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Review on Nutraceutical

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Abstract: *Nutraceutical is the hydride of „nutrition" and „pharmaceutical". Nutraceutical, in broad, are food or part of food playing a significant role in modifying and maintaining normal physiological function that maintains healthy human beings. The principle reasons for the growth of the nutraceutical market worldwide are the current population and the health trends.the food product uses as nutraceuticals can be categorized as dietary fibre, probiotics, polyunsaturated fatty acids, antioxidants and other different type of herbal/natural foods.These nutraceuticals help in combating some of the major health problems of the century such as obesity, cardiovascular disease, cancer, osteoporosis, arthritis, diabetes, cholesterol etc.*

Keywords: *Nutraceutical*

I. INTRODUCTION

The functional component of the food must be standardized in the nutraceutical product and produced under good manufacturing practices (GMPs).

A nutraceutical is any substance considered as a food, or its part whichin addition to its normal which, in addition to its normal nutritional value provide health benefits including the prevention of disease or promotion of health.

It is "any non-toxic food component that has scientifically proven health benefits, including disease treatment or prevention ".

The functional component of the food must be standardized in the nutraceutical product and produced under good manufacturing practices (GMPs).

Food As… Medicine

• Nearly two thirds of the world"s 6.1 billion people rely on the healing power of plant

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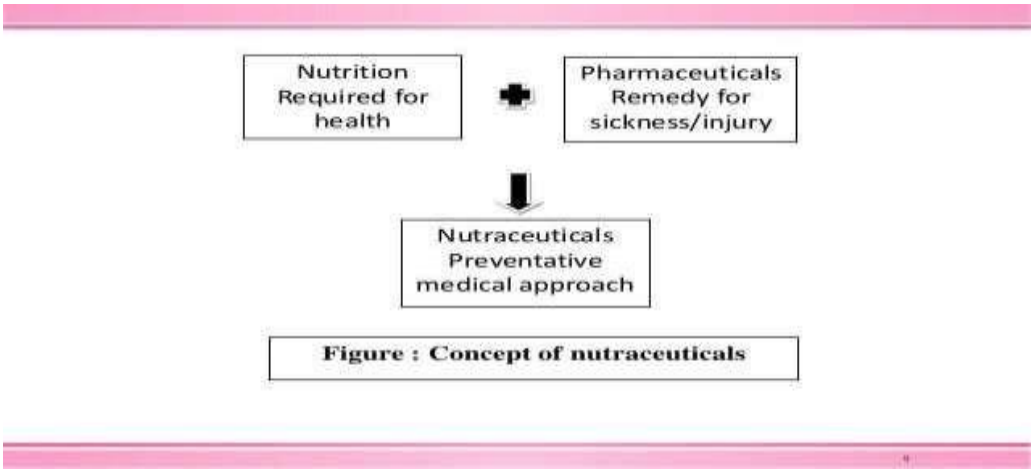
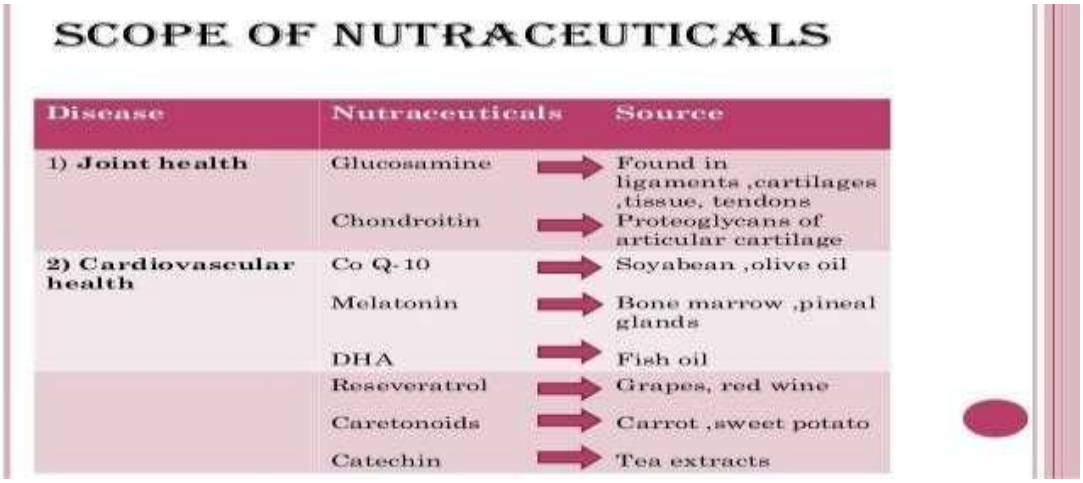


