

REVIEW ARTICLE ON NUTRACUTICALS

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***Abstract** Nutraceuticals, a portmanteau of "nutrition" and "pharmaceuticals," are bioactive compounds derived from food sources that provide health benefits beyond basic nutritional value. In recent years, there has been a surge of interest in nutraceuticals due to their potential role in promoting human health and well-being. This abstract aims to provide an overview of nutraceuticals, including their definition, classification, and mechanisms of action.*

I Introduction

In recent years, there has been growing interest in the field of nutraceuticals, which represents the convergence of nutrition and pharmaceuticals. Nutraceuticals are bioactive compounds derived from food sources that provide health benefits beyond basic nutrition. They have gained significant attention due to their potential role in promoting human health, preventing disease, and improving overall well-being. With a diverse range of substances and mechanisms of action, nutraceuticals offer a promising avenue for bridging the gap between nutrition and medicine.

The term "nutraceutical" was coined by Dr. Stephen DeFelice in 1989, combining the words "nutrition" and "pharmaceuticals." It encompasses a broad spectrum of natural bioactive compounds found in foods, including vitamins, minerals, amino acids, fatty acids, fiber, and various plant-derived substances such as flavonoids and phytochemicals. Nutraceuticals can be consumed as part of a regular diet or formulated into dietary supplements, making them accessible to a wide range of individuals seeking to improve their health.

One of the distinguishing characteristics of nutraceuticals is their potential to provide additional health benefits beyond their basic nutritional value. These compounds are known to possess diverse physiological and biological activities, which can positively impact various body systems. For example, some nutraceuticals exhibit antioxidant properties, helping to neutralize harmful free

radicals and reduce oxidative stress, which is implicated in aging and chronic diseases. Others may possess anti-inflammatory effects, support immune function, enhance cognitive performance, or contribute to cardiovascular health.

Research on nutraceuticals has yielded promising results across various fields of health and wellness. Numerous studies have demonstrated their potential in reducing the risk of chronic diseases, including cardiovascular disease, diabetes, certain cancers, and neurodegenerative disorders. Additionally, nutraceuticals have shown efficacy in supporting cognitive function, gastrointestinal health, joint health, and overall vitality.

However, it is important to note that while nutraceuticals offer potential health benefits, they are not intended to replace a balanced diet or a healthy lifestyle. Rather, they should be regarded as complementary to a nutritious eating plan, regular physical activity, and proper medical care. Furthermore, the safety, quality, and efficacy of nutraceutical products vary, emphasizing the need for regulation and scientific scrutiny.

