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## A REVIEW ON NUTRACEUTICALS

### Abstract

This review is generally based in good therapeutic approaches of Nutraceuticals as commercial remedies. Nutraceutical is defined as, any substance that are considered a food or part of food and provide medical and health benefits. Now a days nutraceuticals nutraceutical are more consumed because their large safety and potential nutritional and therapeutic effects. Nutraceuticals are generally based on both traditional and non traditional nutraceuticals. Various nutraceutical are used in health management like aloe vera, neem, turmeric, garlic, Babul, ginger, amla etc are very usefull in health management and various disease such as diabetes, cardiovascular disease, disease of gastrointestinal tract. Various market products are available such as dietary supplement, functional food, medicinal food and pharmaceuticals. Nutraceuticals are required for proper health, pharmaceutical remedies for disease and preventive medical approach. There are over 470 products are available in market that are well known for health benefits.

### Keywords

Extraction, Functional food ingredients, Nutraceuticals, Enzymes, Non-digestible oligosaccharides, Bioactive peptide

### Introduction

In early times, Hippocrates have explained importance of food 'Let food be your medicine and medicine by your food'. The word nutraceutical is a combination of two words ' Nutrient' and 'Pharmaceuticals'. The term nutraceutical first coined by Dr. Stephan L. DeFelice, in 1989. The concept of nutraceutical first came into the picture during the observed conducted in Europe. As per observed consumer gave more emphasis on diet rather than exercise or hereditary factors to achieve a good health(1).The terms" nutraceutical" combines of two words – "nutrient" ( a nourishing food component) and "pharmaceutical" (a medical drug). A nutraceutical s products are regulated by FDA under the authority of the Federal food, Drug, and cosmetic Act. Therefore nutraceutical is defined as, any substance that is considered a food or part of a food and provide s medical or health benefits, including the prevention and treatment of disease. There some important categories of nutraceuticals product that are generally depends on the source. They are classified on the depends of their natural sources, pharmacological conditions, as well as chemical constitution of the products like isolated nutrients, dietary supplements and functional foods like genetically engineered foods, herbal products and processed foods (Cereal, soups and beverages ). These products also provides a health benefits apart from basic nutrition (2)

“Nutraceuticals and functional foods have received considerable interest because of their except safety and potential nutritional and therapeutic effects”. The nutraceutical and functional food in a unique position to capitalize on consumers' interest. Be it a multinational pharmaceutical corporation, a nutritional company, a large food multinational or a small vitamin-selling firm, all of them recognize the changing trends and are aware of the more health-seeking consumer trend. There is, a spread of these value-added products aimed at not only keeping oneself healthy but also prevention/treatment of various ailments ranging from heart diseases to cancer(3). This type of health-promoting products is getting more popular amongst health-conscious consumers and, thus, a large list of nutraceuticals containing phytochemicals from foods is now available in the market(4). In the US, the term “nutraceutical” products are regulated as drugs, food ingredients and dietary supplements. Nutraceuticals, in contrast to pharmaceuticals, are substances, which usually have not patent protection. Both pharmaceutical and nutraceutical compounds force be used to cure or prevent diseases, but only pharmaceutical compounds have governmental section. A dietary supplement is considered as a product that bears or contains one or more of the following dietary ingredients: A mineral, a vitamin, an amino acid, a medical herb or other botanical, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients. Nutraceuticals are of these nutritional supplements which are used for health purposes other than nutrition(5).

There is a growing overlap between conventional food (including beverages) and food supplements, including energy bars and teas or liquids. This overlap becomes even wider when we consider functional foods and nutraceuticals. What could be considered a functional food under a given set of circumstances may be named a dietary supplement, medical food, food for special dietary use or nutraceutical under different circumstances, depending on its ingredients (active components) and the claims reported on its label. Nutraceuticals are continuously developed and have quickly spread worldwide [8]. Existing contradictory information in the field is generating confusion about the possible effective use of these products, which are available on the market and in pharmacies. Food supplements, as per their micronutrient content, can be used to improve the health of individuals in need. In general, many of the health claims that are currently associated with food supplements, pro and prebiotics, herbal products, and functional foods may not properly be substantiated by scientific data on their safety, efficacy and effect on health and/or pathological conditions. The claims are mainly unsubstantiated due to a lack of studies on possible mechanisms of action and a lack of in vivo research confirming the claimed beneficial health effects on specific pathological conditions(6).

## General Aspect.

In recent modern era, food supply is often lacking in the nutritional value our bodies expect and need due to many reasons. Among that, some of the main reasons are the widespread use of artificial fertilizers, irradiation of vegetables, over planting and failure to practice healthy crop rotations. These results the depletion of the quality of food products day by day. Therefore, abundant availability of the lower quality food production and the increased popularity of an unbalance, nutritionally deficient diet. Such as high level of simple carbohydrates like bagels, pasta and pizza, as well as voluminous level of sugar content in desserts, huge candy bars, etc (2). Nutraceuticals are multi-targeted mixtures at a very low concentration whereas, pharmaceuticals are pure uni-targeted with a very high concentration use. Also, the nutraceuticals are not regulated or tested like the pharmaceutical products.

