamin. From the birth of human race we are depended on offerings of Mother Nature to manage our physiological dysfunctions. One such botanicals obtained from plants like Vinca Ros finding presents the ea and Taxus brevifolia which are used in cancer management till date. Ginseng has been another such traditional drug used as chemotherapeutic even today but its history as herbal medicine in China is beyod 2000 years.[1]

SOURCES OF NUTRACEUTICALS

Many products endorsed to treat various disease states, whether as given medication or as supplement, find their origin in the plant kingdom. This is unsurprising in view of the fact that plant produce many secondary compounds, such as alkaloids, to protect themselves from infection as well as these constituents are often useful in treatment of human disease. One example is recently introduced Taxol, derived from toxoids of the American yew tree then now used in ovarian cancer.

Similarly, the role of flavonoids besides other plant compounds as antioxidants and free-radical scavengers is beginning to have profound effects in area of chronic inflammatory disease as well as cancer. Crude extract of different parts of plant are screened for pharmacological

activity, often based on usage in folk medicine One a result is found, the substances are identified by chromatography as well as purified further before in vivo testing is started, A few of these lead compounds may eventually become licensed as medicines. However, the main drawback to this process is the vast cost involved.[1]

INCREASED DEMAND IN NUTRACEUTICAL

Modern day work profile has led to the development of a new set of diseases popularly termed as life–style disorders. The common causative agents of these types of disorders are improper diet and dependence on fast foods, lack of physical inactivity, non-alignment with biological clock, incorrect body posture, excessive stress and inadequate rest. Nutraceuticals represent a unique blend of modern science and natural agents and perhaps the best possible solutions for management of life style diseases. Besides these lifestyle disorders are also considered responsible for the predisposition of several complex clinical conditions.

Diverse marketed nutraceuticals variants can also help to block the transformation of life style disorders into fatal diseases. Consumer acceptance of nutraceuticals started gaining from 1980 onwards when scientists started indulging into efficacy evaluations of such products followed by their representation in mass media. Other factors like steep rise in medical management costs, increased life expectancy, increased health awareness and available scientific data confirming health benefits of nutraceuticals have also contributed to consumer acceptance of such products.

Global nutraceutical market which was approximately 400 billion USD in 2019 is expected to cross 700 billion USD with a CAGR of 8.3% by 2027. Fast expansions of nutraceuticals product bouquet along with a healthy pipeline of innovative products booming the market are all contributors to the predicted growth. The entry of generic products may cause a dip in nutraceutical product costs but because of high consumer acceptance, the overall market for such products is expected to remain stable.[4]

Fig.No:-2 Nutraceuticals

INORGANIC MATERIAL SUPPLIMENT

1.Calcium

Calcium is an important element in the treatment of decalcification of bone . Calcium deficiency is found in 25% of women, even though much higher percentages have osteopenia or osteoporosis. Prepuberty is the best time to begin supplementing the diet with calcium rich minerals along with exercise regimen. Sufficiently intake of calcium and vitamin D post menopausally can significantly reduce the risk for fracture.

2. Magnesium

Magnesium is an essential element involved in various enzymatic processes and critical in the proper use and maintenance of calcium. Many individuals with calcium deficiency are actually magnesium deficient which prevent proper use of calcium.

3. Manganese

Manganese is required in several enzymatic reactions and necessary for proper bone and cartilage formation.

4. Boron

Boron is reported to be helpful in supporting the calcium and estrogen level in post menopausal in women.

5. Copper

Copper is an essential element needed by all tissues in the body. Copper and Zinc must be in proper formation. Copper is best absorbed when bound to an aminoacids.

6. Zinc

Zinc is one of the most important trace mineral. Zinc supports the bodies overall antioxidant system by scavenging free radicals. It also perform many other vital functions.

7. Phosphorous

Phosphorous important in maintaining bone structure and modulating plasma and bone formation.

8. Silicon

Silicon is concentrated in the active growth areas of bone. It influences both for bone formation and calcification. [5]

CLASSIFICATION OF NUTRACEUTICALS

I.Classification based on food sources

1.Traditional Nutraceuticals /Conventional Nutraceuticals

2. Non- Traditional Nutraceuticals / Non- Conventional Nutraceuticals.[6]

1. Traditional nutraceuticals

These classes are generally sourced directly from nature, without any changes in the natural form. Phytochemicals obtained from plants are used in the diet and give health advantages such as Substrate for biochemical reactions, enzymatic reaction cofactors, enzyme Traditional nutraceuticals are manufactured food that has not been altered in any way, and its components are all natural and have the potential to provide health advantages . Several natural ingredients, such as lycopene in tomatoes, omega-3 fatty acids in salmon, and saponins in soy, are found in a variety of fruits, vegetables, grains, fish, dairy, and meat diets. Tomatoes and salmon are two foods that researchers have shown to provide health advantages beyond basic nutrition (lycopene and omega-3 fatty acids, correspondingly)

These classes are usually derived completely from nature, with no modifications to the original form. Various elements, such as lycopene found in tomatoes, omega-3 fatty acids found in salmon, and saponins found in soy, are available and ingested for a variety of health benefits . [7]

Chemical components, probiotic microbes, and nutraceutical enzymes are all examples of classic nutraceuticals.

