

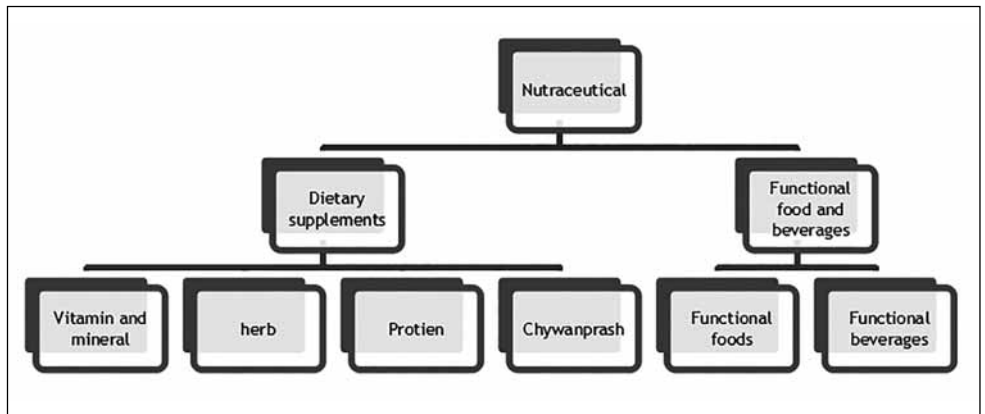
Europe and USA are now nutraceuticals hubs

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THE term 'nutraceuticals' was first invented in the year 1989 by Stephen DeFelice, the founder of FIM (Foundation for Innovation in Medicine), which is now becoming a booming industry because of its functional medicinal application in prevention and treatment of diseases. After that, people from developed countries are taking interest in nutraceuticals and functional foods. However, even today, general populations from developing countries are taking interest in nutraceuticals due to their chronic disease preventive effect.

If we go back to our ancient history, the application of food materials as a folk medicine is quite a common observation. This reminds the words of Hippocrates, who said: "Let food be your medicine." Nutraceuticals is a bioactive part of natural food substances, which are gradually identified and assessed by the researchers to estimate their efficacy and safety for particular disease condition and/or multiple health benefits. Usually, the food components, which are considered as nutraceuticals, do not come under essential food matrix, but they are a non-food matrix, bioactive components enhancing the overall health.

The reports indicate that the market for functional foods and drinks reached US\$26.4 billion in Europe and the US in 2005, and due to increasing consumer acceptance, it is growing at an annual rate



In 2001, the retail sale price was \$3.9 billion in North America

of 4.4 per cent. Currently, China, Brazil, and India are the developing countries which have become the destination of agri-based raw material supply, whereas Europe and USA have become the nutraceuticals hubs.

The Nutraceuticals Market Boom

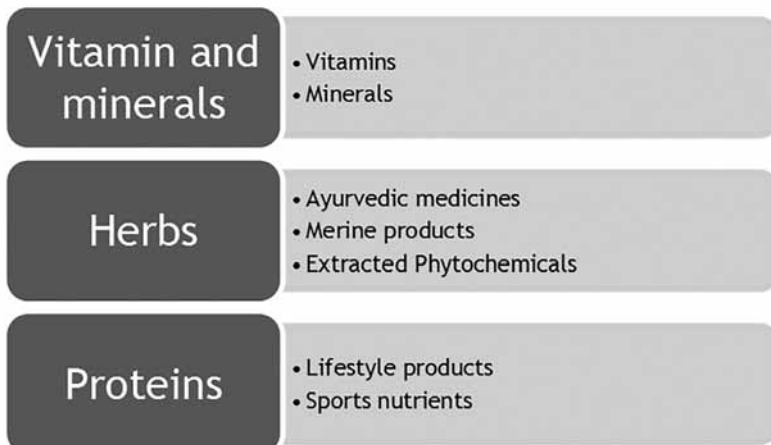
The ancient medicinal system is based on herbal medicinal substances rather nutrient-based medicine than to the chemical-based medicinal system after the discovery

of sulfa drug and penicillin. However, due to several reasons including slow and cost sufficient discovery process of a new molecule, reporting of adverse effects of the existing molecule, treatment-related cost burden, recession, health-related awareness and preventive measures have influenced the scientific research on natural therapies.