Figure : Concept of nutraceuticals

BENEFITS AND SCOPE OF NUTRACEUTICALS

It increase the health value of our diet.
It help us live longer.
It help us to avoid particular medical condition.
It has a psychological benefit from doing something for oneself.
It is perceived to be more "natural" than traditional medicine and less likely to produce unpleasant side-effect.
May present food for population with special need (eg.nutrient-dense food for the elderly)



ROLE OF NUTRACEUTICALS

Many diets are rich in phenolics component and are daily consumed by human beings.
They rarely have any side effect.
They have relatively long half-life.
They can be easily absorbed in the intestine after ingestion. They are easy available without prescription.

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Disease	Nutraceuticals	Scope
3) Eye health	DHA Pycnogeal	Linseed (flax oil),fish oil Barley
	Lotein Caretonoids	Spinach Carrot ,sweet potatoes
4) Cancer prevention	DHA Resveratrol	Flax seed,linseed,fish oil. Red wine,grapes
	Lycopene Tea extracts (ellagic acid)	Tomatoes ,grape fruit Strawberry ,Raspberry

History

The Greek physician hippocrates often known as the "father of medicine"said "Let thy food be thy medicine, and the mrdicine be thy food". The philosophy behind is :

" Focus on prevention "

• The term "nuteaceutical" was coined by combining the terms "nutrition"and "pharmaceutical" in 1989 by Dr.stephen Defelice. MD, founded and chairman of the foundation for Innovation in Medicine (FIM).

• Accourding to Dr.Defelice, "Nutraceutical is any substance that is a food or a part of food that provides medicinal or health benefits including the prevention and treatment of disease".

• Health ministry of canada defines it "As a product isolated or purified from the food generally sold in medicinal form not assisted with food and demonstrated to have a physiological benefit and provide protection against chronic disease."

CLASSIFICATION

Nutraceuticals or functional foods can be classified on the basis of their natural sources, pharmacological conditions or as per chemical constitution of the products. On the basis of natural source it can be classified as the products obtained from plants, animals, minerals or microbial sources.

The classification of nutraceuticals based upon its therapeutical utility for the treatment or prevention of specific condition may produce a big list. Some of the important conditions in which the nutraceuticals are specially directed for its treatment, prevention or support is give

Table 1: Nutraceuticals used in various disease conditions

Conditions	Nutraceuticals
Allergy relief	Ginkgo biloba
Arthritis support	Glucosamine
Cancer prevention	Flax seeds, green tea
Cardiac diseases	Garlic
Cholesterol lowering	Garlic
Digestive support	Digestive enzymes
Diabetic support	Garlic, momordica
Female hormone support	Black conosh, false unicorn
Immunomodulators	Ginseng
Prostate support	Tomoto lycopenes

A systematic classification on the basis of therapeutically important compounds of the nutraceuticals products responsible for the specific health benefit can be done as given in Table 2.

