



NUTRACEUTICALS: SCOPE AND ADVANCES IN MEDICINE AND HEALTH

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Abstract: Free radicals result in oxidative stress that deregulates the cellular and metabolic functions. Phytochemicals with antioxidant property are of great interest due to their beneficial effects on human health as they offer protection against metabolic dysfunction, gastro-duodenal pathogenesis, premature aging, inflammation, rheumatoid arthritis, atherosclerosis, cancer, neuro-degenerative and cardiovascular diseases. Nutritional therapy and phyto-therapy have emerged as new concepts of health aid in recent years. Strong recommendations for consumption of nutraceuticals from plant origin have become progressively popular to improve health, and to prevent and treat diseases. Nutraceuticals are "naturally derived bioactive compounds that are found in foods, dietary supplements and herbal products, and have health promoting, disease preventing and medicinal properties." Plant derived Nutraceuticals/functional foods have received considerable attention because of their presumed safety and potential nutritional and therapeutic effects.

KEYWORDS:- Nutraceutical, antioxidants, Health, probiotics

1. INTRODUCTION

Nutraceuticals (often referred to as health foods or functional foods) are natural bioactive, chemical compounds that have health promoting, disease preventing or medicinal properties. The term 'nutraceutical' was coined in 1979 by Stephen DeFelice, founder and chairman of the Foundation for Innovation in Medicine located in Cranford, New Jersey. It is defined as 'a food or part of food, which provides medical or health benefits, including the prevention and treatment of disease'. Nutraceuticals may range from isolated nutrients, herbal products, dietary supplements and diets to genetically engineered "designer" foods and processed products such as cereals, soups and beverages¹.

The food products used as nutraceuticals contain antioxidants, prebiotics, probiotics, omega-3-fatty acids and certain dietary fibres.

Antioxidants

Antioxidants are the compounds which retard or prevent oxidation. The body defence system against oxidative damage consists of enzymes such as superoxide dismutase, glutathione peroxidase, catalase and reducing agents such as glutathione, ascorbic acid and iron. Naturally occurring antioxidants of therapeutic use include superoxide dismutase, tocopherols, ascorbic acid, carotenoids, adenosine transferrin, lactoferrin and plant pigments like defroxamine².

Probiotics

Probiotics are the living microorganisms which improve the intestinal microbial balance. Eg: Lactobacillus species such as lactobacillus

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acidophyllus, Bifidobacterium etc² 'Probiotics' mean 'for life' and are defined as live microorganisms, which when consumed in adequate amounts, confer a health effect on the host. They are friendly bacteria that promote healthy digestion and absorption of some nutrients. They act to crowd out pathogens, such as yeasts, other bacteria and viruses that may otherwise cause disease and develop a mutually advantageous symbiosis with the human gastrointestinal tract. They have an antimicrobial effect through modifying the microflora, preventing adhesion of pathogens to the intestinal epithelium, competing for nutrients necessary for pathogen survival, producing an antitoxin effect and reversing some of the consequences of infection on the

intestinal epithelium, such as secretory changes and neutrophil migration. Probiotics can cure lactose intolerance by the production of the specific enzyme (β -galactosidase) that can hydrolyze the offending lactose into its component sugars³.

Prebiotics

Prebiotics are the substances, which reach the colon in intact form i.e. without getting acted upon by the gastric pH and digestive acids. These prebiotics selectively promote the growth of colonic probiotic bacteria, hence they act as fertilizers for these symbiotic bacteria. Eg: Inulin, a poly fructose obtained from raw chicory (*Cichorium intybus*).

Botanical name & Family	Common name	Health Benefits	Form of use
<i>Emblica officinalis</i> Euphorbiaceae	Amla	Rich source of vitamin C, Antiscorbutic	Fresh or dried fruits
<i>Allium sativum</i> Liliaceae	Garlic	Antibacterial, antifungal, hypoglycemic, fibrinolytic, Cholesterol and triglyceride lowering effects	Spice, juice, cold infusions, tincture
<i>Panax ginseng</i> <i>Panax quinquefolium</i> Araliaceae	Ginseng	CNS stimulating, sedative, tranquilizing, tonic, antifatigue, hypotensive, hypertensive, improving stamina and concentration	Powdered root or leaves alone or in combination of teas, capsules, tablets, liquid extracts, and instant tea
<i>Zingiber officinale</i> Zingiberaceae	Ginger	Indigestion, motion sickness, nausea, antioxidant, cholesterol control	Fresh or dried root, capsule, tablets, tinctures
<i>Withania somnifera</i> Solanaceae	Ashwagandha	Stress, insomnia, cataract prevention	Root powder, standardized extracts, tinctures