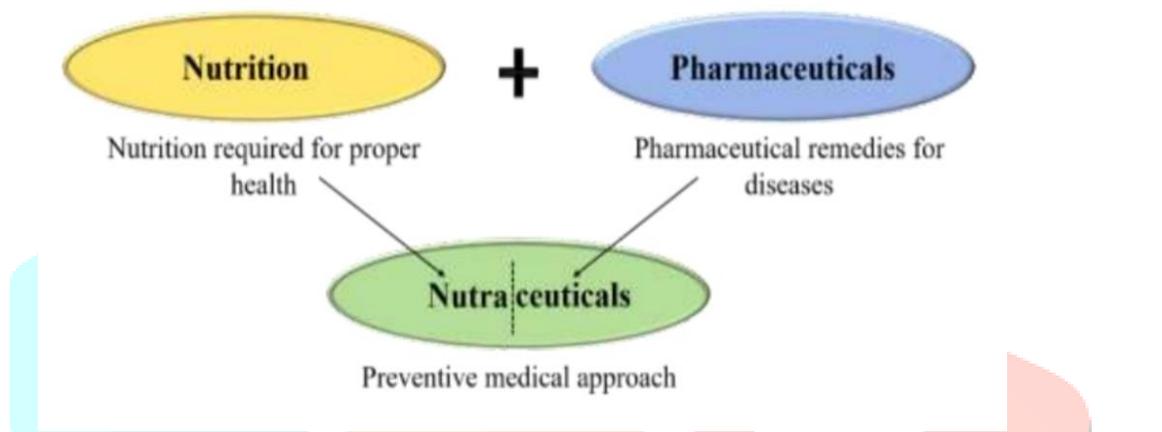


Fig. 1. General diagrammatic representation of concept of nutraceutical term.

The nutraceuticals and their related products are usually classified on the basis of their origin, chemical constituents and pharmacological property etc. Mostly these are grouped as dietary supplements, functional food and medicinal food. Nutraceutical term is not well accepted globally or in regulatory system whereas the dietary supplement has shown a prominent consideration. There are over 470 nutraceutical products available in the market that are well known for various health benefits. Now, the patients are shifting their interest towards the nutraceuticals because these are having least side effects and contraindications as compared to the chemical drugs in long term as well as short term therapy. So, the interest to avoid the use of chemical drugs has come to trend and eventually led to the new research with alternate therapies with the help of nutraceuticals. This review is generally based on the promising therapeutic approaches of nutraceuticals as the commercial remedies(7).

Despite their popularity, the health benefits of dietary supplements are questionable. Lack of vitamins will certainly cause deficiency diseases such as scurvy, beriberi, pellagra, and rickets. However, the vitamin content of normal well-balanced diets is sufficient to avoid these diseases. Studies aimed at determining effects of supplements often give conflicting results. There currently does not seem to be any scientific consensus on whether vitamins (4) or any other dietary supplements prevent disease or have health benefits in well-nourished individuals. The intake of dietary supplements is generally safe but not totally without risk. This review is not intended to be a comprehensive report of all known adverse effects for all dietary supplements. Instead, we discuss adverse events for the most commonly used supplements, such as vitamins, minerals, omega-3 or fish oil, soy protein, and plant-derived antioxidant and anti-inflammatory nutraceuticals. We also discuss weight-loss, bodybuilding, and various botanical supplements that have

been associated with more severe adverse effects. Because dietary supplements can be brought to the market without the support of clinical trials, there is a paucity of systematic studies of adverse effects. Case reports of symptoms appearing after intake of a supplement often provide the first hint that there can be side effects associated with the supplement. However, it is close to impossible to show causation from a single case report(8)

### Classification of Nutraceuticals

The Nutraceuticals are mainly classified as follows:

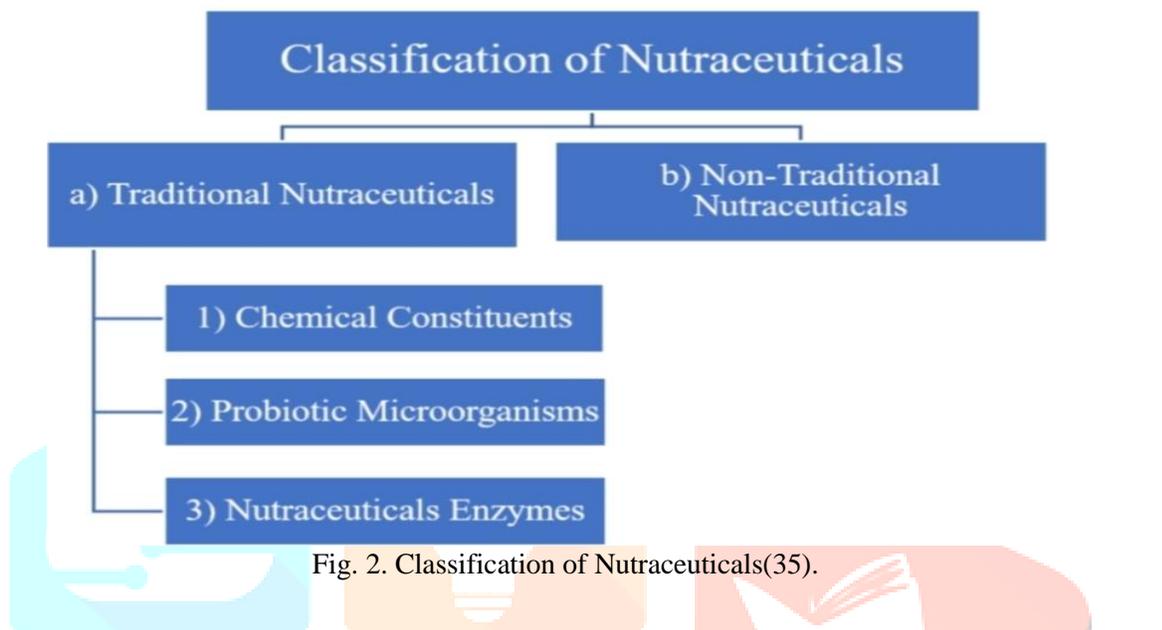


Fig. 2. Classification of Nutraceuticals(35).