Further, various types of traditional nutraceuticals are as follows:

1. Chemical constituents
(a) Nutrients
(b) Herbals
(c) Phytochemicals

2. Probiotic microorganisms
3. Nutraceutical enzymes

1. Chemical constituents

(a) Nutrients

Primary metabolites such as amino acids, various vitamins, and fatty acids had well-defined functions in various metabolic pathways. Plant and animal products along with vitamin have many health benefits and are helpful in curing diseases related to heart, kidney, lungs, etc.

Strokes, cataracts, osteoporosis, diabetes, heart disease, and cancer can all be treated with nutrients. Minerals derived from plant, animal, and dairy diets are beneficial in the treatment of osteoporosis and anemia. Omega 3-PUFAs, found in flaxseed and salmon, are potent regulators of the inflammatory process, brain function preservation, and cholesterol accumulation reduction.[6]

(b) Herbals

Nutraceuticals along with herbs had an excellent impact on prevention of various chronic diseases to make life better.Herbs, often known as botanical foods, are as old as human civilization and provide a wealth of remedies to treat both acute and chronic illnesses. Several nutraceuticals are found in medicinal herbs of important components, providing a whole storage facility of medicine to treat severe and persistent ailments.[8] Some examples are: Parsley (Petroselinum cripsum) is a diuretic, carminative, and antipyretic herb that includes flavonoids (apiol and psoralen). Willow bark (Salix nigra) contains salicin, an anti-inflammatory, analgesic, antipyretic, astringent, and antiarthritic active component. Lavender (Lavendula Angustifolia) contains tannins, which aids in the treatment of depression and anxiety.[6]

(C) Phytochemicals

Non-nutritive plant compounds with defensive or disease-protective capabilities are known as phytochemicals. They are nonessential nutrients that plants make primarily inhibitors, enzyme intestinal absorbents that bind to and remove unwanted constituents and enhance the absorption and/or stability of important nutrients by scavenging reactive or harmful molecules. Phytonutrients/phytochemicals are found in a wide range of foods, including whole grains, beans, fruits, vegetables, and herbs. These phytochemicals, alone or in combination, have enormous therapeutic promise in the treatment of a variety of illnesses. [6]

2. Probiotic Microorganisms

Metchnikoff coined the term “probiotic.” Its application is well boosted in modern medicine due to its ability of making the intestine more friendly for processes such as absorption and metabolim[9]. Probiotics are live bacteria that are given to the host in sufficient quantity to provide a health benefit. They exist in powder, liquid, gel, paste, or granule form, as well as capsule form, and are commonly used to treat gastrointestinal (GI) disorders such as lactose intolerance, acute diarrhea, and antibiotic- related gastrointestinal side effects.

Lactobacillus and Bifidobacterium species are the most commonly utilized probiotics, however the yeast S. cerevisiae, as well as several E. coli and Bacillus species are also used. Lactic acid bacteria, such as Lactobacillus species, which have been used for thousands of years to

preserve food through fermentation, can serve a dual purpose by acting as agents for food fermentation and having the potential to impact health profits.

Probiotic treatment has a variety of important effects, including improving intestinal wellbeing through microbiota guidance, relaxing and improving the immune system, delivering and expanding the bioavailability of supplements, reducing the side effects of lactose influence, and decreasing the risk of various illnesses. [6]

3. Nutraceuticals Enzyme

Enzymes are essential components of life; without them, our bodies would not function correctly. Anyone suffering from digestive issues such as hypoglycemia, blood sugar abnormalities, or obesity might alleviate their symptoms by adding enzyme supplements to their diet obtained from microbial, plant, and animal sources. [10]

Enzymes are proteinous in structure, are produced by the cell, and act as a biocatalyst. It eases the metabolic rate and fastens the life process.e medical problem mainly related to the GIT whether GERD (gastroesophageal reflux disease) or constipation or diarrhoea or ulcerative colitis could be treated with enzyme supplements. enzyme could be a better option for diabetic patients. [6]

2. Non-traditional nutraceuticals

Non-traditional nutraceuticals are obtained from agricultural breeding by adding nutrients and/or ingredients such as calciumfortified orange juice, vitamin- and mineral-fortified cereals, and folic acid-fortified flour. Agricultural experts have successfully developed strategies to increase a crop's nutritional content. They are foods enriched with supplements or biotechnologically designed crops to boost the nutrients; for example, rice and broccoli are rich in β-carotene and vitamins, respectively. They are further subdivided into recombinant and fortified nutraceuticals. [10]

1.Recombinant nutraceuticals

Biotechnology techniques have been successfully employed in a fermentation process to extract enzymes suited for providing critical nutrients at an optimal level in a variety of foods such as cheese and bread . Biotechnology assists in the formation of energy-delivering foods such as bread, wine, fermented starch, yogurt, cheese, vinegar, and others. Biotechnology allows for the production of probiotics and the extraction of bioactive components using enzyme/ fermentation technologies, as well as genetic engineering.[10]

2.Fortified nutraceuticals

Fortified nutraceuticals are made by fortifying dietary components and then adding micronutrients (trace elements or vitamins) to the final product. the process of adding crucial minor components and nutrients to food to improve the efficiency and nutritional value of the food is known as fortification . in children with diarrhea, respiratory infections, and serious illnesses, prebiotics, and probiotics, preserved milk containing bifidobacterium lactis HNO19 are ingested. persistent bananas could be developed as effective foods to combat iron deficiency caused by malnutrition.

