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Review Article on Nutraceuticals

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Abstract

Nutraceuticals are necessary food elements that have both nutritional and therapeutic properties. The inclusion of active substances such as carotenoids, collagen hydrolysate and dietary fibers contributes to the health advantages of these foods. Nutraceuticals have been discovered to have a good impact on cardiovascular and immune system health, as well as play a role in the prevention of infection and cancer. Nutraceuticals are divided into classes based on their nature and mechanism of action. Various nutraceutical classifications and their potential therapeutic action in disease, such as anti- cancer, antioxidant, anti-inflammatory, and anti-lipid activity, Furthermore, the various mechanisms of action, uses, and safety of these products on consumers, as well as current trend sand future prospects of nutraceuticals.

Keywords: Nutrients, Diatery Supplements, Nutraceuticals and Diseases.

Introduction

Hippocrates, some 2000 years ago, properly stated, “Let food be your medicine, and medicine be your food.” The recognition that “nutraceuticals” play a vital role in health enhancement has sparked a surge in global interest.

Dr. Stephen De Felice, Chairman of the Foundation for Innovation in Medicine, created the phrase “Nutraceutical” in 1989 by merging the terms “Nutrition” and “Pharmaceutical”. “Nutraceutical” is a marketing phrase for a nutritional supplement sold with the goal of treating or preventing disease, and it has no regulatory definition. As a result, a “nutraceutical” is any substance that can be regarded a food or a component of a food that has medical or health benefits, including illness prevention and treatment.

Isolated nutrients, dietary supplements, and diets are examples of such items, as are genetically altered “designer” foods, herbal products, and processed foods including cereals, soups, and beverages. There are already over 470 nutraceutical and functional food items with established health benefits on the Market

“Because of their perceived safety and possible nutritional and therapeutic advantages, nutraceuticals and functional foods have attracted a lot of attention.”

The nutraceutical and functional food industries are in a good position to take advantage of consumer

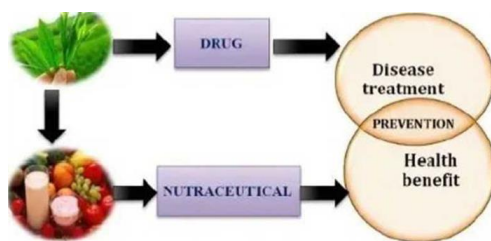
interest in these products.

Whether it's a big pharmaceutical corporation, a nutritional company, a large food multinational, or a tiny vitamin-selling company, all are aware of changing patterns and the growing health-conscious customer trend.

As a result, there is a proliferation of these value-added goods targeted at not only maintaining one's health but also the prevention and treatment of a variety of conditions ranging from heart disease to cancer.

Nutraceutical mainly consist of

1. Nutrients: Substance which have establish nutritional functions for example; Vitamins. Minerals, Amino acids. Fatty acids, etc.
2. Herbals/ Phytochemicals: Herbs or Botanical products.
3. Dietary supplements: Probiotics, Probiotics, Antioxidants, Enzymes. etc.



History

The word is a portmanteau of the word's "nutrition" and "pharmaceutical", was coined in 1989 by Stephen L. Defelice. founder and chairman of the Foundation of Innovation Medicine. Terms 'nutraceuticals', 'food supplements', 'dietary supplements' have evolved after the concept was originated by Dr. De Felice. Prior to the 1990s the term nutraceutical was not in use. but there was research on the functional properties and ability of food to alleviate and/or prevent certain conditions connected to different type of diseases, there is no sharp demarcation between food supplements and nutraceuticals given by regulatory authorities.

In the 19th century, in line with Hippocrates' philosophy "let the food be thy medicine and thy medicine be the food" the connection between nutrition and human health was conceptualized, as well as the relationship between the use of appropriate foods for health and their therapeutic benefits. Traditionally, the people of India and China consume various natural foods that are considered to be medicinal. Countries like Germany, France, and England were the first to consider one's diet more important than both exercise and hereditary factors in people's attempt to achieve good health.

Classification of nutraceutical

To understand the applications, the nutraceuticals are needed to be classified. The classification into various classes counting on their uses are

1. Traditional Nutraceuticals:

This category of nutraceuticals will be directly obtained from nature e.g.

lycopene in tomatoes, omega-3 fatty acids in salmon, or saponins in soy etc. Further, they are also classified

a Chemical constituent

Nutrient's: 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.

Herbals: Nutraceutical chronic diseases to make life better. Salicin present in the willow bark (*Salix nigra*) had been proved for anti-inflammatory, analgesic, antipyretic, astringent, and anti-arthritis response clinically .s along with herbs had an excellent impact on prevention of various

Phytochemicals: They are mainly classified on the basis of phytochemicals. Flavonoids, a class of secondary metabolites, which are present in most of the plants, having more than 4000 varieties had been proven clinically for preventing various disease such as cancer, diabetes, heart diseases, and kidney problem through its antioxidant properties and their bioactive components.

Probiotic microorganisms: Probiotics are very important to make life smoother by removing the toxic flora of the intestine and maintaining a friendly environment, for example, useful consumption of *Bacillus*. Currently various probiotic products are available in the market with adequate nutrients to counter various pathogens so that a number of ailments related to human body can be treated Nontraditional nutraceuticals they are foods enriched with supplements.

2. Non_traditional nutraceuticals Fortified Nutraceuticals:

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 Deficiency

Recombinant nutraceuticals represent the category of energy providing foods prepared by applying genetic Engineering.

Example: Production of yoghurt and cheese.