They are grouped on the basis of

#### A) Traditional Nutraceuticals

Under the category of traditional Nutraceuticals comes food in which no change to the food are made; It is simply natural, whole foods with new information about their potential health qualities. There has been no change to the actual foods, other than the way the consumer perceives them. Many fruits, vegetables, grains, fish; dairy and meat products contain several natural components that deliver benefits beyond basic nutrition, such as lycopene in tomatoes, omega-3 fatty acids in salmon or saponins in soy. Even tea and chocolate have been noted in some studies to contain health-benefiting attributes. Tomatoes and salmon are two types of food that researchers have found to contain benefits beyond basic nutrition - in this case, lycopene and omega-3 fatty acids, respectively(21).

##### I. Chemical Constituents

A) Nutrients

B) Herbals

C) Phytochemicals

Phytochemicals basically is plant nutrients with particular biological activities in supporting human health, they work by following way.

1. Substrate for biochemical reactions.
2. Cofactors of enzymatic reactions.
3. Inhibitors of enzymatic reactions.
4. Absorbents that bind to and eliminate undesirable constituent in the intestine.
5. Enhance the absorption and/or stability of essential nutrients.
6. Selective growth factor for beneficial bacteria.
7. Fermentation substrate for beneficial bacteria.
8. Selective inhibitors of deleterious intestinal bacteria.
9. Scavengers of reactive or toxic chemicals.
10. Ligands that agonize or antagonize cell surface or intracellular receptors(9).

#### A) Nutrients -

Nutrients are substances the body needs for energy, building materials, and control of body processes. There are six major classes of nutrients based on biochemical properties: carbohydrates, proteins, lipids, water, vitamins, and minerals. Fiber, which consists largely of non digestible carbohydrates, is sometimes added as the seventh class of n Besides the biochemical classification of nutrients, nutrients are also categorized as either essential or nonessential nutrients. Essential nutrients cannot be synthesized by the human body, at least not in sufficient amounts for normal functioning, so these nutrients must be obtained from food. Nonessential nutrients, in contrast, can be synthesized in the body in sufficient quantities for normal functioning, although they are generally obtained from food as well. Except for dietary fiber, all dietary carbohydrates are considered nonessential. Every other major class of nutrients contains multiple essential compounds. For example, there are nine essential amino acids, at least two essential fatty acids, and many essential vitamins and minerals. Water and fiber are also essential nutrients(14).

#### B) Herbals –

They are natural plant based medicines which are used as supplements to improve health and well being. They are also used for other therapeutic purposes. They are available in the form of tablets, capsules, powders, extracts, teas etc. Drugs of natural origin, including preparations obtained from medicinal herbs, are still in use in many countries of the world. They are considered as safer in comparison with synthetic drugs, and they have less adverse effects for human organism. Among herbs used in medicine, there are remedies containing rich concentration of flavonoids, known as antioxidant compounds, which have numerous beneficial effects on human organism]. Not counting flavonoids, which are secondary metabolites in plant kingdom, medicinal plants can be ubiquitous sources of essential elements, too. These elements, especially metals, play indispensable role in metabolic processes of living organisms by participation in important biochemical transitions as co-factors of enzymes (15).

### C) Phytochemicals-

Phytochemicals, are non-nutritive plant chemicals that have either defensive or disease protective properties. They are nonessential nutrients and mainly produced by plants to provide them protection. Dietary intake of phytochemicals may promote health benefits, protecting against chronic degenerative disorders, such as cancer, cardiovascular and neurodegenerative diseases. Majority of foods, such as whole grains, beans, fruits, vegetables and herbs contain phytonutrients/ phytochemicals. These phytochemicals, either alone and/or in combination, have tremendous therapeutic potential in curing various ailments. Phytochemicals with nutraceutical properties present in food are of enormous significance due to their beneficial effects on human health since they offer protection against numerous diseases or disorders such as cancers, coronary heart disease, diabetes, high blood pressure, inflammation, microbial, viral and parasitic infections, psychotic diseases, spasmodic conditions, ulcers, osteoporosis and disorders(16).

### 2) Probiotic Microorganisms

Probiotics are live microorganisms that offer a health benefits to human. Basically it aids proper digestion. These are often called as good bacteria that maintains gut microflora. It helps to enhance or restore health to our gut microbiome ]. Many microorganisms that naturally live in our body are similar to microorganisms in probiotic food, Drinks and dietary supplements . Probiotics when taken in requisite amount improves the intestinal microbial balance. Probiotics have both nutritional and medicinal value. Probiotic bacteria are found in fermented dairy products like yoghurt, sauerkraut etc. It is not mandatory that all fermented foods are probiotic [3]. Properties that are considered to be as a Probiotic includes sufficient living bacteria that survive food processing and bacteria that survive have to benefit human health as based on research studies. Probiotics generally include below mentioned bacteria-

1. Lactobacilli (Phylum- Firmicutes)- *L. acidophilus*, *L. bulgaricus*, *L. casei*
2. Bifidobacterium (Phyla- Actinobacterium)- *L. bifidum*, *B. thermophilum*
3. Gram positive Cocci- *Lactococcus lactis*, *Streptococcus thermophilus*, *Streptococcus salivarinus*

Some examples of probiotics in food are Baby milk which nowadays is added with *L. acidophilus* and *Bifidus* bacteria, Yoghurt rich with bacterial culture such as *L. bulgaricus* and *S. thermophilus*, friendly bacteria that is added in cheese is *Lactobacillus* and buttermilk is added with *L. bulgaricus* (10).

### 3) Nutraceutical Enzymes

Enzymes are an essential part of life, without which our bodies would cease to function. Those people who are suffering from medical conditions such as hypoglycemia, blood sugar disorders, digestive problems and obesity, eliminate the symptoms by enzyme supplements to their diet. These enzymes are derived from microbial, plant and animal source(9). Enzymes are an essential part of life, without which our bodies would cease to function. Those people who are suffering from medical conditions such as hypoglycemia, blood sugar disorders, digestive problems, and obesity, eliminate the symptoms by enzyme supplements to their diet (11).