These types of nutraceuticals include breeding at the agriculture level or addition of compatible nutrients to the main ingredients such as minerals added to cereals, flour fortified with calcium, iron, and folic acid, and milk fortified with cholecalciferol commonly used for vitamin D deficiency.[6]

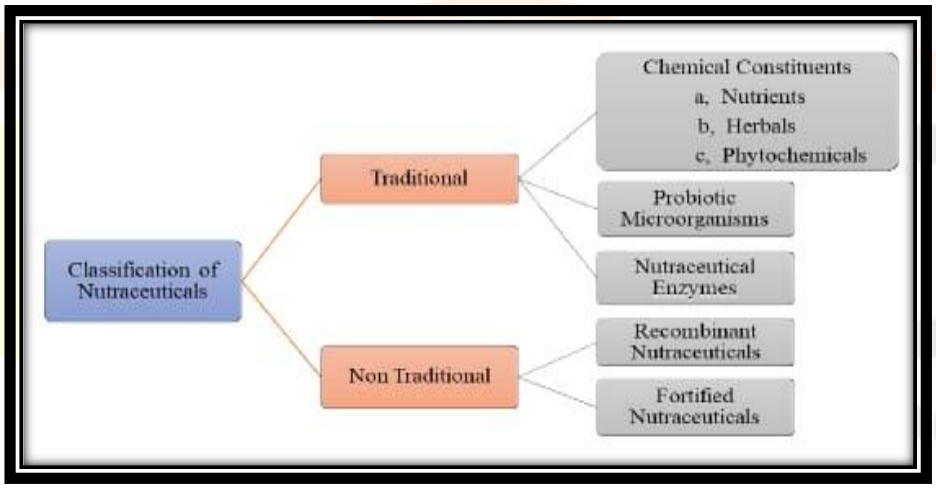

Fig.No:-3 Classification Of Nutraceuticals Based On There Sources

II.Classification based on chemical nature

Nutraceuticals are classified according to their primary and secondary metabolite sources, which include isoprenoid derivatives, phenolic substances, amino acid-based substances, carbohydrates and derivatives, fatty acids and structural lipids, and minerals.[6]

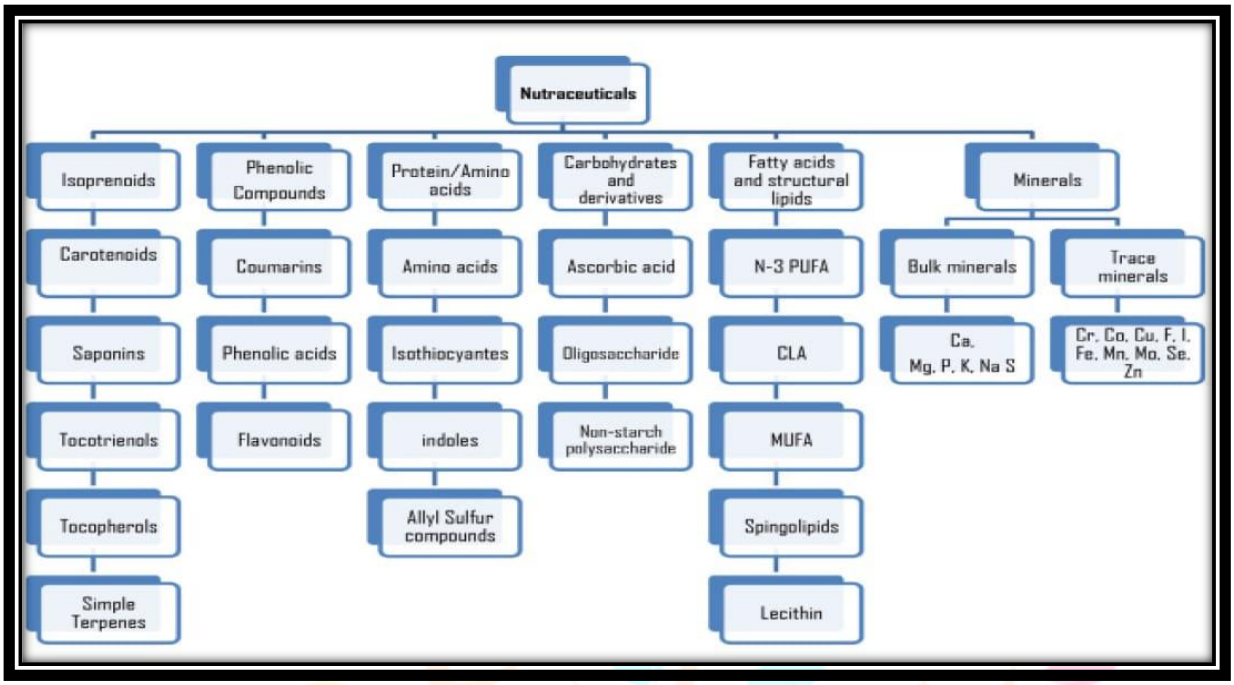

Fig.No:-4 Classification Of Nutraceuticals Based Chemical Nature

III.Classification based on mode of action

To distinguish and evaluate their function and roles, nutraceuticals have been divided into antibacterial, antifungal, antioxidant, anti-inflammatory, and antiobesity groups based on therapeutic properties.[6]

