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NEUTRACEUTICAL: A NUTRIENT RICH FOOD

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ABSTRACT :

Nutraceuticals are the nourishing components (**hybrid of nutrition and pharmaceuticals)** that are biologically active and possess capability for maintaining optimal health and benefits. These products play a significant role in human health care and its endurance, most importantly for the future therapeutic development. Nutraceuticals have received recognition due to their nutritional benefits along with therapeutic effects and safety profile. Nutraceuticals are globally growing in the field of services such as health care promotion, disease reduction, etc. Various drug nutraceutical interactions have also been elaborated with various examples in this review. Several patents on nutraceuticals in agricultural applications and in various diseases have been stated in the last section of review, which confirms the exponential growth of nutraceuticals' market value. Nutraceuticals have been used not only for nutrition but also as a support therapy for the prevention and treatment of various diseases, such as to reduce side effects of cancer chemotherapy and radiotherapy. Diverse novel nanoformulation approaches tend to overcome challenges involved in formulation development of nutraceuticals. Prior information on various interactions with drugs may help in preventing any deleterious effects of nutraceuticals products. Nanotechnology also leads to the generation of micronized dietary products and other nutraceutical supplements with improved health benefits. In this review article, the latest key findings (clinical studies) on nutraceuticals that show the therapeutic action of nutraceutical's bioactive molecules on various diseases have also been discussed.

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.[1] "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 ofchanging 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.[2]

- **Advantages of neutraceutical:**
  - Delay aging.
  - Easily available and cheap.
  - Improve helath.
  - Increase health value of our diet
- **Disadvantages of neutraceuticals :**
  - The bioavailability of neutraceuticals is low.
  - Unregulated products are created with only meeting the profit margins.
  - They are not subjected to testing and regulations same as pharmaceuticals.
  - They are not regulated by authority boards like FDA.

Physiological benefits of neutracetical

- ✓ Antidiabetics
- ✓ chronic inflammatory disease
- ✓ degenerative disease
- ✓ anticancer agent
- ✓ Anti- obese agent
- ✓ cardiovascular agents
- ✓ Immune booster
- ✓ degenerative disease

The Reasons for Shift Towards Nutraceuticals Are: [2][3] [4]

✓ Nutraceuticals cover most of the therapeutic areas, such as anti-arthritic, cold and cough, sleeping disorders, digestion and prevention of certain cancers, osteoporosis, blood pressure, cholesterol control, pain killers, depression and diabetes.

✓ Dissatisfied with pharmaceutical agents in promoting health, are turning to nutraceuticals to improve their health and prevent chronic disease.

✓ Health care provider recognize the fact that our heavily processed food supply coming from crops grown with chemical fertilizers, pesticides, herbicides, and often genetically modified seeds, lacks sufficient nutrients necessary for optimum Health.

✓ Nutraceuticals show an ample scope to flourish in future as therapeutic agents with preventive and curative properties.

✓ People who have chronic diseases and have found no solution in allopathic medicines.

✓ Nutraceuticals are quickly replacing pharmaceuticals in prevention and management of acute and chronic health problems.

- **Benifites of neutraceuticals :-**

Abbott
Horlicks Nutrition for growth
and development
Calcium, vitamin,
iodine, and protein
GlaxoSmithKline
Consumer Healthcare
ActiPlus Dahi,
CEREGROW,
MILO, Baby &
Me
Growth and
development immune
supplement
Antioxidants, vitamins,
minerals, and proteins
Nestlé
Soya Industries
Nutrela
Nutritious supplement Carbohydrate, proteins,
bers, vitamins
Ruchi
Amul Nutritious supplement Skimmed milk,
sucrose, carbohydrates,
minerals
Gujarat Co-operative
Milk Marketing
Federation
NutriFit Improve body
composition, boost
your energy
Carbohydrate, proteins,
bers, lipids, vitamins
minerals, etc.
Mother Dairy Fruit &
Vegetable
Yakult Probiotics, immunity
booster
Lactobacillus casei
Shirota
Yakult
(continued)

