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A Review on Nutraceuticals New Era

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ABSTRACT
Nutraceuticals have received considerable interest because of their Presumed safety. The Present article focuses on the need for Consuming appropriate diets, health issues surrounding failure toAdhere to the known healthy eating models, development of new Nutraceuticals/functional foods/food supplements with novel healthBenefits, elucidation mechanisms of action of these products, to define And understand the analytical, formulation and regulatory aspects of Nutraceutical. This article may act as a tool to abreast with the recent Developments in nutraceutical research.Nutraceuticals refers to foods having a medicinal effect on health of human beings. It consist of food supplements, Herbal products, probiotics and prebiotics, medical foods meant for prevention and treatment of diseases. Major Nutraceuticals posses multiple therapeutic effect with lacking of unwanted effects hence attract more consumer Interest. Increase in shift towards preventive therapies and increasing disposable income,favorable pricing Environment growth in pharma retail chain and increase in healthcare spending is mainly responsible for increasing Market for nutraceuticals in India, but lack of standardization and awareness, high pricing, marketing and distribution Are some challenges. Nutraceutical market is seeing tidal growth mainly in United States, India and European Countries. Faster access to this market is possible through business partnership models, effective regulatory compliance And by evaluating key trends and consumer references

KEYWORDS: Nutraceutical, food supplement, Prebiotics, Probiotics, Regulatory compliance.

I. INTRODUCTION

The word is a portmanteau of the words “nutrition” and “pharmaceutical”, was coined in 1989 By Stephen L. Defelice, founder and chairman of the Foundation of Innovation Medicine.Nutraceuticals are products derived from food sources that are purported to provide extra Health benefits, in addition to the basic nutritional value found in foods. Depending on the Jurisdiction, products may claim to prevent chronic diseases, improve health, delay The aging process, increase life expectancy, or support the structure or function of the body.

The reasons for shift towards nutraceuticals are[2-6]

1. Increasing numbers of consumers, concerned about healthcare costs.
2. Dissatisfied with pharmaceutical agents in promoting health, are turning tonutraceuticals To improve their health and prevent chronic disease.
3. 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.
4. People believing more in prevention than a cure.
5. People who have chronic diseases and have found no solution in allopathic medicines.
6. Economically challenged patients.

With few exceptions, the U. S. Food and Drug Administration (FDA) has not approved Nutraceuticals for health benefits or disease prevention; nonetheless, the manufacturers ofNutraceuticals have been touting them as health-promoting agents. Categories based on natural source[7, 8]

- Carbohydrates &Fiber
- Fat & Essential fatty acids
- Protein
- Minerals like Macrominerals& Trace minerals
- Vitamins
- Water
- Other nutrients like Antioxidants, Phytochemicals & Intestinal bacterial floraRecombinant nutraceuticals.

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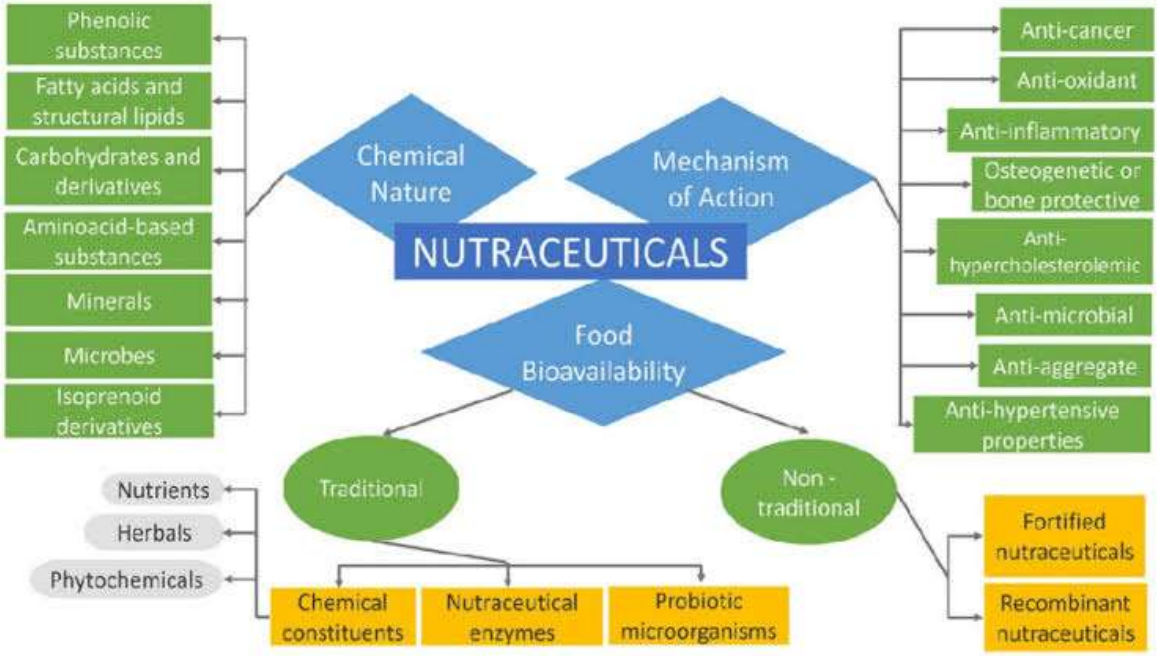