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Sl. no.	Class	Example
1	Inorganic mineral supplements	Minerals
2.	Vitamin supplements	Vitamins
3.	Digestive enzymes	Enzymes
4.	Probiotics	Lactobaccilus acidophilus
5.	Prebiotics	Digestive enzymes
6.	Dietary fibres	Fibres
7.	Cereals and grains	Fibres
8.	Health drinks	Fibre
9.	Antioxidants	Natural antioxidants
10.	Phytochemicals Polysaccharides Isoprenoids Flavonoids Phenolics Fatty acids Lipids proteins	Arabinogalactans Carotenoids Bioflavanoids Tea polyphenols Omega-3-fatty acids Spingolipids Soya proteins
11	Herbs as a functional foods	Soya proteins

INORGANIC MINERAL SUPPLEMENTS

Large number of elements control variety of physiological and biochemical functions of human body. Most of these minerals are provided through the diet but their deficiency in diet may develop variety of health related problems and diseases

Calcium

Calcium is an important element in the treatment of decalcification of bone . Calcium deficiency is found in 25% of women, even though much higher percentages have osteopenia or osteoporosis. Prepuberty is the best time to begin supplementing the diet with calcium rich minerals along with exercise regimen. Sufficiently intake of calcium and vitamin D post menopausally can significantly reduce the risk for fracture

Magnesium

Magnesium is an essential element involved in various enzymatic processes and critical in the proper use and maintenance of calcium. Many individuals with calcium deficiency are actually magnesium deficient which prevent proper use of calcium.

Manganese

Manganese is required in several enzymatic reactions and necessary for proper bone and cartilage formation.

Boron

Boron is reported to be helpful in supporting the calcium and estrogen level in post menopausal in women.

Copper

Copper is an essential element needed by all tissues in the body. Copper and Zinc must be in proper formation. Copper is best absorbed when bound to an aminoacids.

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Zinc

Zinc is one of the most important trace mineral. Zinc supports the bodies overall antioxidant system by scavenging free radicals. It also perform many other vital functions.

Phosphorous

Phosphorous important in maintaining bone structure and modulating plasma and bone formation

.

Silicon

Silicon is concentrated in the active growth areas of bone. It influences both for bone formation and calcification.

DIGESTIVE ENZYMES….

Much of the reflux is not caused by increased production of acid in the stomach but from poor digestion because of too little acid. As we grow older stomach cells responsible for acid production diminishes, this in turn slows the transit time of food in the stomach causing reflux of food from the oesophagus. So we have to use a variety of digestive enzymes to help absorption and digestion of food materials. There are animals as well as plant derived digestive enzymes.

The principle digestive enzyme in the pepsin, present in the gastric juices, which helps in the digestion of proteins. It is obtained from the glandular layer of fresh stomach of hog, Sus scrofa var domesticus of family suidae. Pancreatin, an enzyme obtained from pancrease of certain animals like hog (sus scrofa) family suidae or Ox bostaurus of family Bovidae. It is employed as digestive aid for converting starch into dextrin and sugar. Each gram contains not less than 12,000 units of amylase activity, 1000 units of protease activity and 15,000 unit lipase activity. Another important digestive enzymes of animal origin are Trypsin obtained from mammalian pancreas like Ox bostaurus of family

Bovidae, Chymotrypsin also obtained from the same source. UROKINASE FIBRINOLYSIN, DEOXY-RIBONUCLEASE, STREPTOKINASE are the other animal derived digestive enzymes.

ANTIOXIDANTS

Atioxidants are of 3 categories :

1. True antioxidants
2. Reducing agents
3. Antioxidant synergists

Deficiency causes disease link cancers, rheumatoid arthritis, disease. Cardiovascular disease.

ANTIOXIDANT	SOURCE
VITAMINS	CITRUS FRUITS, VEGETABLES
VITAMIN C	GRAINS, NUTS,OILS
VITAMIN E	
CAROTENOIDS	
LYCOPENE	TOMATOES
BETA CAROTENE	CARROTS, SWEET POTATO
XANTHOPHYLLS	
BETA CRYPTOXANTHIN	MANGO, PAPAYA, ORANGES
FLAVANOIDS	
RUTIN	TOBACCO, EUCALYPTUS SPECIES
LUTEOLIN	LEMON, RED PEPPER, OLIVE

The water insoluble fibres absorb water to a certain extend and mainly contribute to bulking of stool and allows quick passage of water through the alimentary canal.