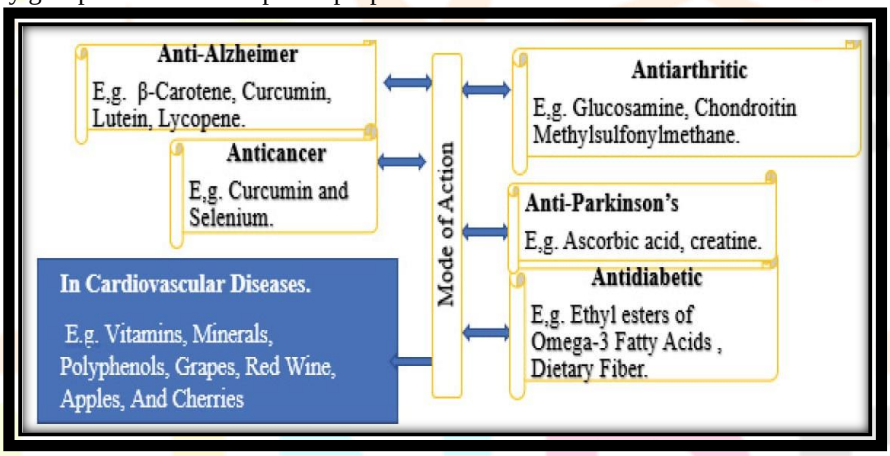

Fig.No:-5 Classification Of Nutraceuticals Based On Their Mode Of Action

HEALTHCARE IMPACT OF NUTRACEUTICALS

1. Polyunsaturated fatty acids

The topical usage of PUFAs in cosmetics as well as topical skin formulations is controlled due to the formation of malodorous secondary oxidation products. Research into the topical use of fish oil has exposed a statistically important development in erythema as well as scaling, and marked development in plaque thickness.

A fish oil concentrate has been shown to advantage patient's anguish from atopic dermatitis. Atopic eczema has been cured with evening primrose oil, due to the 9% content of g-linoleic acid (GLA). One further trial assessed skin limitations in healthy elderly people after supplementation with 360–720 mg GLA (from borage oil) daily, over two months. Cutaneous layer function was better-quality by 11%, and dry skin condensed.[11]

2. Coenzyme Q10

Ageing as well as photo ageing are related with an increase in cellular oxidation, possibly produced by declining levels of coenzyme Q10 (Co Q10). Topical solicitation of Co Q10 has been shown to lance into viable layers of the epidermis then to reduce the level of oxidation, ensuing in a reduction in wrinkle depth. It has also been initiated to be effective against UVA-mediated oxidative stress in human keratinocytes, and to prevent oxidative DNA damage. [11]

3.Melatonin

Topical use of melatonin either single-handedly or in combination with vitamins C and E has been shown to reduce UV-induced skin erythema after topical application 30 minutes before exposure.[11]

4.Obesity

A mixture of chitosan, fenugreek as well as vitamin C in the dietary supplement implicitly condensed body weight as well as endorsed fat loss in obese persons. Supplementary studies are required to initiate a long term efficacy and adverse effect potential. There is a very high commonness of obesity globally as well as hence Nutrition and exercise play a key role in its prevention and treatment. Nutraceuticals involvements are presently being examined on a large-scale basis as potential treatments for obesity and weight management. Nutraceuticals like conjugated linoleic acid (CLA), capsaicin, Momordica Charantia (MC) then Psyllium fiber possess potential anti-obese properties.

5. Diabetes

Isoflavones are Phytoestrogens; they have a structural as well as functional resemblance to human estrogen as well as have been expended by human's world-wide. Of all phytoestrogens, soy isoflavones have been studied most. A high isoflavones intake (20–100 mg/day) is connected with lower incidence besides mortality rate of type II diabetes, heart disease, osteoporosis as well as certain cancers, Omega-3 fatty acids have been proposed to reduce glucose tolerance in patients predisposed to diabetes. Ethyl esters of n-3 fatty acids may be potential beneficial in diabetic patients.

Docosahexaenoic acid modulates insulin resistance and is also vital for neurovascular development. This is particularly significant in women with gestational diabetes mellitus which foster the recommendation for essential fatty acids during pregnancy. Lipoid acid is a universal antioxidant, now used in Germany for the treatment of diabetic neuropathy. However it has been suggested that Nutraceuticals with meaningful doses of combinations may substantially prevent as well as presumably could be marketed other uses.

- ✓ Cancer
- ✓ Immune boosters and anti-inflammatory agents
- ✓ Immune boosters
- ✓ Inflammatory disorders
- ✓ Osteoarthritis
- ✓ Allergy
- ✓ Degenerative diseases
- ✓ Macular degeneration
- ✓ Vision improving agents
- ✓ Alzheimer's disease
- ✓ Parkinson's disease. [11]

THERAPEUTIC POTENTIAL OF NUTRACEUTICALS IN HUMAN HEALTH:

1. Nutraceuticals in Cardiovascular Diseases (CVD)

Heart disorders, such as hypertension (high blood pressure), coronary heart disease (heart attack), and various forms of cerebrovascular disease (stroke), are all associated with cardiovascular diseases . Overconsumption of calorie-dense, nutrient-deficient, deeply processed, and easily absorbable meals can result in systemic inflammation, decreased insulin sensitivity, including several metabolic abnormalities, including obesity, hypertension, dyslipidemia, and glucose intolerance .

Polyphenols present in grape and grape derivatives, cocoa, and tea have been studied for their potential to reduce cardiovascular disease. By altering cellular metabolism, vitamin D, coenzyme Q10, folic acid, omega-3 fatty acids, and polyphenols help to prevent artery disease. Flavonoids found in onion, grape, apples, and cherries inhibit the Angiotensin Converting Enzyme (ACE), lowering blood pressure and reducing the risk of coronary artery disease and myocardial infarction.