## Non-traditional Nutraceuticals

Non-traditional nutraceuticals are artificial foods prepared with the help of biotechnology. Food samples contain bioactive components which are engineered to produce products for human-wellness. They are the outcome from agricultural breeding or added nutrients and/or ingredients such as orange juice fortified with calcium, cereals with added vitamins or minerals and flour with added folic acid are nontraditional nutraceutical. Agricultural scientists successfully have come up with the techniques to boost the nutritional content of certain crops. They are arranged in to

a) Fortified nutraceuticals

b) Recombinant nutraceuticals

## Market, Growth of Nutraceuticals

The nutraceuticals market size has the potential to grow by USD 216.23 Billion during 2021-2025 and the market's growth momentum will accelerate during the forecast period. This report provides a detailed analysis of the market by product (functional food, functional beverages, and dietary supplements) and geography (APAC, EUROPE, MEA, NORTH AMERICA & SOUTH AMERICA) also the report analyzes the market's competitive landscape and offers information on several market vendors, including Abbott Laboratories, Archer Daniels Midland Co, BASF, Cargill Inc., Danone SA, General Mills Inc., Kellogg Co., Nestle SA, PepsiCo, and Coca-Cola Co. (12).

From the last decade nutraceuticals market has experienced exponential growth in developed and health conscious nations all over the world. Globally, U.S.A and Japan are having well developed nutraceutical markets among nations. Hence, the disposable income of population of these countries are also increasing. Brazil, China and India have shown a huge potential among developed nation in the field of nutraceutical markets. Now, China and India have developed as a key source for the natural raw ingredients for these nutraceutical markets. In 2018, the global market of nutraceuticals was around 250 billion USD. Nutraceutical foods were the major market section with worth of 39.9 billion USD in year 2007 and increased up to 56.7 billion USD by 2013. While nutraceuticals supplement had second highest place in market shares of 2007 with 39 billion USD that has been increased to about 48.8 billion USD in 2013. Whereas, beverages include under nutraceuticals had worth of 38.4 billion USD in 2007 and 71.3 billion USD in the year of 2013. The market shares of nutraceuticals has been increasing yearly and reached to 285.2 billion USD (7).

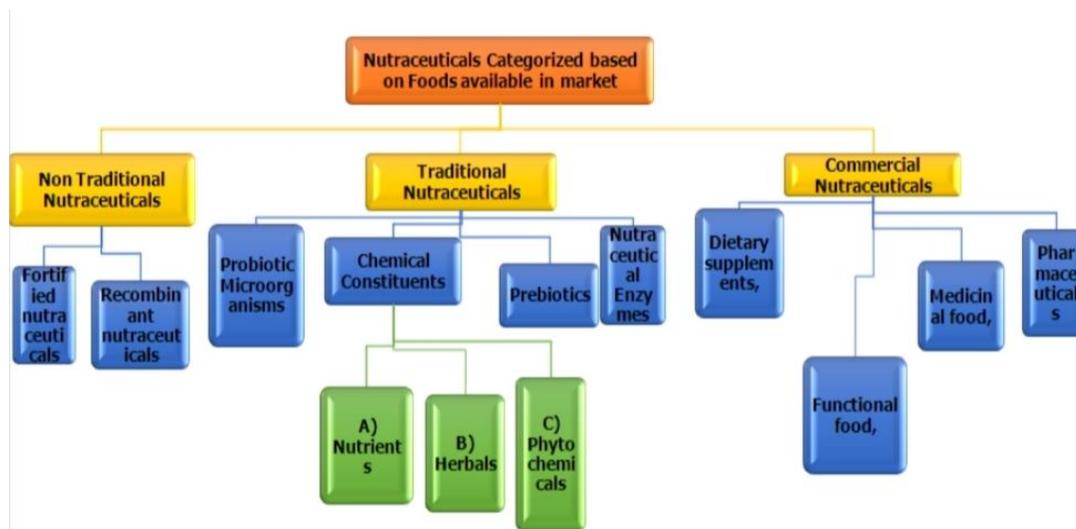


Fig. 3. Nutraceuticals available in market

The market for nutraceuticals is not global, and any company that fails to acknowledge this is likely to fail. One reason is that consumers cannot agree whether nutraceuticals are food or drugs, and they are highly suspicious of exaggerated health claims. Another is that each country regulates nutraceuticals differently. In the EU, any product that claims to be a nutraceutical has to be certified first by the European Food Safety Authority, which tests the product to see whether it lives up to its claims. Canada operates a similarly demanding process. In both cases, only a small proportion of claims are approved(13).

### Scope of Nutraceuticals

Nutraceuticals are often referred to as phytochemicals and functional foods. They are considered natural, with bioactive compounds that have health promoting, disease preventing or medicinal properties. The term nutraceuticals was originally defined by Dr Stephen L DeFelice, founder and chairperson, Foundation of Innovation Medicine (FIM), Crawford, New Jersey. The term nutraceuticals was used to describe foods or food components which have the potential to cure specific disease conditions(17).

With the ever-changing lifestyle of humans, the antioxidant defense systems are often overloaded resulting in oxidative stress. Moreover, the levels of antioxidant defense mechanism decrease appreciably with age. These may result in the development of a great many diseases. Hence research over the past several decades have primarily focussed on different nutraceuticals. Antioxidant products may either function intrinsically to scavenge free radicals (e.g. vitamins, PUFA) or specifically stimulate the body's defense system. This review reflects the potential merits and demerits of nutraceuticals among healthy individuals. However, an individual's susceptibility to any particular disease predominantly depends upon genetic predisposition and lifestyle disorders like smoking, high alcohol consumption. So the response of nutraceuticals can vary from person to person. Nutraceuticals have proven health benefits and their consumption (within their acceptable Recommended Dietary Intakes) will keep diseases at bay and allow humans to maintain an overall good health.