<i>Moringa oleifera</i> Moringaceae	Moringa	antimicrobial, antiviral, hepatoprotective, anticancer, antiseptic and in treating rheumatism, skin diseases, asthma and venomous bites	tree's bark, roots, fruit, flowers, leaves, seeds, and gum
<i>Curcuma longa</i> Zingiberaceae	Turmeric	Reducing inflammation, indigestion, antioxidant, liver problem	Dried root, whole, powdered
Ginkgo biloba Ginggoaceae	Ginkgo	Age-related memory, loss, fatigue, tinnitus, anti-arthritis, improving microcirculation	Dried leaf, tea
<i>Foeniculum vulgare</i> Umbelliferae	Fennel	Stomach bloating, stimulant, digestive spasms, catarrh aphrodisiac, galactagogue	Whole seed, capsules, tinctures
<i>Silybum marianum</i> Asteraceae	Milk thistle	Liver disorders, anti-oxidant lactation problems,	Whole or powdered seed, capsules, tablets, tinctures

Polyunsaturated fatty acids (PUFA)

The natural vegetable oil and marine animal oils containing polyunsaturated fatty acids belonging to linoleic group (Omega-6-type and Omega-3-type), help to reduce cholesterol formation/deposition and prevent thromboxane formation and thus useful as preventive measure for atherosclerosis. Eg: Safflower oil, corn oil, soybean oil, mustard oil and marine fishes such as salmon, tuna, mackerel, herrings etc.

Dietary Fibres

Dietary fibres are used in health food products for the normalization of intestinal transit. They have dual effect on intestinal transit. This effect is on bulk of the faeces, which is often increased in substantial proportions, this action takes place with insoluble fibres. The other effect is on duration of transit, which get normalized around 48 hours. Long transit get

shortened and short transit get lengthened. Soluble fibres are present in oats, dried beans,

Obesity

A blend of glucomannan, chitosan, fenugreek, G sylvestre, and vitamin C in the dietary supplements significantly reduced body weight and promoted fat loss in obese individuals. Nutraceutical interventions are currently being investigated on a large-scale basis as potential treatments for obesity and weight management. Nutraceuticals like conjugated linoleic acid (CLA), capsaicin, *Momordica Charantia (MC)* and Psyllium fiber possess potential antiobese properties.

Diabetes

Diet therapy is the cornerstone for the management of gestational diabetes mellitus. Although there is wide spread use of herbal dietary supplements that are believed to benefit type 2 diabetes mellitus, few have been proven to do so in properly designed randomized trials. Isoflavones are Phytoestrogens; they have a structural/functional similarity to human estrogen and have been consumed by humans world-wide. A high isoflavone intake (20–100mg/day) is associated with lower incidence and mortality rate of type II diabetes, heart disease, osteoporosis and certain cancers. Omega-3 fatty acids have been suggested to reduce glucose tolerance in patients predisposed to diabetes. Docosahexaenoic acid modulates insulin resistance and is also vital for neurovascular development. Dietary fibers from psyllium have been used extensively both as pharmacological supplements, food ingredients, in processed food to aid weight reduction, for glucose control in diabetic patients and to reduce lipid levels in hyperlipidemia. Good magnesium status reduces diabetes risk and improves insulin sensitivity; chromium picolinate, calcium and vitamin D appear to promote insulin sensitivity

and improve glycemic control in some diabetics; extracts of bitter melon and of cinnamon have the potential to treat and possibly prevent diabetes.