3. Commercial nutraceutical –

1.Dietary Supplements

- These are the most widely consumed nutraceuticals and include: Vitamins: Vitamin C, vitamin D, B-complex supplements
- Minerals: Calcium, iron, magnesium, selenium Essential fatty acids: Omega-3, omega-6 supplements
- Amino acids: Glutamine, branched-chain amino ac

2 Functional Foods enriched with specific bioactive compounds:

Probiotic yogurts and fermented beverages Fortified milk

(vitamin D, omega-3)Breakfast cereals fortified with vitamins and minerals Antioxidant-rich juices (pomegranate, blueberry)These combine nutritional benefits with therapeutic effects. ids (BCAAs)

Chemistry of nutraceuticals

Nutraceuticals are found in both natural and processed foods, including carotenoids, flavonoids, curcuminoids, phyto sterols, and certain fatty acids .Many of these nutraceutical shave the potential to act as therapeutic agents, and may therefore be suitable for incorporation into functional or medical foods as a

means of preventing or treating certain types of cancer. Nutraceuticals vary considerably in their chemical structures, physiochemical properties, and biological effects. For example, nutraceuticals vary in their molar mass, structure, polarity, charge, and functional groups, which influence their chemical reactivity, physical state, solubility characteristics, and biological fate and function. Some nutraceuticals are naturally present in whole foods, such as fruits, vegetables, and cereals, and are therefore often consumed in this form.

Conversely, other nutraceuticals are isolated from their natural states and converted into additives that can be incorporated into functional foods, dietary supplements, or pharmaceuticals.

Alzheimer's disease

Alzheimer's disease (AD) is characterized by progressive dementia with memory loss as the major clinical manifestation. Women are more affected than men at a ratio of almost 2:1 due in part to the larger population of women who are over 70.

Several lines of evidence strongly suggest that oxidative stress is etiologically related to a number of neurodegenerative disorders including Alzheimer's disease.

Current status of nutraceuticals in Alzheimer's disease Nutraceutical antioxidants like (3-carotene, curcumin, lutein, lycopene, turmeric etc may exert positive effects on specific diseases by neutralizing the negative effects oxidative stress, mitochondrial dysfunction, and various forms of neural degeneration.

A great deal of research has pointed to deleterious roles of metal ions in the development of Alzheimer's disease, by the augmentation of oxidative stress by metal ion. The growing trend in nutraceutical intake is in part a result of the belief that they postpone the development of dementias such as Alzheimer's disease. However, pathogenic events centered on metal ions are expected to be aggravated by frequent nutraceutical

Health benefits of nutraceuticals

- Improving health and delaying aging.
- Preventing chronic disease and increasing life expectancy.
- Supporting the structure and functioning of the body.
- Improving mental health and clarity.
- Enhancing sleep quality and quantity.
- Boosting energy and relieving anxiety.
- Reducing drug cravings

Limitations of nutraceuticals

Despite their growing popularity, nutraceuticals have several limitations that affect their efficacy, safety, and clinical reliability:

1. Lack of Standardization: Variability in source materials, extraction methods, and active compound concentrations leads to inconsistent product quality.
2. Poor Bioavailability: Many nutraceuticals (e.g., curcumin, resveratrol) have low absorption, rapid metabolism, or poor stability, reducing their therapeutic effect.
3. Limited Clinical Evidence: Most claims are based on in-vitro or animal studies; well-designed human clinical trials are often lacking.
4. Regulatory Gaps: Regulations differ across countries, and many products enter the market without stringent safety or efficacy testing.

Advantages of nutraceuticals

- Improve health
- Delay aging
- Easily available and cheap
- Increase life expectancy
- Reduced side effects with desirable outcomes
- Holistic approach
- Provide Dietary supplement naturally
- It provides food or population with special needs eg. Dense food for the elderly

Disadvantages of nutraceutical

- Not subject to same testing and regulations as pharmaceuticals
- Majority not regulated by FDA in USA
- Bioavailability of nutrients is lower
- No regulatory definition
- The Nutraceuticals dose and quality are unclear
- One of the main drawbacks is the existence of adulteration brought on by a lack of pharmaceuticals quality control

The future of nutraceuticals

A majority of the world population is focused towards maintenance of proper health and in this context nutraceuticals play a vital role. Additionally the adverse effects related to drugs available in the market have increased their inclination to such products .

In global market presently a large number of nutraceuticals formulations are available with diverse bioactive ranging from vitamins to plant bioactive. With time the list of nutraceuticals products are enhancing based on supportive research where their consumption is linked to prevention of complex clinical conditions like cancer, diabetes, cardiovascular disease etc. The high consumer acceptance can be traced back to low health risks compared to synthetic drugs.

Besides toxicity profile of all nutraceuticals needs to be extensively evaluated which would help the manufacturing companies meet the regulatory requirements as well as ensure product safety. In a nutshell we can conclude that though nutraceuticals products have high acceptance rate, newer technological interventions and supportive scientific evidences are highly warranted to secure the future of such products and introduce them in healthcare practice.

Conclusion

Nutraceuticals are presently entering recognition as being salutary in coronary heart disease, obesity, diabetes, cancer, osteoporosis and other habitual and degenerative conditions similar as Parkinson's and Alzheimer's conditions. Attestations indicate that the mechanistic conduct of natural composites involve a wide array of natural processes, including activation of antioxidant defenses, signal transduction pathways, cell survival- associated gene expression, cell proliferation and isolation and preservation of mitochondrial integrity.

- It appears that these parcels play a pivotal part in the protection against the It's veritably imperative that the nutrients plant in numerous foods, fruits and vegetables are responsible for the well- proved health benefits. Recommended diurnal boluses of these nutraceuticals should be known by each consumer.

- The list of nutraceuticals being studied is changing continually and reflects ongoing exploration, request developments and consumer interest .

Declaration of Conflicting Interests

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