Classification

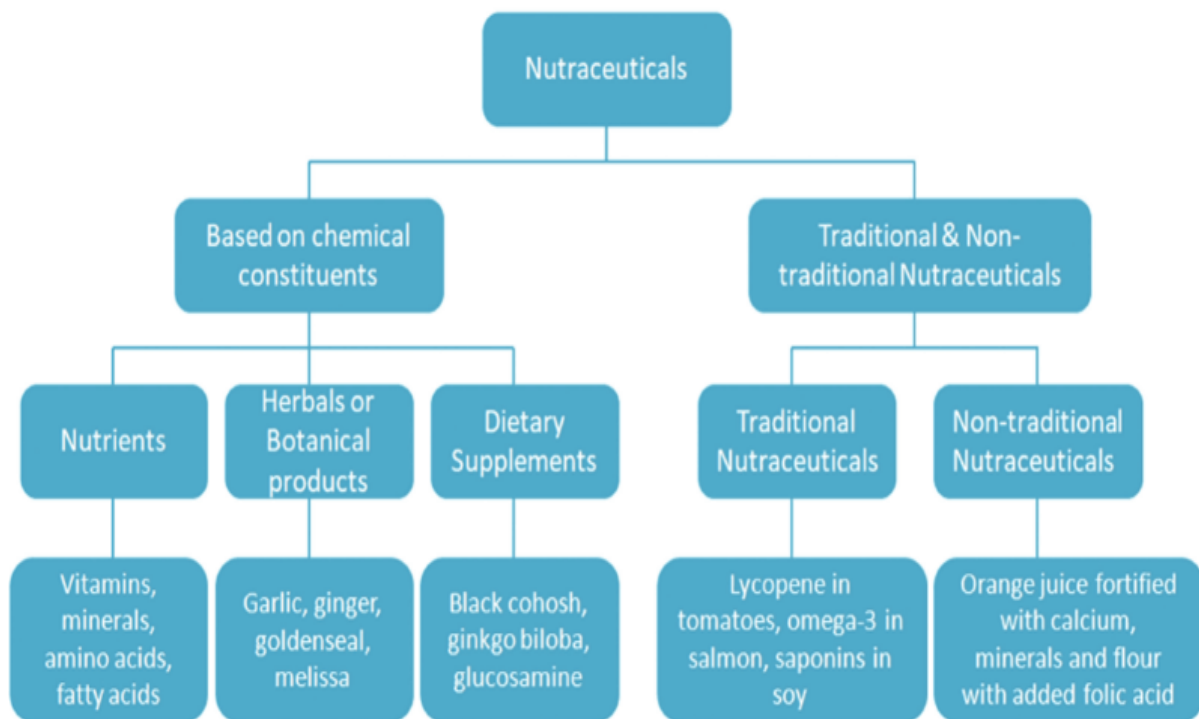


Fig. 1 Nutraceuticals Tree Chart

Nutraceuticals can be classified based on different criteria, including their source, chemical composition, and health benefits. Here are some common classifications of nutraceuticals:

1. **Functional Foods:** These are whole foods or fortified foods that contain bioactive compounds with specific health benefits beyond basic nutrition. Functional foods include ingredients such as probiotics, prebiotics, omega-3 fatty acids, fiber, and fortified foods enriched with vitamins and minerals.
2. **Dietary Supplements:** These are products that are intended to supplement the diet and provide concentrated sources of specific nutrients or bioactive compounds. Examples of dietary supplements include multivitamins, mineral supplements, herbal extracts, fish oil capsules, and other specialized formulations.
3. **Phytochemicals:** Phytochemicals are bioactive compounds found in plants that are known to have beneficial effects on human health. They include various subclasses such as polyphenols (e.g., flavonoids, resveratrol), carotenoids, glucosinolates, and phytosterols. Phytochemical-rich foods include fruits, vegetables, whole grains, herbs, and spices.
4. **Nutritional Supplements:** These are supplements that provide specific nutrients or combinations of nutrients to address specific nutritional deficiencies or support particular health conditions. Examples include calcium supplements for bone health, iron supplements for anemia, and vitamin D supplements for immune function.

II Nutraceutical in Diseases Prevention and Control

Nutraceuticals have been studied for their potential in supporting the management and prevention of various diseases. Here are some examples of diseases or conditions for which nutraceuticals have shown potential benefits:

1. **Cardiovascular Disease:** Nutraceuticals such as omega-3 fatty acids (found in fish oil), coenzyme Q10, resveratrol (found in red grapes and wine), and garlic extract have been studied for their potential to support cardiovascular health. They may help lower blood pressure, reduce

inflammation, improve lipid profiles, and promote overall heart health.

2. Diabetes: Certain nutraceuticals, such as chromium, alpha-lipoic acid, cinnamon extract, and berberine, have been investigated for their potential in managing blood sugar levels and improving insulin sensitivity in individuals with diabetes.
3. Cognitive Decline and Neurodegenerative Disorders: Nutraceuticals like omega-3 fatty acids, curcumin (found in turmeric), resveratrol, and green tea extract have been studied for their potential neuroprotective effects and their ability to support cognitive function and reduce the risk of neurodegenerative disorders such as Alzheimer's disease.
4. Inflammatory Conditions: Nutraceuticals with anti-inflammatory properties, such as omega-3 fatty acids, curcumin, ginger extract, and green tea extract, may help reduce inflammation and alleviate symptoms associated with conditions like arthritis, inflammatory bowel disease, asthma.
5. Gastrointestinal Disorders: Nutraceuticals like probiotics, prebiotics, and certain herbal extracts (e.g., peppermint oil, aloe vera) have shown potential in supporting gastrointestinal health, alleviating symptoms of conditions such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD).
6. Age-Related Macular Degeneration (AMD): Certain antioxidants, such as vitamins C and E, lutein, zeaxanthin, and omega-3 fatty acids, have been studied for their potential in reducing the risk and progression of AMD, a leading cause of vision loss in older adults.
7. Osteoporosis: Nutraceuticals like calcium, vitamin D, vitamin K, magnesium, and collagen peptides have been investigated for their potential in promoting bone health and reducing the risk of osteoporosis.



