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Nutraceuticals: Modern Era's Nutritional Pharmaceuticals

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ABSTRACT

In recent year there is a growing interest in nutraceuticals which provide health benefit and are alternative to modern medicine. Nutrients, functional food & dietary supplements are major constituents of nutraceuticals which make them instrumental in maintaining health, act against various disease condition and thus promote the quality of life. Nutraceuticals hold promise in clinical therapy as they have the potential to significantly reduce the risk of side effects associated with therapy along with reducing the health care cost. Nutraceuticals have received considerable interest because of their presumed safety and potential nutritional and therapeutic effects". Nutraceuticals are medicinal foods that play a role in maintaining well being, enhancing health, modulating immunity and thereby preventing as well as treating specific diseases. The ability of nutraceuticals to positively influence cardiovascular risk factors should be recognized as an enormous opportunity in the treatment of a highly prevalent disease. They do not easily fall into the legal category of food and drug and often inhabit a grey area between the two. Risk of toxicity or adverse effect of drugs led us to consider safer nutraceuticals and functional food based approaches for the health management. Recent improvements in the identification and standardization of botanical materials, coupled with screening by human cell line and gene expression-directed fractionation, are expected to expedite the development of new nutraceuticals and drugs. These will afford an immediate benefit to the rapidly emerging alternative, complementary, and integrated healthcare practices. It is also hoped that the nutraceuticals industries and regulatory agencies will work together to prevent the ultimate cost of new drug development from becoming prohibitive.

Keywords: Nutraceuticals, Functional foods, Dietary supplements, Prebiotics, Probiotics.

1. INTRODUCTION

Nutraceuticals or functional foods are any food or food ingredients that may provide beneficial health affects beyond the traditional nutrients they contain. [1] Nutraceutical is also known as medical food, nutritional supplements and dietary supplements. Nutraceuticals range from isolated nutrients, dietary supplements, genetically engineered "designer" foods, herbal products, and processed products such as cereals and soups. The functional food market has increased because of the fast growth of the older generation in the United States and their concerns about health-beneficial foods. [2] The term "nutraceutical" was coined from "nutrition" and "pharmaceutical" in 1989 by Stephen DeFelice, MD, founder and chairman of the Foundation for Innovation in Medicine (FIM), Cranford, NJ. According to DeFelice, "a nutraceutical is any substance that is a food or a part of food and provides medical or health benefits, including the prevention and treatment of disease". Such products may range from isolated nutrients, dietary supplements and specific diets to genetically engineered designer foods and herbal products. [3]

There is a small disparity between the functional foods and nutraceuticals. When food is being cooked or prepared using "scientific intelligence" with or without knowledge of how or why it is being used, the food is called "functional food." Thus, functional food provides the body with the required amount of vitamins, fats, proteins, carbohydrates, etc, needed for its healthy survival. When functional food aids in the prevention and/or treatment of disease(s) and/or disorder(s) other than anemia, it is called a nutraceuticals. Examples of nutraceuticals include fortified dairy products (e.g. milk) and citrus fruits (e.g. orange juice). India is strong and is a growing force in the international health foods market. Rapid urbanization, rising incomes, changing lifestyles and dietary patterns, and growing health consciousness have triggered the growth of health and wellness foods in India. The health and wellness foods market is currently estimated to be around US$ 1.6 billion and is expected to reach US$ 7.5 to 10 billion by 2015 growing at 25 to 30 percent compound annual growth rate. [4]

2. SIGNIFICANCE OF NUTRACEUTICALS

Nutraceutical have the potential to play a role in healthy eating and to contribute to the prevention and treatment of diseases so that how functional components in foods could expand the role of disease prevention and treatment. [5]

The nutraceuticals are preferred due to

- The faith among consumers that these "food like substances" are either harmless or least toxic as compared to conventional pharmaceuticals.
- Increased healthcare costs with conventional pharmaceuticals, recent legislation and scientific discoveries.
- New molecule is difficult to discover and more expensive and risky than ever before, many pharmaceutical companies are now trying to nutraceuticals so that there is undoubtedly a very huge and growing market.
- Inappropriate dietary habits are seen as contributing to the leading cause of deaths of due to coronary heart disease, certain type of cancers etc. the role of nutraceuticals in treating these conditions is thus speculated.
- The emergence of diet-disease relations have lead to search of specific constituents of plants, animals and minerals having a beneficial role for our mental and physical health.
- Long history of use and better patient tolerance as well as public acceptance.