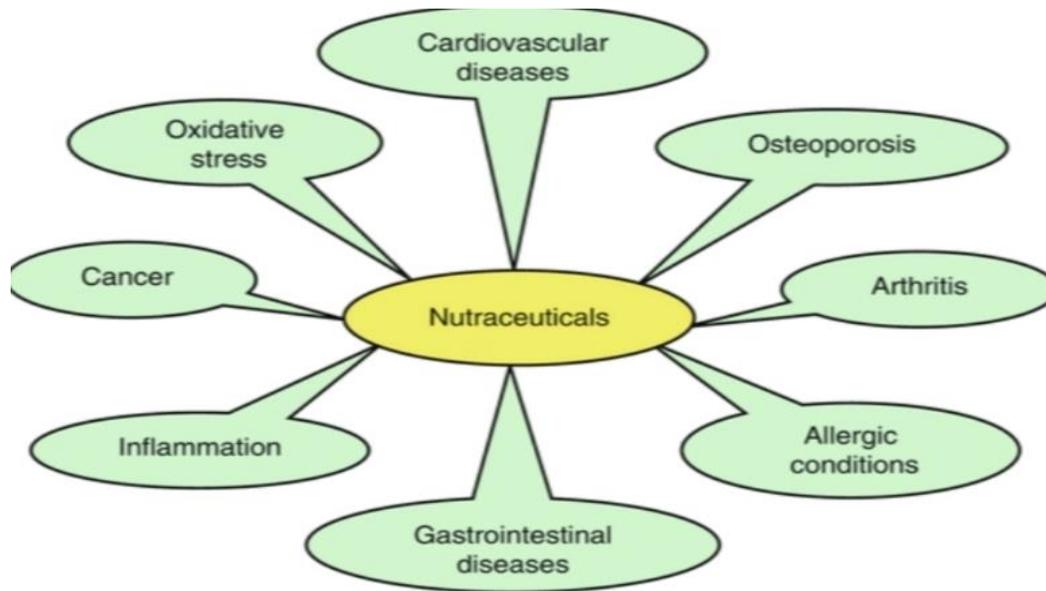


Fig. 4. Scope of Nutraceuticals in various health management systems(41)

They are the outcome from agricultural breeding or added nutrients and/or ingredients such as orange juice fortified with calcium, cereals with added vitamins or minerals and flour with added folic acid are nontraditional nutraceutical. Agricultural scientists successfully have come up with the techniques to boost the nutritional content of certain crops. Research currently is being conducted to improve the nutritional quality of many other crops meant for prevention and treatment of diseases. Major Nutraceuticals possess multiple therapeutic effects with lacking of unwanted effects. A Nutraceutical is demonstrated to have a physiological benefit or provide protection against chronic disease. I try to redefine functional foods and Nutraceuticals. When food is being cooked or prepared using scientific intelligence with or without knowledge is called functional food.

#### Types of Products Available in the Market

In market , Nutraceutical products are consist as both traditional food and non traditional food. Traditional food consist of natural , whole food with new information about their potential health qualities , no change to actual food. Like lycopene in tomatoes , omega -3 fatty acid in salmon whereas non- traditional are resulted from agricultural breeding or aded nutrients and ingredient , that is to boost their nutritional value . Like , beta carotene enriched rice and soybeans, orange juice fortified with calcium , cereals with added vitamins and minerals and so on .

There are various types of products that fall under the category of Nutraceuticals namely

- (a) Dietary supplements,
- (b) Functional food ,
- (c) Medicinal food and
- (d) Pharmaceuticals.

## (a) Dietary supplements :

- Proteins and amino . The use of high-protein diets has a long history in sport nutrition and such diets were popular with athletes in the Olympics of ancient Greece. There is good evidence that protein requirements are increased by hard training and it is often recommended that the protein intake of strength athletes should be 50–100% greater than that of their sedentary counter-parts (Tarnopolsky, 2001)

- B-Hydroxy-b-methyl butyrate : A relatively recent addition to the plethora of nutritional supplements is b-hydroxy-b-methylbutyrate (HMB), a metabolite of leucine. Although the mechanism of action of HMB is unknown, it has been hypothesized that it either acts by decreasing molecule proteolysis or by improving cell integrity by providing substrate for cholesterol synthesis (Nissen and Sharp, 2003).

- Herbal supplements : Many herbal supplements are claimed to concentrations and hence have an anabolic cation. These include tribulis terrestris, chrysin, indole-3-carbinol, saw palmetto, gamma-oryzanol, yohimbine ,smilax and mumio(24).

(b) functional food : The term functional food was first introduced in Japan in 1980's which refers to processed foods containing ingredients that aid specific body functions in addition to being nutritious

- Bioactive compounds : Naturally occurring chemical compounds present in, or derived from a plant, animal, or marine source, that exert the desired health/wellness benefit are termed as bioactive compounds .

- Medical foods: According to U.S. Food and Drug Administration (FDA) (19), medical foods can be defined as “formulated to be consumed orally administered eternally under the supervision of a physician, and which is intended for the specific dietary management of a disease or condition for which distinctive nutritional requirements, on the basis of recognized scientific principles, are established by medical evaluation.

- Natural health products: Natural health products (NHP) includes homeopathic preparations substances used in traditional medicines, minerals or trace elements, vitamins , amino acid, essential fatty acids, or other botanical, animal, or microorganism derived substances. These products are generally sold in medicinal or ‘dosage’ form to diagnose, treat, or prevent disease, restore or correct function, or to maintain or promote health. NHP also include nutraceuticals (25).

## (c) Medicinal food :

- L. Batatas : Sweet potato is one of the average calories starch foods and provides 90 calories/100 g vs. 70 calories/100 g of other types of potatoes (*Solanum tuberosum*). . The 10000ains no saturated fats or cholesterol and is a rich source of dietary fiber, anti-oxidants, vitamins, and minerals. Its energy content mainly comes from starch, a complex carbohydrate. Sweet potato has a higher amylose to ratio when compared to *S. tuberosum*. Amylose raises the blood sugar levels slowly in to simple sugars, and is recommended as a healthy food sub-stance, even for patients with diabetes.(26).