Soluble fibres get dissolved in water and forms a gel that binds the stool, also slows down the absorption of glucose action and reduce blood cholesterol level.

It has been recommended that about 30-40 gm of dietry fibre should be consumed daily in order to obtain significant health benefits. The main sources of water insoluble fibres include whole grain cereals, whole wheat products, brown rice and fruits and vegetables with the peels.

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Sources of water soluble fibres are oats, dried beans, legumes lentils, fruits and vegetables. Some of the processed food marketed in the form f the soluble fibres are breads, breakfast cereals, high fibre beverages.

VITAMIN SUPPLEMENTS

Vitamins are the complex substances of organic origin which in small quantities are necessary for the maintenance of human and animal life. Some of the important water soluble and water insoluble vitamins are discussed below.

Vitamin B-Complex

Specific vitamin B are recommended for daily requirement to combat high level of homocysteine, a known risk factor for heart diseases. Homocysteine accumulates in the blood secondary to protein intake, specially from meat. Vitamin B extra is generally recommended to those who use caffeine, alcohol, excessive sugar or oral birth pills in their diet, since B vitamins are water soluble and easily excreted from the body.

Vitamin B1 or thiamin deficiency is mostly observed with individuals using white rice. Riboflavin-5-phosphate is a cofactor for vitamin B2 which is beneficial in people who lack the enzyme to convert vitamin B2 because of nutritional factors or disease condition. Niacinamide deficiency may cause neurological and skin problems. The major sources are the peanut, ragi, pulses, soyabean etc. The body can also synthesis niacin from tryptophan panthothenic acid. The panthothenic acid deficiency affect adrenal gland, immune and cardiovascular system.

Vit. B6 is crucial for glucose production, hormone modulation and neuro transmitter synthesis. Pyrodoxal 5-phosphate is considered as an active form of vitamin B6. Vitamin B12 deficiency may be observed in vegetarian people as plant has no appreciable vitamin B12. Folic acid is a B-complex vitamins which contribute to healthy bone format

Name of vitamin	Source	Deficiency disease
Vitamin A_1 Vitamin A_2	Fishliveroil, liver Kidney, cheese, butter carrots, spinach, pumpkins, papaya	Night blindness, xerophthalmia, Keratomalacia
Vitamin D	Fishliver oil, wheat germ oil, egg yolk, milk, butter	Rickets in children osteomalacia in adults
Vitamin E	Wheat germ oil, cotton seed oil, peanut oil	Sterility, degenerative changes in muscle, ageing of skin
Vitamin K	Cabbage, cauliflower, tomatoes, alfalfa	Haemorrhagic condition
Vitamin B_1 Vitamin B_2	Cereals, pulses Nuts, yeast	Beriberi, Cheilosis, corneal opacity
Vitamin B_3(panthotemico)	Liver, meat, yeast	Chick dermatitis
Folic acid Nicotinic acid (B_5) Pyridoxine (B_6) Biotin (Vitamin H)	Rice polishing, yeast, egg, milk	Macrocylic anaemia Pellagra Depression, mental confusion Anemia, nausea, glossitis

PROBIOTICS

Probiotics (for life) can be described as a living micro organism which when ingested with or without food improves the intestinal microbial balance and consequently the health and functioning of large intestine. The major sources are the cultured dairy products such as natural cheese, yogurt, kefir and butter milk lactobacillus also in green foods such as wheat grain, spirulina and chlorella.