Are simply natural with no changes to the food. Food contains several natural components That deliver benefits beyond basic nutrition, such as lycopene in tomatoes, omega-3 fatty Acids in salmon or saponins in soy.

Dietary supplements

Dietary supplements, such as the vitamin B supplement shown above, are typically sold in Pill form. A dietary supplement is a product that contains nutrients derived from food Products that are concentrated in liquid or capsule form. In the US, the Dietary Supplement Health and Education Act (DSHEA) of 1994 defined the term: "A dietary supplement is a Product taken by mouth that contains a "dietary ingredient" intended to supplement the diet.The "dietary ingredients" in these products may include: vitamins, minerals, herbs or otherBotanicals, amino acids, and substances such as enzymes, organ tissues, glandulars, And metabolites. Dietary supplements can also be extractsor concentrates, and may be found In many forms such as tablets, capsules, softgels, gelcaps, liquids, or powders.

Dietary supplements do not have to be approved by the U. S. Food and Drug Administration (FDA) before marketing, but companies must register their manufacturing Facilities with the FDA.

With a few well-defined exceptions, dietary supplements may only be marketed to support The structure or function of the body, and may not claim to treat a disease or condition, and Must include a label that says: "These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any Disease." It achieves this goal by using efficacy of such nutraceuticals in detoxifying the Body, avoiding vitamin and mineral deficiencies, and restoring healthy digestion and dietary Habit.

They are grouped on the basis of Chemical Constituents

A. Nutrients
B. Herbals
C. Phytochemicals

Phytochemicals basically is plant nutrients with particular biological activities in supporting Human health, they work by following way.

1. Substrate for biochemical reactions.
2. Cofactors of enzymatic reactions.
3. Inhibitors of enzymatic reactions.
4. Absorbents that bind to and eliminate undesirable constituent in the intestine.
5. Enhance the absorption and/or stability of essential nutrients.
6. Selective growth factor for beneficial bacteria.
7. Fermentation substrate for beneficial bacteria.
8. Selective inhibitors of deleterious intestinal bacteria.
9. Scavengers of reactive or toxic chemicals.

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10. Ligands that agonize or antagonize cell surface or intracellular receptors.[91]

II. PROBIOTIC MICROORGANISMS

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 (ß-galactosidase) that can hydrolyze the offending lactose into its component sugars.In the selection benchmarks for probiotics one should consider safety, functional and Technological aspects as follows Show a potential health benefit.

- Probiotics should have human origin.
- Commanly gram positive organism.
- Can survival after passage through acid and bile.
- Can adherence to the human intestinal cells and grow in the gut.
- Can show antagonist action against pathogenic or carcinogenic bacteria.
- Clinically proven documented beneficial health effects.[9]