## 1) Improves overall health

Nutraceuticals help us improve our overall health. As we have discussed before that how a balanced diet is helpful in improving our health. It adds nutritional value to our body and help in improving both mental and physical health.

## 2) Boosts energy

There are various types of Nutraceuticals, which really help us boost our energy like all the vitamins mainly from Vitamin B group. Vitamin D group also helps you stay active. Vegans and vegetarians should try to increase their B-12 intake because it is mainly found in milkband meat which is not a part of their diet.

## 3)Prevents chronic diseases

Nutraceuticals are proved to help deal with fatal diseases like diabetes, high blood pressure etc. Supplements like fibre help to keep your arteries free of any form of submission. Diabetes can also be controlled if one maintains a healthy weight and proper nutrition intake.

## 4)Improves sleeping pattern

Nutraceuticals are also believed to improve sleeping patterns. Many natural nutraceuticals like valerian roots and some minerals like magnesium may help you get a sound sleep. It also helps us to improve our sleeping patterns.

## 5)Relieves anxiety

Certain vitamins like vitamin D have a very major role on establishing our mood. Vitamin B definitely is also associated with increased risk of anxiety and depression. Vitamin B2 or riboflavin is also a very important vitamin which is mostly found in meat. Hence, vegetarians can take supplements for it(18).

## Role of Nutraceuticals in Ailments

### Nutraceuticals in Diabetes Management

Diabetes Mellitus is a complex metabolic disorder associated with developing insulin resistance, impaired insulin signalling and  $\beta$ -cell dysfunction, abnormal glucose and lipid metabolism, sub-clinical inflammation and increased oxidative stress; It was estimated to affect 2.8% of the worldwide population in the year 2000, and it is expected to affect 4.4% in 2030 due to the population aging and a constant increase in obesity; these metabolic disorders lead to long-term pathogenic conditions including micro-vascular and macro-vascular complications, neuropathy, retinopathy, nephropathy, and a consequent decrease in quality of life and an increase in the rate of mortality. Among the multiple risk factors underling the incidence and progression of type 2 diabetes mellitus, diet is the main modifiable factor. An increasing number of epidemiological investigations show that diet rich in foods with high content of phytochemicals, high total antioxidant capacity and polyphenolic compounds may be related to lower risk of diabetes and predisposing factors. Based on the current understanding of pathophysiology of insulin resistance and type 2 diabetes mellitus, multiple pharmacological and non-pharmacological interventions have been developed with the aim

of improving glycemic control and prevention of diabetes complications; in this area, recently the use of functional foods and their bioactive components have been considered as a new approach in the prevention and management of diabetes and its complications. A nutraceutical is a food with a medical-health benefit, including the prevention and treatment of disease. Nutraceuticals also refer to natural functional/medical foods or bioactive phytochemicals that have health promoting, disease preventing or medicinal properties(27).

## Herbs in Diabetes

**Curcumin-** The compound curcumin, which is found in the spice turmeric, has been shown to both boost blood sugar control and help prevent the disease. In a nine-month study of 240 adults with pre-diabetes, those who took curcumin capsules (which are available over-the-counter) completely avoided developing diabetes while a sixth of patients in the placebo group did. **Ginseng-** Ginseng has been used as a traditional medicine for more than 2,000 years. Studies suggest that both Asian and American ginseng may help lower blood sugar in people with diabetes. One study found that extract from the ginseng berry was able to normalize blood sugar and improve insulin sensitivity in mice who were bred to develop diabetes(28).

**Rosemary-** That delicious whiff in soups and curries is because of rosemary. Not just does rosemary promote weight loss but it also balances blood sugar levels. Rosemary is also responsible for reducing bad cholesterol (LDL) and increasing good cholesterol (HDL).

**Aloe Vera-** The fleshy plant forms an essential part of alternative medicine in India, Mexico, Australia and South America. It reduces inflammation in the body and treats indigestion. Inflammation in the body is responsible for many chronic lifestyle diseases like diabetes.

**Ginger-** Anti-diabetic, hypolipidemic and anti-oxidative properties in ginger are beneficial in controlling blood sugar levels. Ginger also can improve insulin sensitivity, reduce oxidation and improve cholesterol levels. It even helps with weight loss. A 2014 study published in the *Complementary Therapies in Medicine* journal found that daily consumption of three 1-gram capsules of ginger powder for 8 weeks proved useful for patients with Type 2 diabetes.

- Drink 2 to 3 cups of ginger tea daily.
- Also, include fresh or dry ginger in your cooking.
- Another option is to take ginger supplements after consulting your doctor.

## Nutraceuticals in CVS Diseases

Cardiovascular disease (CVD) is common, indeed the majority of adults above sixty years of age will experience some manifestation of CVD. Based on data from 2012 and 2013, it has been estimated that CVD is responsible for 17.3 million deaths annually worldwide. Morbidity is also high, and in Europe, 200 billion Euros of healthcare expenditure is attributable to CVD(19). The nutraceuticals used are antioxidants, dietary fibres, omega-3 fatty acids, vitamins, minerals for avoidance and treatment of CVD. Polyphenol (in grape) avoid and control arterial diseases. Universal, the burdens of chronic diseases like cardiovascular diseases, cancers, diabetes and obesity is quickly increasing. In 2001, chronic diseases contributed approximately 59% of the 56.5 million total reported deaths in the world and 46% of the global burden of disease. Cardiovascular diseases (CVD) is the name for the group of disorders of the heart and blood vessels and consist of hypertension (high blood pressure), coronary heart disease (heart attack), cerebrovascular disease (stroke), heart failure, peripheral vascular disease, etc. In 1999 CVD only contributed to a third of global deaths and by 2010 it would be the leading cause of death in developing countries. Majority of the CVD are preventable and controllable. It was reported that low intake of fruits and vegetables is related with a high mortality in cardiovascular disease. A lot of research studies have recognized a protective role for a diet rich in fruits and vegetables against CVS(20)