There are over 400 different bacteria living in the human GI tract, of all these lactobaccilus acidophilus is one of the major component of the probiotic fighter. It enhances theimmunesystem. Lactobacillus acidophilus ca n reduce the incidence of vaginal infections including thrush and bacterialvaginosis. Bifidobacteria and Streptococcus thermophilus both found in yoghurt can prevent young children suffering from diarrhoea also in treating

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travelers diarrhoea and rotavirus infection. Probiotics only have a transient effect and regular daily in take is needed to bring about health benefits.

HEALTH DRINKS

Drinks are the fast developing area of Nutraceuticals. Some of these health drinks are fortified with the anti oxidants, vitamin A, C, E. The fruits and vegetable juices have also been shown to produce the health benefits. A Tropicana fruit juice fortified with calcium provides about 365mg calcium per 250 ml glass. An ideal health drink Increases physical endurance, improves and increase concentration and reaction speed.

Almond Sharbat (almond soft drink) Ingredients

Sugar, Almond, Rose water, Cardamom.

Nutrition

Prepared of the choicest ion almonds and blended cardamom, saffron, and rose water. With a matchless taste, and it is full of values both for brain and body. Regular use enriches body with protein, iron, calcium, phosphorous and other proteins. It can be utilized with either hot water or cold milk.

Nutritional value per glass

Iron	-	0.69mg
Protein	-	2.80mg
Carbohydrate	-	28.52g
Energy	-	206.32cal
Vitamin	-	139.631

Saffron sharbat

POLYUNSATURATED FATTY ACIDS (PUFA)

Human body is capable of synthesizing most of the fatty acids it needs except the two major polyunsaturated fatty acids, i.e., omega-3-fatty acid and omega-6-fatty acids. These fatty acids are required to be supplemented from the diet. The polyunsaturated fatty acids are the known precursors for arachidonic acid (AA), eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA). These fatty acids have been fund to regulate blood pressure, heart rate, blood clotting and immune response. Omega-3-fatty acids have been reported to be important fatty acids in the prevention of heart diseases and also in the treatment of arthritis. Omega-3 fatty acids are mostly found in cold water fishes such as tuna, salmon and macaerel. It is also present in dark green leafy vegetables, flaxseed oil and in certain vegetable oils. The fatty acids such as AA and DHA are essential for the development of the foetus and also during the first six months after birth. The deficiency of these fatty acids may result in poor development of foetus and may also cause a verity of problems such as premature birth to underweight babies. Breast milk is a very rich source of DHA. Most of the infant formulas which are used as a substitute of breast milk should be supplemented with DHA, as per the recommendation by World Health Organization.

HERBS AS FUNCTIONAL FOOD

A great attention has nowadays been given to discover the link between dietary nutrients and disease prevention. Large numbers of herbs which had been in use since unknown time have been shown to play a crucial role in t he prevention of disease. In addition to the macro and micro nutrients such as proteins, fats, carbohydrates, vitamins or minerals necessary for normal metabolism, a plant based diet contains numerous nonnutritive phytoconstituents which may also play an important role in health enhancement. A brief overview of the role of various herbs in disease prevention, with a focus on bioactive components from flaxseeds, garlic, citrus, fruits, soyabean, ginkgo biloba has been given in this part of the nutraceuticals.

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Flaxseeds

Flaxseeds are the dried ripe seeds of Linum usitatissimum, family Linaneae. The components are of great interest as functional food. Flaxseed incorporations into the diet is particularly attractive from the perspective of specific health benefit. Flaxseed has been recorded as one of the six plant materials as cancer preventive foods. Alpha linolenic acid (ALA) has a broad spectrum of health advantages. It inhibits the production of eicosanoids, alters the production of several prostanoids, reduces blood pressure in hypertensive patients and lowers triglycerides and cholesterol. Dietary ALA may retard tumour growth and plays an important role in metastatis.

It has been suggested that Ala is dietary essential for optimal neurological development of humans especially during fetal and early postnatal life.