Flavonoids prevent platelet stickiness and accumulation (by opposing the "suicide" enzyme cyclooxygenase that breaks down prostaglandins), and they also keep the vascular system and support small capillaries that carry oxygen and necessary nutrients to the entire cell.[6]

2. Nutraceuticals in cancer

Cancer is defined as abnormal cell division in any part of the body, and malignant cells can influence our normal cells. Cancer is caused by a combination of complicated elements that develop in a stepwise manner, eventually leading to the uncontrolled spread and proliferation of malignant cells throughout the body, a process known as metastasis. It is one of the most important global health firms, with continuing increases in revenue and morality.

Oxidative stress and redox waving, in addition to environmental variables, are important in the origin and spread of cancer. Cancer cells' receptivity to therapeutic interventions is also harmed by reactive oxygens. Chronic inflammation is linked to a higher risk of cancer. Chronic inflammation has also been linked to immunological suppression, which is a cancer risk factor. At the molecular level, free radicals and aldehydes produced by chronic inflammation can promote gene alterations and posttranslational modifications of cancer-related proteins.

Natural products or antioxidants (e.g., microbial and plant secondary metabolites) are employed as adjuvants to chemotherapy medications to increase their effectiveness, rather than other pharmaceutical drugs. Ginger, garlic, flaxseed, cabbage, soybeans, fenugreek, green tea, and umbellifers vegetables are examples of foods and herbs with high anticancer activity. Nutraceuticals, especially phytochemicals, play a role in cancer recovery. To date, all widely used cancer medications have come from natural sources. Cancer patients should eat foods that have a low carbohydrate content and a moderate amount of protein, dietary fiber, and fat.[6]

3. Nutraceuticals in diabetes mellitus

Diabetes mellitus is a chronic metabolic illness in which the body's ability to utilize carbohydrates is harmed due to an absolute or relative lack of the hormone insulin produced by the -islets of Langerhans in the pancreas. Diabetes mellitus is characterized by abnormally high levels of blood glucose, either due to inadequate insulin production or its ineffectiveness.

Nutraceuticals and a wide range of bioactive components, such as phenolic compounds, sulfur compounds, herbs, and natural antioxidants, are all involved in glucose metabolism and may help to prevent the development of diabetes and other complications. Some dietary supplements, such as L-carnitine-lipoic acid, omega- 3 fatty acids, berberine, chromium, soy, and phytoestrogens, are currently available in markets and are widely prescribed by clinicians.[6]

4. Nutraceuticals in obesity

Obesity develops as a result of excessive consumption of high-fat and energy-dense foods, which leads to the formation of fatty plaques on the inside surface of arteries, which restrict blood flow to various sections of the body. Angina pectoris, heart attack, cardiac arrest, transient ischemic attacks, and stroke can all be caused by a lack of blood supply in certain organs.

It is characterized by an excess of body fat; however, the threshold value that defines what amount of body fat is "unhealthy" is unclear, and the ability to reliably degree body fat mass necessitates specialized equipment that is not readily available in most clinical settings. Following that, body mass index BMI) records are used to define people as "normal weight" (BMI 18.5-24.9 kg/m2), "overweight" (BMI 25-29.9 kg/m2), or "obesity" (BMI 30 kg/m2), which stratifies health risk based on the link between weight and height.

Fortified margarine (Plant sterol and stanol esters), oolong tea (catechins), green tea (Organosulfur compounds), garlic (Organosulfur compounds), Psyllium (Soluble fiber), and soybean (protein) are all beneficial in the treatment and prevention of obesity. These functional foods remove excess fat from the body by a variety of processes, including inhibiting pancreatic lipase, increasing thermogenesis, limiting adipocyte differentiation, improving lipid metabolism, and decreasing hunger.[6]

5. Nutraceuticals in Alzheimer's disease

Alzheimer's disease is the most common form of dementia and a degenerative neurological illness. This sickness has no cure and will ultimately kill everyone . Necrobiosis in Alzheimer's disease results from the mass of beta-amyloid protein fragments forming solid plaques that affect the ability of acetylcholine to affect synaptic communication and initiate inflammatory progression and variations in the chemical nature of the specific proteins and also leads to necrobiosis in Alzheimer's disease wherein neuron's microtubules couples with other tubules creating neurofibrillary tangles that cause tubule.[6]

β -carotene, curcumin, lutein, lycopene, and turmeric have antidisease Alzheimer's properties by neutralizing the negative effects of oxidative stress, mitochondrial malfunction, and neuronal degeneration.[12]

6. Nutraceuticals in osteoporosis

Low bone mass, thinning bone tissue, and disruption of bone microarchitecture are all symptoms of osteoporosis . Many factors that influence low bone mass are divided into two categories: those that cannot be changed and those that can. Gender, age, body size, and race are unchangeable, whereas hormonal status, lifestyle factors such as food, smoking, and alcohol consumption patterns, and physical activity levels can be changed.

Nutraceuticals such as herbs, minerals, and dairy products are increasingly being utilized to combat this condition. Calcirol D-3 is a popularly marketed nutraceutical product that contains calcium and vitamins to aid in the treatment of osteoporosis. Probiotics are effective in alleviating osteoporosis symptoms and lowering osteoporosis risk.[6]

7. Nutraceuticals in osteoarthritis

Osteoarthritis is characterized by articular cartilage loss, synovial membrane inflammation, and subchondral bone resorption. It is the most well-known form of arthritis, afflicting millions of individuals all over the world. When the protecting cartilage on the extremities of the bones breaks down over time, it causes this condition. It can cause pain in any joint in the body. It most usually affects the joints of the hands, knees, hips, and spine. Although there is no cure for osteoarthritis, there are therapies that can help with pain relief and joint mobility.