SAFETY AND EFFICACY

Many nutraceuticals are being used as alternatives for both nutrition and medicine. A substantial number of these products make illegal drug claims without regulation and proper data to support their safety and efficacy. Safety of a nutraceutical product is often easier to establish than efficacy. Studies that test doses of nutraceutical several fold greater than the intended recommended dose help to establish toxicity data. Evidence of efficacy is generally provided by studies that document the pharmaceutical, pharmacokinetic, and pharmacodynamic characteristics of a compound. Since the market for nutraceuticals is booming, many products are available that have not been tested for either safety or efficacy. A simple test of a quality nutraceutical product may be to ask for research data (peer reviewed and published) which support the product.⁴ Some time they also cause harmful effect as seen with ephedrine, a widely used botanical ingredient in weight-loss products. Now a days people are more conscious about their health and these products offer the promised health benefits. But danger is associated with some product due to lack of solid information about interaction and side effect.⁵

WORLD MARKET⁶

The US market

As we have seen, US is the largest nutraceutical market and this is probably due to cultural as well as regulating factors, US consumers have a long history of taking food supplements, and the regulation on claim and

new product commercialization is rather permissive. It is forecasted that the market will double over the next five years. In the US, drinks, breakfast cereals, sports foods and food supplements are growing at a rapid 12,3% rate for a total market of some US\$ 22 billions. While some large food corporations, such as Kellogg's, General Mills or Procter & Gamble, are at the forefront of nutrition research, many are tending to approach the nutraceutical sector as a marketing issue rather than from the point of view of innovation.

Asiatic market

Faced with a large elderly population and dotted of a strong domestic phytotherapy tradition and expertise in bio products. Japan was the first country to recognize and regulate functional food. It is named Food for Specific Health Use (FOSHU) and it was founded in the early 1980s. Japan is the most advanced market with a flexible regulatory environment. Today it is worth some \$12 billions for nutraceuticals and food supplements combined.

There have been about 1,400 functional foods and beverages launched in Japan since 1988, with leading ingredients including oligosaccharides, dietary fibre and calcium.

European market

In Europe, due to a much more restrictive regulatory climate and a lack of harmonization, the functional food sector remains a «hit or miss» development opportunity, with many products not becoming commercially successful. But the explosive growth of the US and Japanese markets has created similar expectations for the European market. Thus, food supplements and articularly plant extracts have developed considerably in 1999.

In Europe, the functional food market is

dominated by prebiotics/probiotics due to a large dairy products market (five times the size of the comparable market in both the US and Japan). The total food supplement and functional food market is valued at US\$ 31,6 billions.

Indian nutraceutical markets: Scope and oppourtunity

The Indian nutraceutical market valued at \$ 1,480 million in 2011 could grow to \$ 2,731 million in 2016, a report said today. According to the report by business research and consulting firm Frost & Sullivan, functional foods will be the quickest growing category followed by dietary supplements until 2015. The report said that at present the dietary supplements were the largest category accounting for 64 per cent of the nutraceuticals market. This market is driven primarily by the pharmaceutical sector in the form of vitamin and mineral supplements. As per the study the global nutraceutical market was estimated to be \$ 149.5 billion in 2011 with US, Europe and Japan being the largest regional markets, accounting for nearly 93 per cent of the global nutraceutical demand. As these markets are nearing maturity, with exceedingly high per capita spends on nutraceutical products nutraceutical manufacturers are looking at developing countries such as India and China as key growth regions. Apart from the current low per capita spend on these products in India, other factors that could support the growth of nutraceuticals in India are increasing obesity in the population and rising instances of diabetes and cardiovascular diseases. The government is also chipping in by funding vitamin fortification initiatives due to increasing food security concerns in India and need for additional nutrition. The total Indian nutraceuticals market is expected to be approximately \$5 billion in 2015⁷.

LABELLING AND HEALTH CLAIMS⁵

Proper labeling and health claims are very important for nutraceutical products because they alert consumers. Food and food substances can qualify for health claims only if they meet FDA requirements.

CONCLUSION

Nutraceuticals can provide substantial health benefits especially in the prevention and/or treatment of acute and chronic human diseases. But its development depends upon its quality, safety, long-term adverse effects, and toxicity as well as supplementation studies and clinical trials in humans. Attempts are made to avoid genetic disorders using nutraceuticals in form of enzymes, probiotics and fortified food. Commercial nutraceuticals have to pass through strict regulatory controls to provide a positive impact on an individual's health.

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