Dietary fibres of flaxseeds contain about 6% mucilage which has nutritional value. It appears to play a role in reducing diabetes and coronary heart disease risk, preventing colon and rectal cancer and reduces the incidence of obesity.

Ginkgo biloba

Ginkgo biloba, family Ginkgoaceae, known as fossil tree is an important drug used in traditional Chinese medicine since more than 2800 years. Mainly leaves and edible seeds are used as drugs.

Ginkgolides A, B, C and bilobalide are also the therapeutically active constituents.

Leaf contains 6-hydroxykynurenic acid, a metabolite of tryptophan.

The leaves are recommended as being beneficial to the beneficial to the heart and lungs. Ginkgolides present in the leaves are able to alleviate the adverse effects of platelet-activating factor in a number of tissues and organs both in animals and in humans. It is also effective in the treatment of arterial insufficiency in the limbs and in the brain.

Garlic organosulfur compounds:

Garlic consists of the fresh or dried bulbs of Allium sativum, family Liliaceae. It is a perennial erect bulbous herb indigenous to Asia but commercially cultivated in most countries. Garlic is used as an adjuent to dietic management in the treatment of hyperlipidaemia and in the prevention of atherosclerotic (age dependent) vascular changes. Fresh garlic juice, aged garlic extract or the volatile oil, all lowers cholesterol and plasma lipids, lipid metabolism, and atherogenesis both in vitro and in vivo. The mechanism of garlics antihypercholesterolaemic and antihyperlipidaemic activity appears to involve the inhibitin of hepatic HMG-CoA reductase and remodeling of the plasma lipoprotein and cell membrane. The overall activity of garlic is mainly due to the presence of sulfur compound such as allin, allicin, ajoene and others.

Garlic has been reported to reduce the risk of colon cancer and lung carcinoma. Consumption of one or more servings of fresh or powdered garlic per week resulted in a 50% lower risk of cancer of the distal colon and a 35% lower risk of cancers anywhere in the colon.

Citrus limonoids:

Citrus fruit consumption has been shown to protect against a variety of human cancers. The citrus fruits such as oranges, lemons, limes and grapefruits are the principal source of important nutrients like vitamins C, folate, fibres and vitamins E, but the other monoterpene compounds known as limonoids are reported to be responsible for the anticancer activity. d-limonene, a predominant monocyclic monoterpene found in essential oil of citrus fruits has been reported to be a cancer chemopreventive agent.

The mechanism of antitumour activity of limonoids include the induction of hepatic detoxification enzyme, glutathione S-transferase and uridine diphosphoglucoronosyl tranferase. Limonene has little or no toxicity in humans and has been suggested as a good candidate for human clinical chemoprevention.

Soya products

Soyabean, Glycin max, family Leguminoseae has clearly been a plant food in the spotlight in the 1990s. it has been recognized as an excellent source of protein,

equivalent to quality to animal protein. Soya has been extensively investigated for its ability to treat and prevent a variety of chronic diseases including cancer. Soyabean meals, concentrates and isolates are used as meat substitute and have

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many healthful benefits. Soyabean is also a major source of lecithins which yields liposomes used to formulate stable emulsions and finds major use in food technology.

The primary isoflavones in soya, genistein and daidzein are structurally similar to the estrogenic steroids and have been reported to have estrogenic and antiestrogenic activities. Due to their weaker activity, isoflavones may act as antiestrogens by competing with the more potent naturally occurring estrogens for binding to the estrogen receptor. Due to this, soya consumption may reduce the risk for estrogen-dependent cancers. South east Asian population who consume 20-80 mg of genistein per day are found to have significantly lower incidence of breast and prostate cancer. Genistein has been reported to be a potent and specific inhibitor of protein tyrosine kinase. Genistein also inhibits DNA topoisomerase II activity, alters cell cycle specific events, induce apoptosis and inhibits angiogenetic process which is essential for tumour growth.

Tomato lycopenes.