CVD, including heart disease and stroke), represent the primary impact on both human health and community social costs in Western countries. Cardiovascular diseases and tumors, together, contribute to more than 60 % of deaths in economically-developed countries. In economically-developed countries, CVDs acquire a character of epidemic proportions, and surpass infectious diseases in mortality. Recent studies implicate reactive oxygen species (ROS) in the pathogenesis of both acute and chronic heart diseases as a result of cumulative oxidative stress. In particular, oxidation of low density lipoproteins (LDL), the latter emanating from saturated, trans fats and meat products, has a key role in the pathogenesis of atherosclerosis and cardiovascular heart diseases through the initiation of the plaque formation process(23).

Herbs in CVS action

Ginkgo biloba L. (Ginkgoaceae) – Ginkgo

Ginkgo biloba commonly called the maidenhair tree is one of the oldest living fossil on the planet dating well over 200 million years. G. biloba forms part of one of the most popular herbs used worldwide and is advocated mainly for cerebral insufficiency, memory loss, Alzheimer's disease, peripheral vascular disease and circulatory disorders. The use of the root and kernels of G. biloba is widely documented in TCM(29).

Nutraceuticals in various Gastrointestinal Diseases

About 40 million American suffers from a various digestive disorders like gastro-esophageal reflux disease, irritable bowel syndrome, celiac disease, food allergies, diverticulitis, ulcerative colitis, crohn's disease etc. The prebiotics which are polysaccharides in nature could be useful for both disease prevention and for healing process. Nutraceuticals have the ability to reduce antigenic and oxidative insults in the gastrointestinal tract of an individual. Flavonoids and polyphenols show antioxidant activity and have been found to be known as possible gastroprotective and cytoprotective agents. Glutamate, a neurotransmitter found in gut which improves neonatal gastrointestinal function, gastric emptying as well significant role in developing infant gastric mucosa 10, 11. Herbal nutraceuticals like probiotics play an unique role for healthy digestive function. It may stimulate the growth of healthy gut microflora, slow down harmful bacterium and reinforce the body's natural gut defense mechanisms. It can reduce lactose intolerance and prevent GI tract disorders (22).

Constipation

Constipation is a common gastrointestinal disorder that refers to inadequate bowel movement or hardness of passing intestinal contents]. Difficulty in defecation is one of the commonly seen symptoms associated with hard and dry stool. Persistence of constipation can last for weeks or even longer, which may raise the necessity of medical intervention. Substances that either loosen stools or stimulate a bowel movement are called laxatives. For occasional constipation, laxatives are usually recommended for helping defecation. Lots of botanic products can promote this beneficial effect, and have been used even from ancient times. Senna is one of the mostly used therapies which comes from an important class of botanic laxatives, anthraquinone drugs. The class also has cascara, frangula, aloe, and rhubarb included, and is enriched in corresponding plants and herbs in forms of glucoside derivatives of anthracene, i.e., the anthraquinones(30).

## Nutraceuticals in Cancer Treatment

Cancer is one of the leading causes of death globally, associated with multifactorial pathophysiological components. In particular, genetic mutations, infection or inflammation, unhealthy eating habits, exposition to radiation, work stress, and/or intake of toxins have been found to contribute to the development and progression of cancer disease states. Early detection of cancer and proper treatment have been found to enhance the chances of survival and healing, but the side effects of anticancer drugs still produce detrimental responses that counteract the benefits of treatment in terms of hospitalization and survival. Recently, several natural bioactive compounds were found to possess anticancer properties, capable of killing transformed or cancerous cells without being toxic to their normal counterparts. This effect occurs when natural products are associated with conventional treatments, thereby suggesting that nutraceutical supplementation may contribute to successful anticancer therapy. This review aims to discuss the current literature on four natural bioactive extracts mostly characterized by a specific polyphenolic profile. In particular, several activities have been reported to contribute to nutraceutical support in anticancer treatment: (1) inhibition of cell proliferation, (2) antioxidant activity, and (3) anti-inflammatory activity. On the other hand, owing to their attenuation of the toxic effect of current anticancer therapies, natural antioxidants may contribute to improving the compliance of patients undergoing anticancer treatment. Thus, nutraceutical supplementation, along with current anticancer drug treatment, may be considered for better responses and compliance in patients with cancer. It should be noted, however, that when data from studies with bioactive plant preparations are discussed, it is appropriate to ensure that experiments have been conducted in accordance with accepted pharmacological research practices so as not to disclose information that is only partially correct(31).

## Nutraceuticals in Irritable Bowel Syndrome

Inflammatory bowel diseases (IBD), including Crohn's disease (CD) and ulcerative colitis (UC), are a group of idiopathic, chronic and relapsing inflammatory disorders of the gastrointestinal tract, whose incidence and prevalence has been increasing in the last decades. Although the etiology of IBD is still unclear, it is assumed that many interacting components could affect IBD development, including genetic susceptibility, ethnicity, environmental factors, infectious diseases, and dietary habits. At present, the acknowledged pathogenetic mechanisms are featured by immune dysregulation, altered intestinal microflora, oxidative stress, defects in the gastrointestinal mucosal barrier and increased permeability, whose interplay leads to the onset of a state of chronic mucosal inflammation(32).

The symptoms vary between individuals and affect some people more severely than others. In some people, the symptoms seem to be triggered by something they have had to eat or drink, stressful periods, or food poisoning. You may find some of the symptoms of IBS ease after going to the toilet and opening your bowels. Flare-ups of symptoms can last a few days, but, after this time, symptoms will usually improve. Whilst symptoms can come and go in episodes, they may not disappear completely(33).