Fig . 2 Benefits of Nutraceutical

Nutraceuticals extend a range of implicit advantages for mortal health and well- being. While the special advantages may vary depending on the type of nutraceutical and individual health procurators, then are some common advantages associated with nutraceutical use –

1. **Nutritional Support:** Nutraceuticals provide essential nutrients, vitamins, minerals, and other bioactive compounds that may be lacking in a person's regular diet. They can help fill nutritional gaps and support overall health by ensuring adequate intake of key nutrients.
2. **Disease Prevention:** Many nutraceuticals possess antioxidant properties, which help protect cells from damage caused by harmful free radicals. By reducing oxidative stress, nutraceuticals may contribute to the prevention of chronic diseases such as cardiovascular disease, cancer, and neurodegenerative disorders.
3. **Immune System Support:** Certain nutraceuticals, such as vitamins C, D, and E, zinc, and probiotics, have been studied for their potential to support immune function. They may help strengthen the immune system, enhance defense against pathogens, and reduce the risk of

infections.

4. **Anti-Inflammatory Effects:** Inflammation is associated with various chronic diseases. Nutraceuticals like omega-3 fatty acids, curcumin, resveratrol, and ginger extract have shown anti-inflammatory properties and may help reduce inflammation in the body, potentially alleviating symptoms of conditions such as arthritis and inflammatory bowel disease.
5. **Cognitive Function and Brain Health:** Nutraceuticals such as omega-3 fatty acids, phosphatidylserine, and certain antioxidants have been investigated for their potential to support cognitive function and brain health. They may help improve memory, focus, and overall cognitive performance, and reduce the risk of age-related cognitive decline.
6. **Heart Health:** Some nutraceuticals, such as omega-3 fatty acids, coenzyme Q10, and garlic extract, have shown benefits for cardiovascular health. They may help lower blood pressure, reduce cholesterol levels, improve blood vessel function, and decrease the risk of heart disease.
7. **Gastrointestinal Health:** Nutraceuticals like probiotics and prebiotics support a healthy gut microbiota, which plays a crucial role in digestive health, nutrient absorption, and immune function. They may help alleviate symptoms of gastrointestinal disorders, promote regularity, and improve overall gut health.
8. **Sports Performance and Recovery:** Nutraceuticals like creatine, branched-chain amino acids (BCAAs), and beta-alanine have been studied for their potential to enhance athletic performance, increase muscle strength, and aid in post-exercise recovery.
9. **Skin Health:** Certain nutraceuticals, such as collagen peptides, antioxidants (e.g., vitamins C and E), and hyaluronic acid, have shown benefits for skin health. They may help maintain skin elasticity, reduce signs of aging, and support overall skin integrity.