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aspects (Chau et□al. 2007; Chen et□al. 2006a, b; Sanguansri and Augustin 2006). Many research groups have developed production methods for pharmaceutical drug delivery systems. Recent technological advances that make use of proteins, lipids, and polysaccharides as additives have opened the door to new applications and functionalities for nanoparticle delivery systems (Acosta 2009). To depict the next generation of nanoparticle vehicles, it is essential to optimize as well as modify the properties of these nanoparticles to enhance the bioavailability of different ingredients.

Over the past decade, both in research and clinical setting, nanoparticulate phar- maceutical carriers have been used to enhance the in□vivo ef□ciency of many drugs. Surface modi□cation of pharmaceutical nanocarriers is generally done to control and enhance their biological properties, resulting in prolonged half-life and biodis- tribution as well as precise active or passive targeting. Additionally, these can be engineered as "multifunctional pharmaceutical nanocarriers," having multiple chemical moieties assembled on the surface of nanoparticles (Rolland 1993; Gregoriadis 1988; Müller 1991; Alonso 2004) or for pH- and temperature- dependent controlled release.

Nanocarriers possess one or more of the following set of desired properties (Bernkop-Schnurch and Walker 2001; van Vlerken and Amiji 2006):

Table 20.2 (continued)

Product	Category	Contents	Manufacturer
Quaker oats	Nutritious supplement	Salt, guar gum, calcium carbonate (thickener), vitamins, and minerals	Pepsi Co
Bournvita malt drink	Nutritious supplement	Malt extracts, cocoa, carbohydrates, emulsi□ers, vitamins, minerals, and salt	Mondelez
Nutrilite□– range of products	Essential supplement	All plant protein powder, calcium, co-enzymes, iron tablets, etc.	Amway
Dabur Glucose□– D	Energy supplement	Dextrose, vitamin D, calcium, phosphorous, and energy	Dabur India Ltd
Calcium Sandoz	Dietary supplement	Calcium lactate-gluconate, calcium	

carbonate, and calcium
Novartis
Herbalife protein
powder
Nutritious (protein)
supplement
Soy protein, plant-
based protein powder,
and fructose
Herbalife
International
Himalaya Pure
Herbs
Healthcare Medical
Equipment Personal
Care Sports
Pure herbs: organic
ashwagandha, amla,
neem, turmeric, etc.
Himalaya Drug
Company
Based on: Chauhan et□al. (2013) and Sharma et□al. (2019)
20 Recent Developments in□Nanocarrier-Based Nutraceuticals for□Therape

1. Prevent and treat chronic disease:

Nutraceuticals have a major role in preventing the onset of chronic diseases and the complications that can come with them. Some conditions that nutraceuticals address include type 2 diabetes, cardiovascular disease, gastrointestinal disorders, kidney disorders, obesity, and some cancers.

2. Improve function of immune system:

Popular nutraceuticals such as blueberries, green tea, amino acids, and garlic can all provide helpful antioxidants that boost the functioning of your immune system. This can be very beneficial at fighting against illnesses.

3. Reduce inflammation:

The presence of phytochemicals in nutraceuticals plays a huge role in both the prevention and reduction of inflammation in the body. They're able to reduce oxidative stress that's present in conditions such as asthma, osteoarthritis, rheumatoid arthritis, and autoimmune disorders.

4. Boost gut health:

Some nutraceuticals such as prebiotics, probiotics, and aloe vera can stimulate the production of good bacteria in your gut. They can also reinforce some of your gut defense mechanisms.

5. Slow down aging:

Because nutraceuticals do so many beneficial things for your health, it can reduce the risk of disease that decreases life longevity. Nutraceuticals such as soybeans and citrus fruits can promote the renewal of healthy cells and slow down the aging process.