The research findings provide evidence that bioactive nutrients obtained from different food substances play a major role in disease prevention. Gradually, the nutraceuticals market is established and it has been found that Western countries, including USA and members of Europe and other developed countries have been taking keen interest to expand the nutraceuticals market. In 2001, the retail sale price was \$3.9 billion in North America. In 2010, the nutraceuticals market started to accelerate all over the globe. In 2010, the nutraceuticals market value reached \$50.4 billion in USA, \$35 billion in a European country and \$2 billion in India.

Previously, alternative therapy or complementary medicinal treatment was limited in developing or underdeveloped countries. But gradually, the health benefits of this therapeutic management, including the incorporation of nutraceuticals have changed the prescription pattern.

In present days, medical doctors also prescribe nutraceuticals, dietary supplements, and functional foods along with conventional medicine. Study research had also reported that one-half of adult Americans are ingesting vitamins and other dietary supplements. A research study reported 70



Functional Food and Beverages

F&B items enriched with particular nutrients

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per cent of patients found their medical doctor as an alternative practitioner. Younger generations are very much attracted towards nutraceuticals. The buzz of nutraceuticals is not a crazy therapeutic approach, but it indicates the necessity of nutrition in the healthcare industry to promote overall health. All the developed countries, including USA and members of Europe also promoted phytotherapeutics and herbal remedies.

Classification and Definition of Nutraceuticals

Nutraceuticals are broadly classified into two groups - dietary supplements and functional food and beverages.

Dietary supplements are a combination or a single component of dietary ingredient/s, which can prevent disease or improve health.

Functional food and beverages are conventional food or beverage items enriched with particular nutrients recommended to achieve particular health benefits, including improving compromised health condition, maintaining normal physical or mental functioning or preventing diseases.

Each section of dietary supplements and functional food and beverages is further classified into different categories:

Dietary Supplements

Functional Food and Beverages

* Examples of mineral adjustable food items include iodised salt and low sodium salt.

Depending upon the functional ingredients profile, the nutraceuticals are categorised as follows:

Functional foods

- Fortified foods
- Probiotics
- Whole grains

Functional beverages

- Energy drinks
- Sports drinks
- Fortified juice

Amino acids are the fundamental nutraceuticals of protein synthesis

List of Nutraceuticals

There are various types of nutraceuticals available in the market, which are named under different categories:

Vitamins

There are different vitamins that are served as major nutraceuticals such as vitamins B1, B2, B6, B12, folic acid, niacin, pantothenic acid, vitamin A, vitamin C, vitamin D, vitamin E, vitamin K, biotin.

Minerals

There are different minerals enlisted as major nutraceuticals including calcium, zinc, iron, magnesium, selenium, sodium and potassium.

Amino Acids

Amino acids are the fundamental nutraceuticals of protein synthesis. Amino acids are linked by peptide bonds and synthesised proteins. Some peptide enzymes are essential for digestive functioning. Arginine, glutamine, lysine, leucine, isoleucine, valine are some examples of amino acids marketed as major nutraceuticals. Beside these amino acids, certain protein and peptide are also included in the list of major nutraceuticals, such as lactoferrin, immunoglobulins, bioactive peptides, digestive enzymes.

PUFA

Arachidonic acid, docosahexaenoic acid, eicosapentaenoic acid, γ -linolenic acid, conjugated linoleic acid are certain popular nutraceuticals that come under polyunsaturated fatty acids (PUFA). Structured lipids are also available as specialty lipid supplement.

Phytochemicals

There are certain phytochemicals that are

Cardiovascular Disease prevention	Bone Health Management	Weight Management	Cognitive
<ul style="list-style-type: none"> •Omega - 3 •Antioxidant •Phytosterols •Fibers 	<ul style="list-style-type: none"> •Minerals •Antioxidants •Vitamins •Proteins •Amino acids •Omega - 3 •Botanicals 	<ul style="list-style-type: none"> •Fibers •Herbal extracts •Proteins •Fatty acids 	<ul style="list-style-type: none"> •Omega - 3 •Amino acids •Antioxidants

Carotenoids are pigmenting substances

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considered as important nutraceuticals due to their variety of health benefits including phytosterols, isoflavones, lignans, polyphenols, tocotrienols, and isothiocyanates.