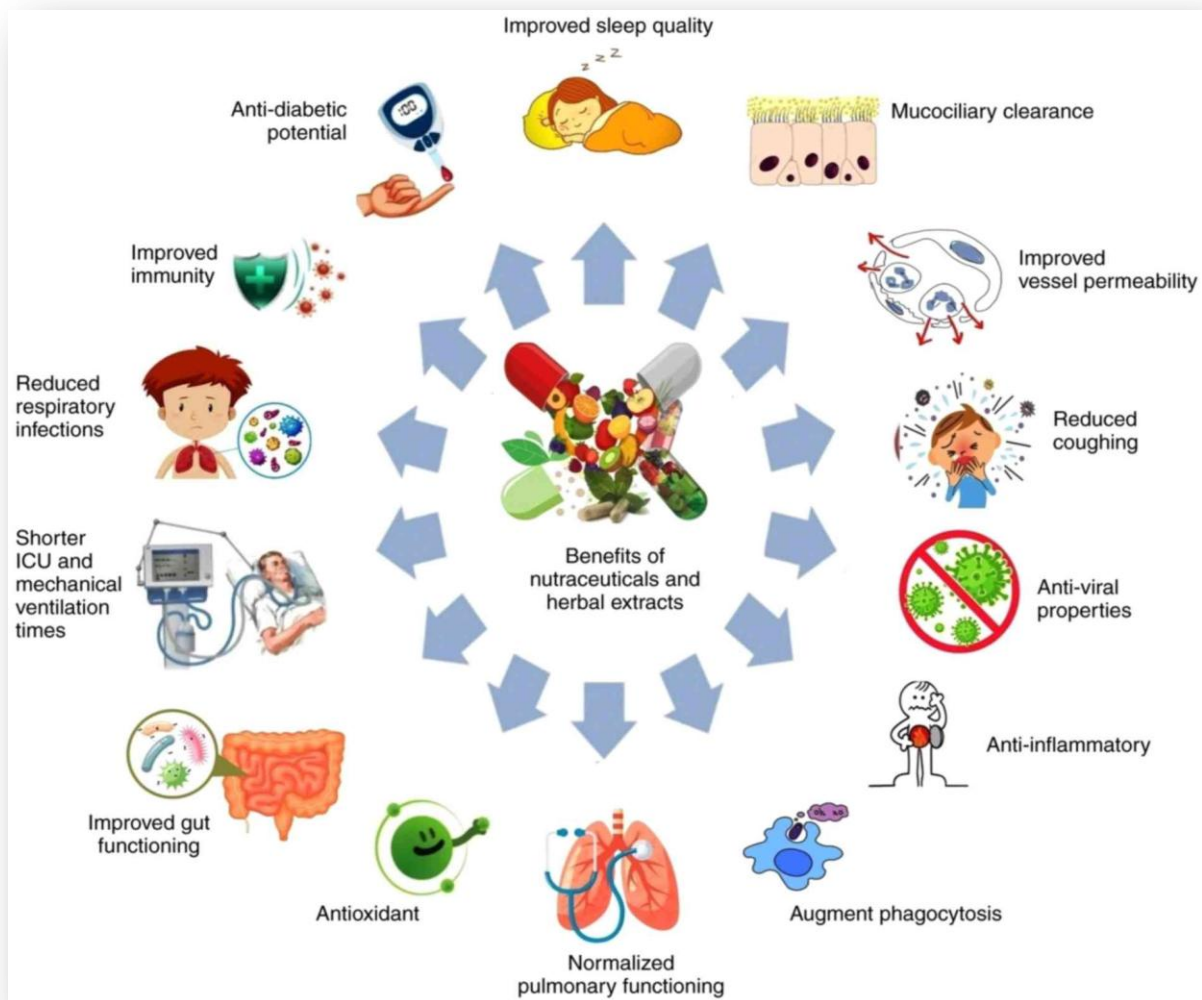


Fig. No. 3 Benefits of Nutraceuticals

III Mode of Action of Nutraceuticals

The mode of action of nutraceuticals can vary depending on the specific compound and its mechanism of action within the body. Here are some common modes of action for nutraceuticals:

1. Modulation of Gene Expression: Certain nutraceuticals can influence gene expression, affecting the activity of specific genes involved in various physiological processes. They may upregulate or downregulate the expression of genes related to inflammation, oxidative stress, or cellular signaling pathways. For example, resveratrol has been shown to activate sirtuin genes associated with longevity and cellular health.
2. Regulation of Cellular Signaling Pathways: Nutraceuticals can interact with cellular

signaling pathways, affecting processes like cell growth, differentiation, and apoptosis (cell death). They may modulate protein kinases, transcription factors, and other signaling molecules involved in regulating cell functions. For instance, curcumin has been found to modulate multiple signaling pathways, including those involved in inflammation and cancer development.