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3. CLASSIFICATION OF NUTRACEUTICALS

The food products used as nutraceutical contain the following- except probiotics; all the components are in fruits, vegetables and different type of herbal foods. [6]

1. Antioxidant
2. Prebiotics
3. Probiotics
4. Omega 3 fatty acid
5. Dietary fibers

Antioxidants

Antioxidants are substances, which retard or prevent deterioration, damage or destruction caused by oxidation. During the last few years research has confirmed that many have the common disease and ailments (CVS, diabetes, cataracts, high blood pressure, infertilities, respiratory infection, and rheumatoid arthritis) are associated with tissue deficiency and/or low dietary levels of compounds called antioxidants. Antioxidative nutraceuticals can inhibit or slow the formation of free alkyl radicals in the initiation step and interrupt the free-radical chain reactions in the propagation step during lipid oxidation.

Action of antioxidants

Antioxidants are used to prevent the damage at the cellular level by using the following mechanisms:

- They may reduce the energy of the free radical
- Preventive (suppress radical formation)
- Repair (repair damage and reconstitute membranes)

Prebiotics

Prebiotics are the substances, which reach to colon in intact form i.e. without getting depleted by the gastric pH and digestive acids.These prebiotics also selectively promote the growth of colonel probiotic bacteria; hence they act as fertilizers for these bacteria. e.g. inulin,which is soluble dietary fibres and resistant to digestive enzyme and thus reaches to large intestine or colon essentially intact, where it is fermented by resistant bacteria,Lactobacilli.

The food components or ingredients (prebiotics)

A prebiotic nature has been attributed to many food components that the food or food components. [7]

- Resists host digestion, absorption and absorption processes.
- Fermented by the microflora colonizing the gastrointestinal system.
- Selectively stimulates the growth and/or the activity of one or a limited number of bacteria with the gastrointestinal system.

Probiotics

Probiotics are live microbial food ingredients, which are beneficial to health. The prerequisite for probiotic action include survival in and adhesion to specific areas of the gastrointestinal tract and competitive exclusion of pathogens or harmful antigens. Probiotics are situated as health or functional foods whereby they

are ingested for their purported positive advantages in the digested tract and/or systemic area like the liver, brain, vagina or blood stream[8]. Colon is the most densely populated region of the gastrointestinal tract and harbors an estimated 500 different bacterial species.

Characteristics of Probiotic bacteria

Bacteria should have the following features:

1. GRAS (generally recognized as safe)
2. In vitro resistance to hydrochloric acid and pancreatic juice.
3. Produce antimicrobial substances.
4. Compete with bad bacteria to adhere on the gut wall.
5. Compete for the nutrients and stimulate immunity.

Polyunsaturated fatty acids

Essential fatty acids are needed for normal growth and development but cannot be synthesized by our body. Omega-3 fatty acids belong to this class. Long chain omega-3 fatty acids such as eicosapentaoic acid and docosagexanoic acids are built up in algae and plankton and the fish living on them. The natural vegetable oils and marine animal oils containing polyunsaturated fatty acid belong to Linoleic group (omega 6-type and omega 3-fatty acid) help to reduce cholesterol formation/deposition and prevent thromboxane formation. e.g. safflower oil, corn oil, soybean oil, mustard oil and marine fishes.

Dietary Fibers

Dietary fibers are used in health food products for normalization of intestinal transit time. They have dual effect on intestinal transit. First effect is on the bulk faeces, which are often increased, in substantial proportion (127% after ingestion of 20 g of wheat bran, this action with insoluble fibers. The other effect if dietary fibers are upon the duration of transit, which gets normalized Dietary fibers are categorized into two groups.