Carotenoids

Carotenoids are pigmenting substances that are found in plant-based products and marine sources including β -carotene, lycopene, lutein, zeaxanthin, and astaxanthin.

Fibres

Fibres are essential dietary nutrients. Some of the fibres like inulin, polydextrose, beta glucan, resistant starch, gums such as guar gum, pectin, resistant maltodextrin, psyllium, and insoluble fibres are used as nutraceuticals.

Prebiotics

Prebiotics can be defined as a non-absorbable (or non-digestible in case of food) ingredient that usefully affects the host by selectively stimulating the growth and/or activity of one or a limited number of 'friendly bacteria'. Polydextrose, inulin, fructooligosaccharides, galacto-oligosaccharides, xylooligosaccharides, and soybean oligosaccharide are some of the examples of prebiotics enlisted under major nutraceuticals.

Probiotics

Probiotics can be defined as a live microbial supplement which helpfully affects the host by improving the balance of 'friendly bacteria.' Lactobacilli and bifidobacteria are very common nutraceuticals marketed as probiotics.

Polyols

Polyols are used as a sugar replacer. Xylitol, Lactitol, Isomalt and Maltitol are the different nutraceuticals that can be used as a sugar replacer.

Others

Some other nutraceuticals, such as coenzyme 10, glucosamine, chondroitin, lipoic acid and inositol have a wide range

Raw Material	Constituents	Finished Product	Health Benefits
Fish oil, Algae (obtained from marine sources)	Omega 3 fatty acids	Fortified foods & dietary supplements	Promotes cardiovascular functioning & cognitive health
Trimethylhydroquinone, Soybean oil (Non GMO)	Vitamin E	Dietary supplements (Single or multivitamins)	Promotes cardiovascular functioning, skin and bone health & improve cognitive health
Chemically processed ammonium salts or ammonia	Amino acids (e.g. lysine)	Fortified foods	Promote & improve cognitive health
Milk cultures (mother culture)	Probiotics	Fortified foods & dietary supplements	Digestive health
Soybean	Soy protein	Dietary supplements	Cardiovascular Health promoting & Weight management

A sequential production process has been followed to develop nutraceuticals in production unit to convert raw materials into finished goods

of health benefits, obtained from different natural dietary sources.

The Sequence of Nutraceuticals Production

A sequential production process has been followed to develop nutraceuticals in production unit to convert raw materials into finished goods.

The Necessity to Promote Next-Gen Nutraceuticals

In the present century, almost 75 per cent of people are well aware of the benefits of food but only 35 per cent general population is aware of the term nutraceuticals. The promotion of nutraceuticals research is very important for developing the market for next generation nutraceuticals. The lifestyle related morbidity, including diabetes, hypertension, hypercholesterolemia, and obesity are the key reasons for mortal-

ity in all developing countries, including India. Worldwide health associates are promoting to lead a healthy lifestyle with consumption of all the health promoting nutrients to obtain the optimum quality of life throughout the lifespan.

According to the data obtained in 2010, vitamins and minerals are the most acceptable nutraceuticals, whereas fibres and prebiotics are least desirable nutraceuticals. We need to promote the nutraceuticals as next-generation health solution for combating existing health problems, weight management, enhancing daily health, revitalise, and obtain a good future health and cosmetic purposes. Proper selection of nutraceuticals can help to provide health benefits without increasing economical, as well as side-effect load to the current generation.

The promotion of nutraceuticals can also increase the economic growth of the country. In 2010, the worldwide nutraceuticals market size was \$140.1 billion. Thus, bulk revenue can be collected from the overall growth of nutraceuticals market size. In addition, the disease-preventive effect of nutraceuticals can promote health and consequently healthcare spends will be reduced. ○

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