3. Enzyme Modulation: Nutraceuticals can influence the activity of enzymes within the body. They may inhibit or activate specific enzymes involved in metabolic pathways, such as those responsible for lipid metabolism, detoxification, or neurotransmitter synthesis. For example, omega-3 fatty acids have been shown to inhibit enzymes involved in inflammation and blood clotting.

IV Scope of Nutraceuticals

The scope of nutraceuticals in India is significant and continues to grow due to several factors:

Ayurvedic and Traditional Medicine: India has a rich heritage of Ayurveda, an ancient system of medicine that emphasizes the use of natural ingredients and herbal remedies for health and well-being. Nutraceuticals align well with Ayurvedic principles, and many traditional Indian herbs and formulations are considered nutraceuticals. This heritage provides a strong foundation for the development and acceptance of nutraceuticals in India.

Growing Health Consciousness: With increasing awareness about the importance of nutrition and preventive healthcare, there is a rising demand for products that promote wellness and support disease prevention. Nutraceuticals cater to this demand by offering natural, holistic solutions for maintaining health and enhancing well-being.

Large and Diverse Consumer Base: India has a large population with diverse nutritional needs and health concerns. Nutraceuticals offer a wide range of products that can address various health conditions and cater to different age groups, making them appealing to a broad consumer base.

Government Initiatives and Regulations: The Government of India has taken several initiatives to promote the nutraceutical industry. The Food Safety and Standards Authority of India (FSSAI) regulates the safety and quality standards for nutraceutical products. Additionally, the Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homeopathy (AYUSH) supports the

development and promotion of traditional Indian systems of medicine, including nutraceuticals.

Innovation and Research: India has a thriving research and development sector that focuses on nutraceuticals. Academic institutions, research organizations, and private companies are actively engaged in studying the efficacy, safety, and formulation of nutraceuticals. This fosters innovation and the development of new nutraceutical products that cater to specific health concerns.

Export Potential: India is a major exporter of nutraceutical products. The country's rich biodiversity and traditional knowledge of herbal remedies make it a valuable source of natural ingredients for nutraceutical formulations. Indian nutraceutical products are sought after globally, contributing to the growth and expansion of the industry.

Integration with Traditional Medicine Systems: Nutraceuticals in India often draw from traditional medicine systems like Ayurveda, Siddha, and Unani. This integration strengthens the cultural acceptance and usage of nutraceuticals in the country, as they are seen as part of a holistic approach to health and wellness.

V Conclusion

In conclusion, nutraceuticals represent a promising field that combines nutrition and pharmaceutical principles to promote health, prevent diseases, and enhance well-being. They offer a wide range of potential benefits, including nutritional support, disease prevention, immune system support, anti-inflammatory effects, cognitive function enhancement, cardiovascular health, gastrointestinal health, and more.

Nutraceuticals play a vital role in complementing conventional medical treatments and promoting personalized approaches to healthcare. They are part of the growing movement towards preventive medicine, focusing on maintaining health and addressing nutritional deficiencies before the onset of diseases.

The scope of nutraceuticals is vast and continually expanding. They have found a strong foothold in India, thanks to the country's traditional medicine systems, growing health consciousness, diverse consumer base, supportive government initiatives, and rich research and innovation landscape. India's nutraceutical industry is well-positioned to cater to the unique needs of its

population and contribute to the global nutraceutical market.

While nutraceuticals offer significant potential, it's important to approach their use with caution and consult healthcare professionals for personalized guidance. Further research and rigorous scientific investigation are needed to fully understand the mechanisms of action, optimal dosages, and potential interactions with other substances.

Overall, nutraceuticals present a promising avenue for improving health outcomes and promoting holistic well-being. As the field continues to evolve and new discoveries emerge, nutraceuticals are expected to play an increasingly significant role in preventive healthcare, personalized nutrition, and the pursuit of a healthier and more fulfilling life.

