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An Overview of Nutraceuticals: A Review

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Abstract
Nutraceuticals are nutritive supplements, consumed to enrich health, suspend senescence, avertinfections and ailments, and support the proper functioning of the human body. Presently, nutraceuticals are achievingconsiderableconsideration due to their nutritional and therapeutic abilities. Based on their sources, they are categorized into diverse categories. Herbal nutraceutical helps in keeping health and stimulating optimal longevity and quality of life. Various studies undertaken so far have shown encouraging results of nutraceuticals to treat numerous diseases, such as cancer, neurodegenerative disorders, cardiovascular diseases, etc. In the present review, an overview of nutraceuticals (carbohydrates, lipids, edible flowers, alkaloids, medicinal plants, etc.) and their role in health benefits, has been discussed.

Keywords: *Nutraceuticals, classification, traditional and non-traditional Nutraceuticals, fortified and recombinant Nutraceuticals.*

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I. Introduction

Over the past previous years, rapid increase in industrialization and modifications in the life style of manhasgiven rise to fast-food culture with more instantaneous and flavorsome meals which has resulted in decline in the quality of nutrients in the food. This busy and fast moving life style has lead to many health risks like diabetes, obesity, vascular diseases and severe immune dysfunction (Prabu et al. 2012). In order to improve the physical health and to fight against the day to day challenges such as stress, a new namecalledNutraceuticals in in vogue. Nutraceuticals are the pharmaceutical products that possess both nutritional as well as the medicinal value (Chanda et al. 2019).The term "Nutraceutical" was coined by Dr. Stephen DeFelice, Chairman of the Foundation for Innovation in Medicine (Ahmad et al. 2013), and is a blend of two words'nutrition' and 'pharmaceutical'. Nutraceuticals are composed of nutritious ingredients such as vitamins, minerals, proteins, fibers, probiotics, amino acids etc. and thus having both nutritional as well as medicinal value.

From the very beginning, our ancestors used the extract of various natural things in order to make medicine (Gupta et al. 2010). About 2500 years ago, Hippocrates (460-377BC), the father of modern medicine found the relation of food in the treatment of various disorders and he formerly said, "Let food be thy medicine and medicine be thy food" (Yapijakis 2009). Nowadays, people are very much aware of the chemicals present in the medication and their side effects, and changing their choices from consuming medicines which have harmful side effects to the natural products which are giving right nutrition to the body. This gave rise to the growth of nutraceutical markets in U.S, Europe, and APAC region. These are marketed in concentrated forms as pills, capsules, powders and tinctures etc. (Mazza 1998; Stephen 1998).This growth is also shown in the Indian markets.The people of northeast region use their food as medicine(Chandaet al.2019). Garlic, onion, ginger, turmeric arethe most widely used natural health products which are considered as food, spice and medicine by Ayurveda (Tiwari and Chanda 2011). These Natural Health Products are considered as a functional food, dietary supplements having naturally occurring bio active compounds that increase the general immune system.According to Chanda et al. 2019 there are examples of herbs and plants that are used as food as well as medicine in order to boost the immune system and used in many infections or illnesses, some examples includea traditional Chinese herb *Astragalusmembranaceus*whichis aninfluential immune enhancer antioxidantthatalso showshepatoprotective(Zhao et al. 1990) anti diabetic (Agyemang et al. 2013) and anticancer activity (Wu et al. 2017). Another traditional plant *Puerariamirifica* of Thailand and Myanmar has been used for decades for gynecological conditions such as fertility, menopausal and menstrual problems (Awuchi 2019). In Ayurveda three important herbs, namely, *Terminaliabellerica* (Combretaceae), *Terminaliachebula* (Combretaceae), and *Emblicaofficinalis* (Phyllanthaceae) are combined to form Triphala,avaluable nutritive tonic which is important for almost all body organs especially skin, liver, eyes, digestive and respiratory system (Peterson et al. 2017).

Classification of Nutraceuticals

Nutraceuticals on the basis of different characteristics, can be classified into different categories (Rathore et al. 2008):

a. Nutraceuticals based on their food source.
b. Nutraceuticalsbasedontheir action of mechanism.
c. Nutraceuticalsbasedontheir chemical nature.
d. Nutraceuticals based on their higher contents in specific food items.