List of Bacteria and their beneficial effects.[10-18]

breast milk)	• Immunosupportive and anti-gas effects associated with breastfeeding.
B. infantis	• Reduction of irritable bowel syndrome symptoms • Reduction of necrotizing enterocolitis in preterm infants • Simulates the production of cytokines that affect the immune system, • Antimicrobial action against clostrida, salmonella and shigella. B. longum colonizes the large intestine. • This can decrease the frequency of gastrointestinal problems, such as diarrhea, and nausea during antibiotic use.
B. animalis (lactis)	• Reduction of incidence of febrile urinary tract infections in children • Reduction of necrotizing enterocolitis in preterm infants • Reduction of total microbial counts in dental plaque also protect from enterohemolytic pathogen like Escherichia coli • Reduction of total cholesterol • Reduction of risk of upper respiratory illness • Usefull in Crohn's disease • Improvements in immunity • Protection from Salmonella infection • reduce the severity of weanling diarrhea associated with rotavirus and E. coli • Used in animal feed(stimulate animal growth, reduce coliform counts by the production of antimicrobial metabolites
B. bifidum (second most prominent species that identified in breast-fed infants)	• Used in treatment of acute diarrhoea • Reduction of necrotizing enterocolitis • Reduction of total cholesterol • Boosted immune functions. • Shown anti-ulcer activities, anticancer activity

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B. longum (*It is commonly found in the GI tracts and vagina*)	• Prevention and treatment of necrotizing enterocolitis in newborns • Reduction of irritable bowel syndrome symptoms • Perinatal intervention against onset of allergic sensitization • Anti-inflammatory properties that protect the cells lining your mucous membranes from toxins and help immune cells to mature and function properly. • Present in breast milk, and colonize the infant gut • Able to ferment carbohydrates and digest protein • Useful in Seasonal allergies, Bone health, Pathogen infections and also prevent Colon cancer
B. breve	• Prevention and treatment of necrotizing enterocolitis in newborns • Reduction of cholesterol • Preventing the intestinal colonization with pathogen microorganisms • May show resistance to streptomycin due to mutation • Eradicated Campylobacter jejuni from their stools, although less rapidly than in patients treated with erythromycin • Induce formation of large amounts of IgA which may used for against food allergens and pathogens.
S. boulardi	• Protection against toxin A produced by Clostridium difficile and prevents intestinal injury and inflammation. By inhibits the activation of extracellular signal-regulated ½ and mitogen-activated protein (MAP) kinases, thus modulating host signalling pathways for protection against diarrhoeal diseases • Treatment of travellers' diarrhoea, irritable bowel syndrome, ulcerative colitis, recurrent pseudomembrane colitis infection, acute gastroenteritis
L. lactis	• Treatment of antibiotic-associated diarrhoea • adhesion to vaginal epithelial cells • production of bacteriocins I as lacticins, nisin A, lactococcins • modulation of brain activity • Wide spectrum of bactericidal and fungicidal action to the pathogens like activity against *C. difficile* • Use for cytokine delivery • Formation of acetaldehyde, diacetyl, acetoin, and 2-3 butylene-glycol during fermentation which lead to typical flavour in cheese. • Can able to degrade methionine to methonethiol, dimethyledisulphide (DMDS), citrate and dimethyltrisulphide (DMTS) • Utilize in formulation of animal food products
E. faecium	• Treatment of antibiotic-associated diarrhoea • Decreased duration of acute diarrhoea from gastroenteritis • Prevent infection by Salmonella enteric ssp. • Stimulate animal growth, reduce coliform counts by the production of antimicrobial metabolites and therefore utilize in formulation of animal food products • Production of bacteriocin-like inhibitory substances which show antimicrobial activity against Gram(+) bacteria.

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S. thermophilus	• Reduction of irritable bowel syndrome symptoms • Used in fermented milk products deliver enough bacterial lactase to the intestine and stomach where lactose is degraded to prevent symptoms in lactase nonpersistent individuals • reduction of necrotizing enterocolitis in preterm infants • Reduce risk of bleeding
P. acidilactici	• Exert antagonism action against pathogens by production of lactic acid and bacteriocins, pediocins elimination of H. pylori infections and help combat viruses, fungi, and microbes • Used in treatment of constipation, diarrhea, relieving stress, enhancing immune response • Generate accelerated food decomposition and nutrient absorption, as well as more regular bowel movements and increased energy levels. • Prevent colonization of pathogens like Shigella, Salmonella, Clostridium difficile and Escherichia coli in small intestine • regulate glucose readings and potentially aid in weight management and diabetes prevention over time. • Normalize mental stability by stimulating the presence of gamma-aminobutyric acid (or GABA, for short), a neurotransmitter responsible with coordination, stress management, pain and anxiety receptors.
L. mesenteroides	• Produce acids, Leucoin and bacteriocins, which reduce pathogens in ferments and in your body.
B. coagulans (Lactobacillus sporogenes or "spore-forming lactic acid bacterium. ")	• Treatment of antibiotic-associated diarrhoea, bacterial vaginosis • immunological support, increased immune response to viral challenge, prevent respiratory infections. • Decrease Iirritable bowel syndrome, Clostridium difficile colitis, Clostridium difficile colitis, abdominal pain and bloating symptoms. • Also used to prevent cancer or the formation of cancer-causing agents.
E. coli	• Treatment of functional constipation in adults • treatment of inflammatory bowel disease, gastrointestinal disorders • pro-inflammatory potential • reduction ofSalmonella enterica Typhimurium intestinal colonization by iron competition • Promote immune, digestive (produce various digestive enzymes), reproductive health