VI References

- 1.Kalra EK, Nutraceutical-definition and introduction. AAPS Pharm. Sci2003;(5): 2-3.
- 2.Nutraceuticals.Aboutscience.org.2007.http//does.google.com/viewer a&q-cachen2B
- 3.Zeisel SH. Regulation of "Nutraceuticals". Science 199; 285 185-186.
- 4.Schlimme and Meisel., Bioactive peptides derived from milk proteins structural physiological and analytical aspects DieNahrung 1995; (39): 1-20. –
- 5.Kastorini CM. Milionis HJ, Esposito K, Giugliano D, Goudevenos JA and Panagiotakos DB, The effect of Mediterranean diet on metabolic syndrome and its components A meta-analysis of 50 studies and 534.906 individuals. J. Am. Coll Cardiol, 2011;(57): 1299-1313.
- 6.Rajasekaran A, Sivagnanam G, and Xavier R, Nutraceuticals as therapeutic agents A Review. J. Pharm. Sci. Technol,2008: (1):55.
- 7.Dietry supplement health Education act (SHEA) Of 1994. Public Law 103-417, available form FDA
- 8.Fasano E, Serini S, Piccioni E, Innocenti I and Calviello G, Chemoprevention of lung pathologies by dietary n-3 polyunsaturated fatty acids. Curr. Med. Chem, 2010;(17): 3358-3376.
- 9.Miyashita K, Nishikawa S, Beppu F, Tsukui T, Abe M and Hosokawa M, The allenic carotenoid fucoxanthin, a novel mane nutraceutical from brown seaweeds, J. Sci. Food Agric, 2011;(91): 1166-1174.
- 10.Henrotin Y, Lambert C, Couchourel D, Ripoll C, and Chiotelli E, Nutraceuticals Do they represent a new era in the management of osteoarthntis? - A narrative review from the lessons taken with five products. OsCar, 2011;(19): 1-21

11. MacRedmond R, Singhera G, Attridge S, Bahzad M, Fava C, Lai Y, Hallstrand TS and Dorscheid DR, Conjugated linoleic acid improves airway hyper-reactivity in overweight mild asthmatics. *Clin. Exp. Allergy*, 2010;(40): 1071-1078.
12. Ganesan P, Noda K, Manabe Y, Ohkubo T, Tanaka Y, Maoka T, Sugawara T and Hirata T, Siphonaxanthin, a marine carotenoid from green algae, effectively induces apoptosis in human leukemia (HL-60) cells. *Biochimica et Biophysica Acta* 2010;(1810): 497-503.
13. Marotta F, Chui DH, Jain S, Polimeni A, Koike K, Zhou L, Lorenzetti A, Shimizu H and Yang H, Effect of a fermented nutraceutical on thioredoxin level and INF alpha signaling in cirrhotic patients. *J. Biol. Regul. Homeost. Agents*, 2011;(25): 37-45.
14. Kastoni C M, Milionis HJ, Esposito K, Giugliano D, Goudevenos J A and Panagiotakos DiB. The effect of Mediterranean diet on metabolic syndrome and its components A meta-analysis of 50 studies and 534,906 individuals. *J. Am. Coll Cardiol*, 2011;(57): 1299-1313.
15. Bulathsinghal P, Syrigos KN and Saif M W, Role of vitamin D in the prevention of pancreatic cancer. *J. Nutr. Metab*, 2010;(72): 13-65.
16. Gupta Kannappan R, Reuter S, Kim JH and Aggarwal BD Chemosensitization of tumors by resveratrol. *Ann. NY Acad. Sci*, 2011;(1215):150-160.
17. Berry RJ, Bailey L, Mulinare J and Bower C, Folic Acid Working Group, Fortification of flour with folic acid. *Food Nutr. Bull*, 2011;(31S):22-35.
18. IS. Ehrlich SD, (Willow bark), private practice specializing in complementary and alternative medicine. Phoenix, AZ. Review, VeriMed Healthcare Network 2008