Based on food available in the market, nutraceuticals are categorized as (Chaudhari et al. 2017)-

a. Traditional Nutraceuticals
b. Non- Traditional Nutraceuticals
c. Commercial Nutraceuticals

Traditional Nutraceuticals: These are simply natural products with no changes to the actual foodstuff (Borkar et al. 2015). Some fruits, vegetables, grains, dairy and meat products containing different natural components that bring benefits further than basic nutrition, such as lycopene in tomatoes, omega-3 fatty acids in salmon (Gupta et al. 2010). Different types of traditional nutraceuticals (Chaudhari et al. 2017) are as follows:

(I) Chemical constituents (II) Probiotic microorganisms (III) Prebiotic (IV) Nutraceutical enzymes

(I) Chemical constituents: They are further of the following types:

(a) Nutrients (b) Herbals (c) Phytochemicals

(a) Nutrients are the substances with conventional nutritional functions such as vitamins, minerals, amino acids and fatty acids. For example, Vitamin A is essential in the treatment of certain skin disorders, Vitamin K is essential for blood clotting, whereas fatty acids inclined the whole inflammatory response and brain function also reducing cholesterol in the arteries (Chanda et al. 2019).

(b) Herbals/Botanical products are in the form of extracts or concentrates.Forexample, Alovera gel dilates the capillaries and is having wound healing properties. Echinacea helps in the treatment of symptoms of cold and flu. Gingko helps in the treatment of post thrombotic syndrome(Tyler and Foster 1996).

c) Phytochemicals are majorly classified on the basis of their Phytochemicals properties. Carotenoids (isoprenoids) are present in vegetables and help in improving the immune system, non-carotenoids are present in legumes, grains and palm oil and help in removing the cholesterol and are anticarcinogenic. Phenolic acids are present in citrus fruits and red wineand have an antioxidant, anticancer and antitumouractivity(Chanda et al. 2019). Flavonoids present in the plants help in the prevention of different diseases like cancer, diabetes, heart diseases, and kidney problem (Ehrlich 2009).

(II) Probiotic microorganisms: The word probiotic is a Greek phrase 'pro bios' which means 'for life'.Probiotics act as immunity enhancers and reduce the risk of different metabolic diseases like obesity, hypertension, cancer and cardiovascular diseases (Roy et al., 2018). Traditionallydefined as "live microorganisms which when administered in adequate amounts confer health benefits to the host" and is also known as the friendly microorganism. The bacteria of genus Bifidobacterium, Lactobacillus, and Streptococcus are better known as probiotic bacteria. This is an important source of antioxidant and helps in reducing oxidative stress.

(III) Prebiotic: A prebiotic is "a selectively fermented ingredient that allows specific changes, both in the composition and/or activity in the gastrointestinal microflora that confers benefits upon host well-being and health" (Roberfroid, 2007).The food component mainly food oligosaccharides and polysaccharides show prebiotic activity. Inulin is a prebiotic obtained from the roots of plants such as chicory, Jerusalem artichoke, and dandelions, broadly used in processed foods (Montrose&Floch 2005).

(IV) Nutraceutical enzymes: Plants, animals and microbesare the sources of nutraceuticalenzymes. These enzymes are very important for our bodies to get it functioningproperly(Chaudhari et al. 2017). The health conditions like GIT, constipation, diarrhea and even diabetes could be treated by adding these enzyme supplements to the diet.

Non-Traditional Nutraceuticals: These are the artificial products made with some changes to the actual foodstuffwiththeaid of biotechnology, in order to increase nutrient content. Certain crops like rice and broccoli are biotechnologically designed crops rich in β-carotene and vitamins, respectively. They are arranged into two different categories:

(i) Fortified nutraceuticals
(ii) Recombinant nutraceuticals

i) Fortified nutraceuticals: The addition of well compatible nutrients with respect to the main ingredients by using agricultural breeding are included in these type of nutraceuticals. Some of the examples are-milk fortified with cholecalciferol used in the deficiency of vitamin D, cereals added with minerals, flour fortified with calcium, iron, and folic acid (Casey et al. 2010).

ii) Recombinant nutraceuticals: Extraction of bioactive components and the production of energy giving foods (cheese, yoghurt, bread, fermented starch) by enzymatic technology and by the application of biotechnology and genetic engineering(Singh & Sinha 2012). Gold kiwifruit rich in high level of ascorbic acid, carotenoids, lutein and zeaxanthin is also genetically modified (Beck et al. 2011).