Lycopene is a carotenoid principle present in lycopersicon family Solanaceae known throughout the world as tomato. Clinical studies have indicated that lycopene significantly lowered the risk of prostate cancer. The candidates that consumed processed tomato products about 10times per week had less than one half the risk of developing prostate cancer. Lycopene activity is likely to be related to its antioxidant function because lycopene has been reported to be the most efficient quencher of singlet oxygen in biological system. Lycopene has also been shown to reduce risk of other types of cancers of digestive tract, pancreas, cervix, bladder and skin. Recently it has been proved that low plasma lycopene levels may be an independent risk factor for lung cancers especially in smokers.

MILK BIOLOGICALLY ACTIVE COMPONENTS AS NUTRACEUTICALS

Milk contain components that provide critical nutritive elements, immunological protection and biologically active substances to neonates. Milk proteins are currently the main source of a range of biologically active peptides concentrates and these peptides are potential health enhancing nutraceuticals for food and pharmaceutical applications.

Several bioactive peptides may be used as nutraceuticals, for example, in the treatment of diarrhea, hypertension, thrombosis, dental diseases as well as mineral malabsorption and immuno deficiency. Minor wheyproteins such as lactoferrin lacto peroxidase, lysozyme and immuno globulins are considered as antimicrobial proteins. Milk also contain some natural bio active substances. These include oligosaccharides, fucosylated oligosaccharides, hormones, growth factors, mucin, gangliosides and endogenous peptides which are present in milk at secretion.4 Bioactive Proteins/Peptides as Natural Ingredients Of Milk

- Thyrotropin - releasing hormone (TRH)
- Luteinizing hormone - releasing hormone (LHRH)
- Somatostatin (SIH)
- Gastrin - releasing peptide (GRP)
- Calcitonin
- Adrenocorticotropic hormone (ACTH)
- Insulin
- Growth factors
- Prolactin
- Thyroid stimulating hormone (TSH)
- Lysozyme
- Lacto peroxidase
- Lacto ferrin
- Transferring
- Immunoglobulins (IgA, IgM, IgG)
- Enzymes (eg. Plasmin)

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MARKET INTEREST OF NUTRACEUTICALS

The nutraceuticals industry is still in its formative period, and at present there is no universal agreement or legal definitions of the terms and designations used by this industry sector. According to the widely accepted definition, "A nutraceutical is any substance that is a food or a part of a food and provides medical or health benefits including the prevention and treatment of disease." Products include isolated
nutrients, dietary supplements and processed foods such as cereals, soups, soyfood, and beverages. The nutraceuticals market comprises two principal segments:
Functional Foods and Dietary Supplements.
Functional foods are similar in appearance to a convneanl tfioood or beverage, are
consumed as part of a normal diet, and have been demonstrated to have physiological
benefits or to reduce the risk of chronic disease beyond basic nutritional functions.
Functional foods can also promote growth and development and enhance performance, and can take many forms. Some may be conventional foods with bioactive components that can now be identified and linked to positive health outcomes (e.g., soy protein, oat fiber, cranberries, tomatoes and carrot juice). Some may be fortified to enhance foods or specifically created to reduce disease risk (e.g., vitamin- and mineral-fortified cereal, folate-fortified flour and grain products, calcium-enriched orange juice or milk, phytos-fteorrotilfied spreads)

MARKETED PRODUCTS

II. CONCLUSION

Nutraceuticals are food supplements and have nutritional value. The present junk foods will not provide any nutritional value, rather it adversely effect the body. Hence it is concluded that nutraceuticals can be recommended as a regular part of the diet.
Nutraceuticals are present in most of the food ingredients with varying concentration.
Concentration, time and duration of supply of nutraceu ticals influence human health.
Manipulating the foods, the concentration of active ingred ients can be increased.
Diet rich in nutraceuticals along with regular exercise, stress reduction and maintenance of healthy body weight will maximise health and reduce disease risk.

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