Chondroitin Sulfate (CS) and Glucosamine (GLN), also known as 2-amino-2-deoxy-d-glucose ($C_6H_{13}NO_5$), are widely utilized to alleviate the symptoms of osteoarthritis. MSM (Methyl Sulfonyl Methane) is a synergistic combination of glucosamine and chondroitin that is used to treat osteoarthritis and joint problems. Glucosamine (GLN) is an amino monosaccharide that is found in the exoskeletons of crustaceans and mushrooms. It is a component of glycosaminoglycan (GAG) chains. GAG is made up of two sugars that alternate: glucuronic acid and acetyl-d-galactosamine sulfate.[6]

8. Nutraceuticals in Parkinson's disease

It is a neurodegenerative disease characterized by a shortage of dopaminergic neurons in the substantia nigra, resulting in striatal dopamine exhaustion. Numerous nutraceuticals have been proven to provide neuroprotection in animal settings and may be useful as alternatives to synthetic pharmacological molecules such as L-Dopa, which has a long list of negative side effects.

Iron chelation, modulation of cell signaling pathways, Reactive Oxygen Species (ROS)/free radical scavenging, anti-inflammation, anti-apoptosis, and mitochondrial homeostasis are some of the mechanisms by which they work, although several nutraceuticals essentially work through a slew of unthinking pathways rather than a single mechanism. Plant polyphenols, stilbenes, soybeans, and other phytoestrogens, as well as vitamins C, D, E, coenzyme Q10, and unsaturated fatty acids, have been shown to protect against Parkinson's disease progression.[6]

9. Nutraceuticals in COVID-19

SARS-CoV-2 has affected global health and economic well-being since its emergence in early 2020. The virus infection was initially reported in Wuhan by the World Health Organization's (WHO) regional office in China on December 31, 2019, and the infection was declared an epidemic on March 11, 2020 . SARSCoV-2, also known as COVID-19, is a coronavirus with high pathogenicity.

It is a single-stranded positive-sense RNA virus, which means its RNA can be immediately translated into viral proteins in infected cells. Fever, gastrointestinal problems, and memory loss are just a few of the symptoms that SARS-CoV-2 infection can cause . The current COVID-19 virus has increased the demand for immune-boosting foods, vitamins, and nutraceuticals. Food bioactive and nutraceuticals have been suggested as an alternative therapy for COVID-19 disease based on their anti-inflammatory properties as well as their capacity to inhibit virus activity (e.g., SARS-CoV, MERS-CoV, and SARSCoV-2) by disrupting their protein envelopes. [6]

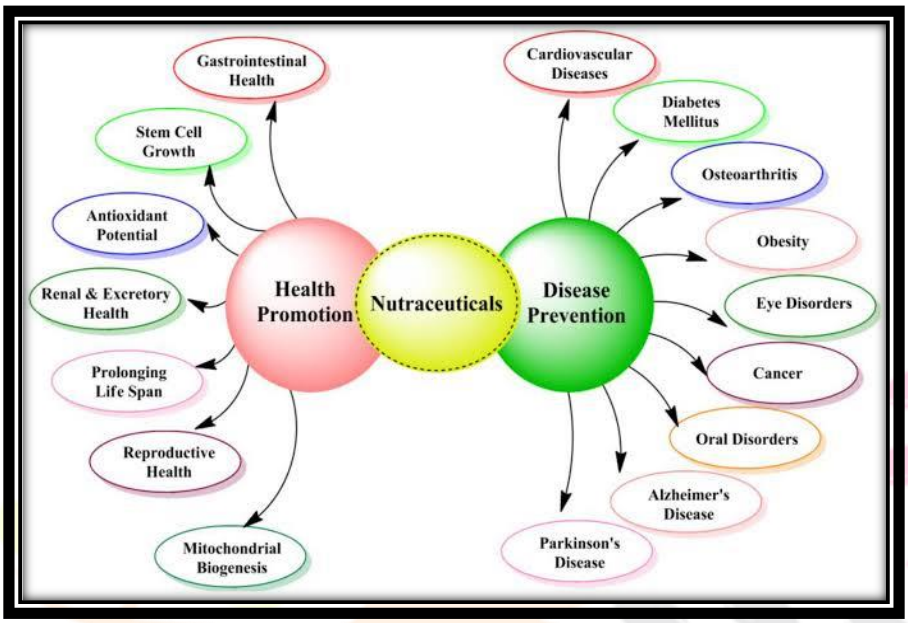

Fig.No:-6 Nutraceuticals In Various Disease

Scope And Types of Products Available in the Market

Nutraceutical from Nutrition and Pharmaceu tical, in 1989 refers to foods having a medicinal effect on health of human beings. It consists of food supplements, herbal products, probiotics and prebiotics, medical foods meant for prevention and treatment of diseases. Major mult Nutraceuticals possess iple therapeutic effects with lacking of unwanted effects. A Nutraceutical is demonstrated to have a physiological benefit or against chronic disease. I try to redefine functional foods and Nutraceuticals.When food is being cooked or pr provide protection epared using scientific intelligence with or without knowledge is called functional food. Thus, functional food provides the body with the required amount of vitamins, fa ts, proteins, carbohydrates, etc., needed for its healthy survival when functional foo Nutraceutical.