Commercial Nutraceuticals: In this current scenario, consumers are much aware of the importance of healthy diet and lifestyle. This awareness increased the demand for nutraceutical supplements. Most of the pharmaceutical companies are currently trying to producenutraceuticalsas there is definitely a very massive and rising market. Anti-arthritic, cold and cough, sleeping disorders, digestion and prevention of certain cancers, osteoporosis, blood pressure, cholesterol control, pain killers, depression and diabetes are some of the therapeutic areas covered bynutraceuticals (Chaudhari et al. 2017). Some of this are-

(i) Dietary supplements: The term defined, in the US, the Dietary Supplement Health and Education Act (DSHEA) of 1994: as "A dietary supplement is a product taken by mouth that contains a "dietary ingredient" intended to supplement the diet (Chaudhari et al. 2017). The dietary ingredient is that which increases the nutritional evaluation of the food. Vitamins, minerals co-enzyme Q are some of the dietary ingredients. These supplements can be found in the form of capsules, pills, powders, tablets, softgel capsules in the markets. In developing countries like China, Brazil, India, demand of these supplements is immensely in growth, and in developed countries it has already kept its place (Norman et al. 2003).

(ii) Functional Food: The functional food is any food or food component that possesses the ability to provide valuable health benefits beyond the basic fundamental nutrition (Spano 2010). Some examples of functional food (legumes) like kidney beans, split beans, chickpeas, lentils and soybeans have profound antioxidant value and show a protective effect against cardiovascular diseases and diabetes (Preuss 2009 ;Thompson et al. 2012). Even chocolate, is also the type of functional food which is the richest source of proteins, calcium, iron, magnesium and riboflavin (Rao et al. 1999; Cooper et al. 2008).

(iii) Medicinal Food: These are the specific category of therapeutic agents that are proposed for managing distinctive nutritional requirements of a particular disease, administered under the supervision of a physician (Rajasekaran et al. 2008). In some medical conditions like impaired ingestion, digestion, absorption, they are prescribed by physicians and are also used in metabolism of traditional foods like phenylketonuria, coeliac disease and lactose intolerance (Borkar et al. 2015).

(IV) Pharmaceuticals: Nutraceuticals are pharmaceutical products having bioactive phytochemical or zoolochemical agents which are used in enhancing health in dosages and is going beyond from normal foods today.

Current Nutraceutical Scenario:

In today's world, the chronic lifestyle diseases arespreadingat drastic speed, nutraceuticals established themselves as solution to this chronic health issue. The global nutraceuticals market, from the last two decades shown notable growth rates and nowadays, has reached a multibillion dollar industry (Borkar et al. 2015).This growth has also seen in Nutraceutical industry in India. As India is rich in world class R & D facilities, experienced human resources and wide-ranging raw material-aspects give our country a foremost position (Gupta et al. 2013). In India the modern- day nutraceutical is inspired by the prevalence of Ayurveda, the ancient Indian medicinal system.From the very beginning, Ayurveda, endorsed the use of chyavanprash, and botanicals like ashwagandha, Triphalaetc, having fortified ingredients meant to improve or maintain the overall health andimmunityof an individual (Fernandes et al. 2019). As immunity became an emergency during this COVID-19 era,almosteveryonebecameirked and started investing in immunity building treatments that were herbal or natural. So in order to boost the immunity, many famous brands like Delhi-NCR based milk supplier Mother Dairy launched haldidhoodh or turmeric milk. There are also combo meals, with all the key ingredients like broccoli, spinach, bell peppers, garlic, dark chocolate, lime, parsley, cinnamon, etc in vogue these days. The market is thriving with more new products being launched every single day (Dr. Pragya Khanna,Nutraceutical Conundrum: A New Challenge, Early times Newspaper, 8/31/2020).Besides this, GlaxoSmithKline consumer healthcare, Dabur India, Cadila Health care, EID Parry's, Zandu Pharmaceuticals, Himalaya Herbal Healthcare, Amway, Sami labs, Elder pharmaceuticals and Ranbaxy are some of the major companies marketing nutraceuticals in India

Challenges and Opportunities:

A huge number ofchallenges in the growth of nutraceuticals are still facedbyIndia, due to the lack of awareness among the Indian consumers about the use and ability of conventional nutraceutical ingredients. Methods for their handling and measurement are lacking as most of the bioactive phytochemicals are still under investigation (Borkar et al. 2015). Challenges are also faced by the Government regulatory bodies in this new category of health products. The safety and efficiency of nutraceuticals needs further research. There is often

confusion in the field of nutraceuticals and functional foods, as it is lumped together with the field of biotechnology and genetic modification (Ligade 2013; Gupta et al. 2013).

II. Conclusion:

Nutraceuticals are presently receiving recognition due to their active role in many health issues like obesity, diabetes, and digestion problems and in other chronic illness. Although in many instances, preference is given to natural products over the chemical therapy. However, there is a bright future in this new field of health products.Awareness must be needed about these products to the Indian Masses.

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