6. Enhance athletic performance:

Oxidative stress and mitochondrial dysfunction can both occur when you do heavy amounts of exercise. Nutraceuticals can lead to better exercise performance and recovery by reducing these two things.

7. Manage psychological function:

Nutraceuticals like vitamins B and D, omega-3, magnesium, and iron can all improve cognitive functioning and reduce anxiety, stress, and depression. comes for women.

Product	Category	Content	Manufacturer
Amiriprsh [gold]	Good immunomodulator	Chyawanprash avaleha swarnbhasma and rasindur	Uappharma pvt.limited
Celestial heathtone	Immune booster	Dry fruit extract	Celestial biolabs Ltd.
Omega woman	Immune supplement	Antioxidants, vitamins and phytochemicals	Wassen surrey, U.K.
Coral calcium	Calcium supplement	Calcium and trace minerals	Natures answer, Hauppauge, NY,USA.
Grd	Nutrional supplement	Protiens,vitamin,minerals and carbohydrate.	Zydus cadila Ltd.ahmedabad,India.

NUTRACEUTICALS AND DISEASES:

1) Nutraceuticals against Alzheimer's disease (AD)[6] Alzheimer's disease (AD), also called senile dementia of the Alzheimer type (SDAT), primary degenerative dementia of the Alzheimer's type (PDDAT), or simply Alzheimer's, is the most common form of dementia. The various neutraceuticals_which are used to cure Alzheimer's disease is as follow:- Antioxidants Antioxidants are very essential in the treatment of almost all diseases because most chronic diseases carry with them a great pact of oxidative stress. Oxidative stress plays a chief job in neurodegenerative diseases such as

Alzheimer's disease (AD), Parkinson's disease (PD), and Huntington's disease (HD). Oxidative stress is accelerated by the ageing process along with lack of dietary antioxidants. A huge number of studies have found an association between high dietary antioxidant intake and a decreased risk of AD which is very imperative because preventing a disease is significantly easier than treating it. So prevention is key and researches suggest that preventing AD is actually not that complex. Treatment with antioxidants is a hopeful loom for slowing disease progression. There is an ongoing study with vitamin E to see if it really slows AD progression. An assessment was done by isolating the patients into two groups one is treated with 1000 IU of vitamin E and at least 5 mg of donepezil (Aricept) and the other who did not take any vitamin E. Consequences showed that those taking the permutation therapy declined at a drastically lower

rate. Food utilization studies have had similar outcomes. There are plentiful antioxidants in food, you get a surplus of them – everything from flavonoids to well known antioxidants like vitamin E and vitamin C.

2. Cardiovascular diseases:[7]

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 CVD**.**

3. Obesity:[8]

Obesity is a composite condition, with serious social and psychological dimensions, affecting almost all ages and socioeconomic groups. The worldwide subsistence of obesity nearly doubled between 1980 and 2008. According to country estimates for 2008, over 50% of both men and women in the WHO European Region were overweight, and roughly 23% of women and 20% of men were obese.Given the worldwide increase in obesity and its health consequences, efficient strategies for its prevention and treatment are important. It has been recommended thatweight reduction programs focus on achieving a modest weight loss of 7–10% of the initial weight Obesity arises from an energy imbalance whereby energy intake exceeds energy expenses. Dealing with obesity — by either prevention or treatment — requires alteration of one or both mechanism of energy balance. Approaches to weight management (including a functional food approach) therefore can target multiple aspects of the energy balance systems: food intake, energy expenditure, and energy storage.

Nutraceuticals have been emerged as an substitute to current medicines and have proven health benefits.

4. Parkinson's disease:[9]

Parkinson’s disease is a brain disorder that results from nerve damage in certain regions of the brain causing muscle rigidity, shaking, and difficult walking **]**typically happening in mid to late adult life. Canadian researchers indicated that vitamin E in food may be protective against Parkinson's disease.**]**Creatine appeared to modify Parkinson’s disease features as measured by a decline in the clinical signs. Researchers have also studied glutathione to conclude its effect on nerve and its power as an antioxidant. The suitable long-term dosing, side-effects and the majority effective method of administration are not yet clear. Nutritional supplements have shown some capable results in preliminary studies, it is important to remember that there is not adequate scientific data to recommend them for Parkinson's disease at present. The patients should be cautioned that over-the counter medications do have side effects and interactions with other drugs and are also exclusive.