Nutraceuticals are nond aids in the prevention, treatment of disease and disorder other than anemia, it is called a toxic food components which claimed to possess multiple therapeutic benefits. Some popular Nutraceuticals include glucosamin e, ginseng, Echinacea, folic acid, cod liver oil, omega3 fatty acid (MUFA, PUFA), calciumenriched orange juice, green tea, plant phenols etc. Nutraceuticals can be organized in several ways depending upon its easier understanding and application, i.e. fo r academic instruction, clinical trial design, functional food 0 50 100 150 200 250 300 350 400 450 India Japan Europe US development or dietary recommendations. So me of the most common ways of classifying Nutraceuticals can be based on food sources, mecha nism of action, chemical nature etc.[1]

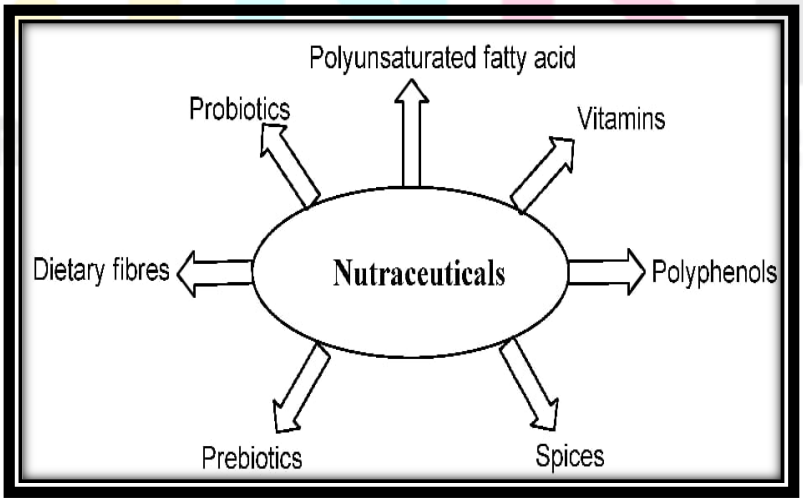

Fig.No:-7 Types Of Nutraceuticals Available In Market

DEVELOPMENT OF NEUTRACEUTICALS

Identification of components: Numerous nutraceuticals currently are on the Marketed.

1. Carotenoids

Carotenoids are pigments in plants, algae, and photosynthetic bacteria.Carotenoids act as a type of antioxidant for humans. They neutralizes free radicals, which may be damage the cell ; bloster cellular antioxidant defences. EX.Beta-carotene.

2. Dietary fiber

Dietary fiber or roughage is the portion of plant-derived food that cannot be completely broken down by human digestive enzymes. They contribute to maintainance of healthy digestive track. Ex. Insoluble fiber.

3. Fatty acids

Fatty acids are the building blocks of the fat in our bodies and in the food we eat. They reduce coronary heart risk of disease. Ex. Monosaturated fatty acids.

4. Flavonoids

Flavonoids, a group of natural substances with variable phenolic structures.The neutralize free radicals, which may damage cells; bolster cellular antioxidant defences. Ex. Flavonols.

5. Phenols

Phenols are one of the major groups of nonessential dietary components appearing in vegetable foods. They may bolster cellular antioxidant defences; may contribute to maintenance of vision & heart health. Ex.Caffeic acid, ferulic acid.

6. Plant stanols/sterols

Sterols and sterolins, also known as phytosterols, are fats present in all plants, including fruits and vegetables. They reduce risk of heart disease.

7. Polyols

Polyols are sugar-free sweeteners. Polyols are carbohydrates but they are not sugars. They are reduce risk of dental caries (cavities). Ex. Sugar, alcohol, mannitol, sorbitol, lactitol.

8. Phytoestrogens

Phytoestrogens are plant-based compounds that mimic estrogen in the body. They are contributes to maintenance of bone health, healthy brain and immune functions for women, maintenance of menopausal health. Ex. Isoflavones (daidzein, genistein).

9. Soy protein

Soy protein is the primary protein found in soy products, such as tofu, tempeh, soy milk, and other soy-based dairy and meat alternatives. They are reduce risk of coronary heart disease. Ex. Soy protein.[13]

NUTRACEUTICAL SCENARIO IN INDIA

The Indian nutraceutical business has a bright future. A vast selection of items have been accessible throughout the last decade, providing insight into the phenomenal expansion. On the one hand, a thriving economy has resulted in an overall increase in population disposable income. In addition, improper eating habits combined with a sedentary lifestyle have resulted in an increase in the occurrence of diet and its linked health disorders. On the other side, there is a rising understanding of the significance of nutrition and food for long-term health.

These factors have contributed to the Nutraceutical industry's positive market conditions in India. India offers numerous advantages, including qualified human resources and world-class infrastructure.R & D facilities and varied raw material-aspects that give our country a leading edgeThe Indian nutritional market is projected to be worth one billion dollars.[14]

MARKET GROWTH

In India, functional foods are expected to see increased consumption over the next five years resulting in functional foods and beverages garnering greater product share in the market as opposed to dietary supplements. The total Indian Nutraceuticals market in 2015 is expected to be roughly US $ 5 billio.

In each product segment, manufacturers can expect a minor shift in consumption, driven by the demand for new and improved product as well their health claims. Interestingly, in the Indian market, the consumption of alternative herbal medicines and supplements (usually Ayurvedic and Homeopathic) is expected to have a detrimental effect on the Nutraceutical market and is considered as a loss to the unorganized market by manufacturers. This segment promises huge potential to Nutraceutical product manufacturers, through customization of their products to include natural and herbal ingredients.