The pathogenesis of IBS is multifactorial and heterogeneous among patients with alterations in motility, visceral sensation, the microbiome, brain-gut interaction via the central and enteric nervous systems, mucosal immune function, bile acid metabolism and intestinal permeability. More recent studies have turned attention to the interplay between the microbiome, immune function, gut sensation and motility. The microbiome of IBS patients has a different luminal bacterial composition with , and *Faecalibacterium prausnitzii* sp and more Lactobacillaceae, Bacteroides, Enterobacteriaceae . These alterations in the microbiome have effects of increased visceral hypersensitivity with colonic distension in animal models. IBS patients have alterations in immune activation by increased toll-like receptor expression and production of pro-inflammatory cytokines. Degradation of tight junction proteins and

increased intraepithelial permeability has been observed. This dysbiosis has effects on gut function and is an important player in the pathogenesis of IBS(34).

## Study of some Herbs as Health Food

### ALFAALFA-

Biological source- It is a perennial flowering plant of *Medicago sativm*.

Family- Leguminosae

Morphology:

Colour: Yellow or olive green to brown.

Odour: Characteristics.

Taste: Mild bitter.

Size: 1 – 2 mm long, 1 – 2 mm wide and 1 mm thick

Shape: kidney shaped



Fig. 5. Alfaalfa Seed(36).

Chemical constituents: Leaves contains carotenoids, triperpenoid saponins (medicago acid), isoflavonoid (Genistein). Seed contains L-Canavaine, betaine, trigonelline etc. also contains vitamins C, K, B, zink, phosphorus.

### CHICORY

Biological source: It is obtained from the flowering plant of *Chichorium intybus*.

Family: Asteraceae.

Morphology: Roots are thick, short and lignified. Stem are fibrous, longitudinal grooves with latex. Leaves are oblanceolate, unlobed, petiolate, runcinate, rough hairy on the underside whereas upper. leaves are sessile,



toothed edge. Flowers are hermaphrodite, bright blue in colour. Fruits are 2-3 mm long with short doll consist of many scales.

Fig. 6. Chicory(37).

Chemical constituents: chicoric acid is the major compound of chicory. The flowers of chicory contains saccharides, methoxycoumarin cichorine, flavonoids, and essential oils.

Health Benefits: seeds are used for liver disorder, the whole plant is used for diabetes and for high blood pressure. Roots are used for the treatment of jaundice, liver enlargement, gout, and rheumatism.

## GINGER

Biological source: Rhizomes of *Zinginer officinale*.

Family: Zingiberaceae

Morphology:

Colour: Dark yellow or light brown to pale buff.

Odour: Characteristic.

Taste: pungent.

Size: 5 cm long and 1.5 cm in diameter

Shape: Irregular, Branched or palma



Fig. 7. Ginger(38).

Chemical constituents: The main constituent is zingiberene and the pungent principle of the spice is zingerone.

Health benefits: Ginger is used in various therapeutic applications viz. Improves blood circulation, asthma, stomach discomfort, relieves stress, sore throat, cough and cold, motion sickness, relief heart burn, relief menstrual cramp, weight loss etc. Apart from that it is also used in various pharmacological activities.

#### GARLIC

Biological source: Bulbs of *Allium sativum*.

Family: Liliaceae

Morphology:

Colour: Ivory to white, Outside skin is white.

Odour: sharp and acrid

Taste: pungent

Size: Bulb, 30-45 cm tall; 22-30 cm in a spread, Made up of 4-15 cloves

Shape: Rounded, bulb



Fig. 7. Garlic(39).

**Chemical constituents:** Sulphur compounds mainly Alliin, Allicin, Ajoene; amino acids minerals and enzymes such as allinase, peroxidase, myrosinase etc.

**Health benefits:** It is generally used to the blood system and heart, mainly atherosclerosis (hardening of the arteries), high cholesterol, heart attack, coronary heart disease, hypertension etc. It is also used to treat various types of cancers, like lung, prostate, breast, stomach, rectal and colon.

AMLA

**Biological source:** Ripe fruits of phyllanthus emblica

**Family:** Euphorbiaceae

**Colour:** Green to light yellow

**Odour:** Odourless

**Taste:** sore and astringent

**Size:** About 2.24 cm in diameter, 5.68 g in weight, 4.92 ml in volume

**Shape:** Globular, depressed

**Chemical constituents:** The fruit contains high amounts of ascorbic acid (vitamin C), high density of ellagitannins (responsible for bitter taste) such as emblicanin A (37%), punicafolin, phyllanemblinin A, phyllanemblin, ellagic acid, gallic acid, some flavonoids like kaempferol etc.



Fig. 8. Amla fruit(40).

Health benefits: It is useful to increase immunity, help in calcium absorption, increase urination, strengthens heart muscles, reduces fever, eliminate toxic products from body, reduces blood sugar, improves eye sight, promotes hair growth, reduces diabetes, improves memory and brain activity, prevent anemia, presents ageing, constipation, blood purifier etc.

## Conclusion

Now a day nutraceutical's are further consumed because they contain potential nutrients, safety and therapeutic effects. Nutraceutical's contain dietary supplements, medicinal food, functional food, phytoconstituents. Nutraceuticals are more beneficial and these are used in various disease such as in diabetes, cardiovascular disease, GIT disorder etc. Various herbs such as Alfaalfa seed, Chicory, Ginger, Garlic and amla fruit are used as nutraceuticals in diet. Many fruits, vegetables, grains, fish and dairy and meet products contain several natural components that deliver benefits beyond basic nutrition. As per survey consumer give more emphasis on diet rather than exercise or hereditary factor to give good health. Nutraceuticals helps to improve our overall health.

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