***5.*Nutraceuticals in Ophthalmic Disorders[10][11]**

Age related Macular Degeneration (A.M.D) may lead to fatal effects like blindness which can be prevented by the use of vitamins and other components like lutein, n-3 fatty acid and zeaxanthin. Apart from this certain polyphenolic flavonoids, carotenoids are strong antioxidants can prevent the age related macular degeneration . are also very effective against the A.M.D. Astaxanthin a carotenoid found in sea animals like from shrimps, salmons, and sea bream has potent activity in opthalmic problems. It finds from the marine

***6.* Nutraceuticals used in Cancer Therapy[12][13]**

Complexity in cancer treatment today is mainly due to side effects of existing therapeutics and emergence of drug resistance. A world wide survey reports that in 2020, 15 million new cancer incidences would be found leading to about 50 % rise in cancer population. Cancer treatment till date mostly revolves round chemotherapy, radiation therapy and surgery. But a healthy life style with an antioxidant rich diet can be the best precautionary measure against cancer. Nutraceuticals can be the perfect candidates to fill the existing gap in cancer treatment as they have limited side effects and are often enriched with compounds/ plant extracts which can evade resistance.

Recent research has shown that carotenoids like lycopene has reported potency in different cancers and so is an essential component of many nutraceuticals formulations [[14]. Nutraceuticals of plant extracts rich in biochanin, isoflavones, tannins and plant bioacrtives like curcumin, gallic acid, caffiec acid portray remarkable potency against diverse cancers [15][16]. β carotene & pectin containing nutraceuticals are found to be effective in prostrate cancers linked to their free radical scavenging activity [17].

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 neutraceuticals formulations are available with diverse bioactives ranging from vitamins to plant bioactives. 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.

Customers are showing keen interest in different types of neutraceuticals for relieving stress, boosting energies, mental alertness, preventative metabolic disorders, combating oxidative stress etc. To compete & sustain in the global market neutraceuticals companies are targeting to innovate new products aided by advertisement in print and web media to attract the customer pool Countries like U.S.A, Germany, China, and U.K. are making huge investments in neutraceutical research as they eye high profits in future years which would be dominated by critical issues like antibiotic resistance where these products may only stand out as facile solutions. Currently in developed countries like U.S.A over 50% of the population depend on nutraceuticals for maintenance of day to day health. Technological advancements like neutrigenomics, real time cellular imaging techniques are now being extensively studied to develop newer neutraceuticals. Such technological interventions in nutraceutical formulation development and allied food industry would have a definite positive impact in health care management. Progress in encapsulation technology has made provisions for multiple ingredients to be encapsulated in a single capsule.

Liquid Encapsulation Technology in neutraceutical formulations allows pellets, oils, granules and powders to be incorporated in hard gelatin capsule. This technology also has the potential to be extended for isolation and purification of neutraceuticals. Different new delivery strategies like nanoparticles, phytosomes, liposomes, lipid nanoparticles are now gradually emerging to shape the future of next-gen nutraceuticals with high degree of efficacy. Enzymes represent a unique domain of nutraceuticals with immense potential for future use. Enzyme oriented nutraceuticals supported by newer technologies like nanotechnology would definitely occupy a considerable market share in times ahead. Unique and advanced characterization methods with the application of the genomics, proteomics and the metabolomics are to be explored for betterment of nutraceuticals products. However detailed pharmacokinetics studies and pre-clinical/ clinical evaluations of such products need to be done to ensure their biological efficacy, predict their mechanism of action and confirm their health-care related claims. 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.

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