The success of the chyawanprash supplements market being case in point. Increased life expectancy, globally, has led to an increase in the incidence of lifestyle (age related) diseases such as diabetes, high blood pressure and cholesterol, obesity etc. As a result, there has been a significant increase in the deaths due to lifestyle diseases worldwide. Consumers worldwide are looking to follow healthy lifestyles to obtain optimum nutrition to keep these diseases at bay, leading to an increase in Nutraceutical consumption by health conscious consumer.[1]

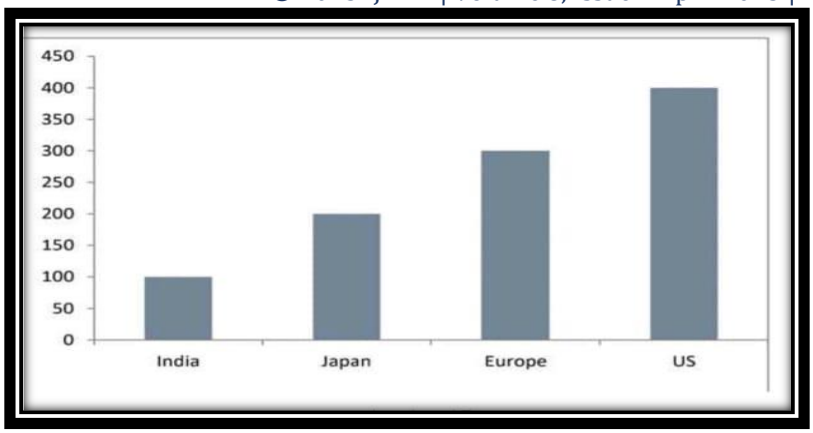

Fig.No:-8 Nutraceuticals Market In Different Countries

INDIAN REGULARLY ASPECTS OF NUTRACEUTICALS

The regulatory framework of nutraceuticals in India needs attention from the relevant authorities. Globally, the regulatory authorities are aware of changing needs of consumers and proactively protect consumers by amending existing laws to accommodate changes but in India old laws such as Prevention of Food adulteration Act, 1954, which regulates packaged foods, still exist for manufacturers. In addition, they need to tolerate by many other cumbersome laws such as:

- Standards of Weights and Measures Act, 1976, and the Standards of Weights and Measures.
- (Packaged Commodities) Rules, 1977 (SWMA).
- Infant Milk Substitutes, Feeding bottles and infant foods (regulation of production, Supply and Distribution) Act, 1992 with Rules, 1993 (IMS).
- Edible Oils Packaging (Regulations) Order,1998.
- Fruit Products Order 1955 (FPO).
- Meat product Order 1973.
- Milk and Milk Products Order 1992.
- Vegetable Oils Products (Regulation) Order 1998 (VOP).
- Atomic Energy Act, 1962 and Atomic Energy (Control or irradiation of Food) Rules 1996.
- Consumer Protection Act 1986 and the Consumer Protection (Amendment) Act, 2002 and Rules 1987.
- Environment Protection Act, 1986 and Rules 1986.
- Agricultural Produce (Grading and Marking) Act, 1937 (as amended up to 1986) and 49.
- General Grading and Marking Rules 1986 and 1988 (AG Mark).
- Bureau of Indian Standards (BIS) Act 1986.[15]

FUTURE IN NUTRACEUTICALS

The expanding nutraceutical market indicates that end users are seeking minimally processed food with extra nutritional benefits and organoleptic value. This development, in turn, is propelling expansion in the nutraceutical markets globally. The emerging nutraceuticals industry seems destined to occupy the landscape in the new millennium. Its implications for tremendous the food, growth has pharmaceutical, healthcare, and agricultural industries Many scientists believe that enzymes represent another exciting frontier in nutraceuticals. "Enzymes have been underemployed. They are going to be a hot area in the future." Fermentation technology using microbes to create new food products also represents potential.

Global trends to healthy products cannot be reversed. Companies taking the lead by investing strategically in science, product development, marketing and consumer education will not go unrewarded . Nutraceuticals supplied through oral or transdermal delivery system would provide well targeted health benefits with optimal bioavailability. With the evolution of “Smart Nutraceuticals”, a Futuristic “Physician’s Desk Reference” would contain information on individual genetic profiles to be matched with specific nutritional interventions as well. This would be a vast improvement over current nutritional recommendations which being too generalized are reported to benefit only 60% of population . [16]

CONCLUSION

Nutraceuticals have a long history of usage in the treatment of disease, and these substances will continue to be used in modern and future medicine. To guarantee the products' safety, improved quality, purity, efficiency, impacts on promoting health and healing diseases, as well as a clearer understanding of the numerous processes used in item development, further study is still required. Extreme care must be taken when taking supplements. Therefore, there is a need for basic research and discussion on the advantages, recommended daily intake, and potential negative consequences of supplement use. After that, we might substitute "nutraceutical day may keep the doctor away" for the proverb "an apple a day keeps the doctor away."

"In the future, nutraceuticals will be marketed to support good health. Public health authorities today view nutraceuticals as beneficial functional foods for preserving health and battling nutritionally induced acute and chronic disorders, as well as for enhancing quality of life. Nutraceuticals are crucial for the maintenance and promotion of human health as well as the avoidance of disease, thus health professionals, nutritionists, biotechnologists, and business people should strategically work together to create legislation that will guarantee high-quality healthcare.

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