Water soluble fibers

Soluble fibers dissolve in water and form a gel that binds the stool and inhibit the non-propulsive colon contractions, helps in bulking of stool and their quick passage through digestive tract. Oats, dried beans, legumes, chicory. [9]

Water insoluble fibers

Insoluble fibers are present in brown rice, banana, vegetables and whole grains. Source of dietary fibers are

- Fresh fruit: Apple, orange, apricot, plum, pineapple with fibers 18-30%
- Vegetables: Cabbage, carrot, lettuce, onion, tomato with fibers 9 to 12 %

4. TYPE OF NUTRACEUTICALS

Nutraceutical have been found to be associated with the prevention and/or treatment of many chronic disease and aliments such as cancer, diabetes, heart disease, hypertension, arthritis, osteoporosis etc. Nutraceuticals and functional foods hold promise in clinical therapy as they have the potential to significantly reduce the risk of side effects associated with chemotherapy along with reducing the global health-care cost. However, with all of the aforementioned positive points, nutraceuticals still need support of an extensive scientific study to prove "their effects with reduced side effects".

- Substances with established nutritional function such as vitamins, minerals, amino acid and fatty acids nutrients.
- Herbs or botanical products as concentrates and extract herbals.
- Reagents derived from other sources (eg. Pyruvate, chondroitin Sulphate, steroid hormone precursors) used
- Herbal and botanical products.
- Foods for vitality, functional food, medical food.
- Health food, organic food, dietetic food.
- Sport and energy products.
- Natural medicinal products with specific health benefits. Source and potential benefits of Nutraceuticals and Functional Foods shown in table 1.

Commercial Available Nutraceuticals

- Resveratrol: - Cholesterol-Lowering Nutraceuticals.
- Sesamin: - Lowering Blood Pressure.
- Boswellic acids, Silymarin: - Anti-inflammatory Nutraceuticals.
- Conjugated Linoleic acid: - Body weight and fat management.
- Odorex: - Eliminate body odour, bad breath and faecal smell.
- Glucuronoxylomannan: - Prevent Diabetes.
- Diindolylmethane (DIM), Baicalin, Quercetin: - Antiproliferative agents.
- Lingzhi and Shiitake: - Improve digestion.
- Statins: - Prevent atherosclerosis.

5. CURRENT STATUS OF NUTRACEUTICALS

Over the last five years, companies have used the consultation process more than 40 times as they moved to introduce genetically altered plants into the U.S. market. Although the agency has no evidence that the policy and procedure do not adequately protect the public health, there have been concerns voiced regarding FDA's policy on these foods. FIM, The Foundation for Innovation in Medicine, maintains that the

nutraceutical industry is on the verge of a fundamental change, from a market-driven enterprise to a business that will be driven by the results of clinical research. Clinical studies of nutraceuticals will power the next phase of development. The growing importance of "healthy foods" in today's society has resulted in a growth of regulations governing foods, functional foods and dietary supplements. In 1992, the Food and Drug Administration published a policy explaining how existing legal requirements for food safety apply to products developed using the tools of biotechnology. According to a survey conducted for FIM, 74% of Americans say that they take nutraceuticals. And 51% of Americans told researchers that they take nutraceuticals at least once a day.

Future Prospective Of Nutraceuticals

Consumer today are more aware when it come to health, which makes them go for nutritional supplements. Developing countries like India, where malnutrition is omnipresent even in the 21st century and these nutritionally enhanced foods will act as a born for our future generations. The expanding nutraceutical market indicates that end users are seeking minimally processed food with extra nutritional benefits and organoleptic value. This development, in turn, is propelling expansion in the nutraceutical markets globally. The emerging nutraceuticals industry seems destined to occupy the landscape in the new millennium. Its tremendous growth has implications for the food, pharmaceutical, healthcare, and agricultural industries.

6. CONCLUSION

Nutraceuticals may be beneficial to our health, but we are still learning about their benefits and possible harmful effects. The nutraceutical industry is growing at a rate far exceeding expansion in the food and pharmaceutical industries. Types of products that are being marketed such as Prebiotics, Probiotics and food fortified with added vitamins are discussed here. However there is lack of proper regulation for their production and marketing, which may reduce exploiting nutraceuticals. Hence there is a chance for budding industries to develop core competency in this emerging arena. Nutraceuticals have a positive impact on an individual's health, physical performance or state of mind in addition to its nutritive value.

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