III. NUTRACEUTICAL ENZYMES

Enzymes are an essential part of life, without which our bodies would cease to function.Those people who are suffering from medical conditions such as hypoglycemia, blood sugar Disorders, digestive problems and obesity, eliminate the symptoms by enzyme supplements to Their diet. These enzymes are derived from microbial, plant and animal sources.

IV. PREBIOTICS

"Prebiotics" are a more recent addition to our vocabulary and are substances which when consumed are not digested by us. Instead, they act as a nutrient source for the good probiotic bacteria. This encourages the probiotic bacteria to grow in a favourable environment, which in turn reduces the chances that harmful microorganisms may start to grow in our digestive tract. Inulin is a prebiotic that has been widely used in processed foods. Essentially, it is a type of fibre obtained from the roots of plants such as chicory, Jerusalem artichoke, and evendandelions.[19]

Non-traditional nutraceuticals Are artificial foods prepared with the help of biotechnology. Food samples contain bioactive components which are engineered to produce products for human- wellness. They arearranged into.

Fortified nutraceuticals.

Recombinant nutraceuticals.

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Fortified nutraceuticals

They are enriched with vitamins, minerals, usually at a range up to 100 percent of the Dietary Reference Intake for that nutrient. It constitutes fortified food from agricultural breeding or Added nutrients and/or ingredients added folic acid. Some examples are milk fortified with Cholecalciferol used in vitamin D deficiency.[20]

Recombinant nutraceuticals

Energy-providing foods, such as bread, alcohol, fermented starch, yogurt, cheese, vinegar, And others are produced with the help of biotechnology. The production of probiotics and the Extraction of bioactive components by enzyme/fermentation technologies as well as genetic Engineering technology are achieved through biotechnology.

REGULATORY ASPECTS:

The primary set of rules governing the nutraceutical market Is the Dietary Supplement Health and Education Act (DSHEA) passed in 19946. The Food Safety and Standard Rule, 2011 have been issued. Food Safety and Standard Authority has also issued regulations with respect to Licensing and registration of food business, manufacturing, Packing and labeling, food product standard etc. The Food Safety and Standard Rule and Regulations are Effective from August 2011. This act will encourageManufacturers for product Research and Development;Develop reliable protocols and carryout clinical studies.Foreign Direct Investment Act passed recently in 2012 that Also provide new opportunities for international firms to Manufacture and sale nutraceutical products in India. Thus, There is only single authority to regulate production, Distribution and marketing of nutraceuticals in India

CONCLUSION

Nutraceuticals provide all the essential substances that should be present in a healthy diet for The human. From the above study it can be concluded that various chemical constituents from Natural sources can be obtained and prepared into various optimized, safe, stable formulations For the treatment and diagnosis of diseases. Nutraceuticals are widely used in the food and Pharmaceutical industries. Most of the neutraceuticals are from either mineral origin, animal Origin or vegetable origin like gamma terpinenes, beta carotene, curcumine, limonene, Eugenol, pinene, safranal, geraniol, aloine, caryophylline, licopine and sylimarine. These Constituents are prepared into dosage forms as topical, oral, etc. Viz. Creams, lotions, Ointments, emulsions, unani formulations, aromatic oils, microemulsions, SMEDDS, beads, Tablets, emulgels, herbal formulations etc. Used in various categories as antidiabetic, Antibiotic, antimicrobial, anti-inflamatory, anti cancer, protective, etc. Results of studyindicate that demand and consumption of nutraceuticals are now going on increasing due to Safety, therapeutic efficacy, stability of formulations.

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