



A Conspectus on Nutraceuticals with an Ayurvedic Narrative

Author: Anand Katti¹

Co Authors: Suryakanth Ghule²

¹Dept of Samhita Siddhanta, Govt. Ayurveda Medical College, Bangalore, KA, India

²Dept of Shareera Rachana, Govt. Ayurveda Medical College, Bangalore, KA, India

ABSTRACT

Consumers thrust for better quality of life and searching alternative and complementary health products has fuelled the 'Nutraceutical revolution'. Nutraceuticals are defined as natural bioactive materials that reduce the risk of chronic diseases, or provide demonstrated physiological benefits above and beyond their basic nutritional function. The association of Nutraceuticals with traditional and ancient medicine brings the long-standing consumer acceptance. Although the concept of Nutraceuticals is gaining more global popularity more recently, its roots are embedded in ancient Indian system of medicine, Ayurveda. The classical texts of Ayurveda are having many scattered references of implication of food products in various disease entities and health. Ayurveda, the more than 5000-year-old health science has mentioned benefits of food for therapeutic purpose. The Philosophy behind is "Focus on Prevention".

Key Words *Nutraceuticals, Functional foods, Aharavarga*

INTRODUCTION

Industrialization has caused numerous air and water pollutions, soil and food contamination because of rampant use of various electromagnetic waves, heavy metals, chemicals and other highly harmful man-made items. These problems have led to an increased incidence of many metabolic diseases, different cancers, diabetes, and vascular diseases, physiological problems, as well as other degenerative diseases. The revised demands for health care have tremendously increased the cost of medical care. Therefore, the tendency to achieve a better quality of life by eating more vegetables, fruits, and other plant foods, taking

dietary supplements or nutraceuticals, or using nutritional therapy or phytotherapy is increased¹. Hence increasing demands for nutraceuticals, functional foods and their therapeutic services, marketers, manufacturers, and related licensed professionals have grown up accordingly. The interest in nutraceuticals and functional foods is growing, progressive research efforts to identify properties and potential applications of nutraceutical substances is also increasing. Public awareness, interest and consumer demand has reached its pinnacle. Current population and health trends wherein metabolic diseases outnumber many other diseases serves as a



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principal reason for the growth of the functional food market.

Plants are one of the most important resources of human foods and medicines. Spontaneous increasing knowledge on nutrition, medicine, and plant biotechnology has changed the concepts about food, health and agriculture and brought in a revolution on them. Owing to recent advances in medical and nutrition sciences, natural products and health promoting foods (like nutraceuticals) have received more attention from both health professionals and the public.

NUTRACEUTICALS

The term “nutraceutical” was framed from 'nutrition' and 'pharmaceutical' by DeFelice in 1989. A nutraceutical can be defined as any substance that may be considered a food or part of a food and provides medical or health benefits including the prevention and treatment of disease².

When DeFelice defined, the Nutraceuticals ranged from isolated nutrients, dietary supplements and diets to genetically engineered “designer” foods, herbal products and processed products such as cereals, soups and beverages³.

FUNCTIONAL FOODS AND NUTRACEUTICALS

The concepts of nutraceuticals, functional or medical foods and dietary supplements are most often confusing and are being used interchangeably. These concepts can be distinguished by their description from different points of view, e.g. functional food is a general term to emphasize foods with specific or strong

purposes. Dietary supplements have more defined health roles such as vitamins, minerals, herbs or other botanicals, amino acids, and other dietary substances intended to supplement the diet by increasing the total dietary intake of these ingredients. Dietary supplements are not used to treat or cure disease, whereas nutraceuticals more emphasize the expected results of these products, such as prevention or treatment of diseases.

However, functional food concept is different from nutraceuticals and can be defined as food products to be taken as part of the usual diet in order to have beneficial effects that go beyond what are known as traditional nutritional effects⁴. Functional food products are milk, cheese and eggs that are all enriched with omega-3 fatty acids; yogurt enhanced with live active cultures (probiotics); fruit juices and drinks with increased antioxidant levels; cereals and grains such as wheat, oat, barley and fenugreek products with enhanced amounts of dietary fibre; modified fatty acid vegetable oils; and vegetable proteins from soy, canola and hemp, legumes and fruit products. Nutraceuticals are described as products extracted, purified or produced from a plant, animal or marine source (e.g. antioxidants from blueberries, elk velvet, fish oils), or produced from dried, powdered, or pressed plant material. Therefore most apt definition would be, Nutraceuticals are the products that are prepared from foods, but sold in the form of pills, powders or in other medicinal forms not usually associated with foods. Nutraceuticals have proven evidences for

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physiological benefit or prevents the onset of chronic disease.

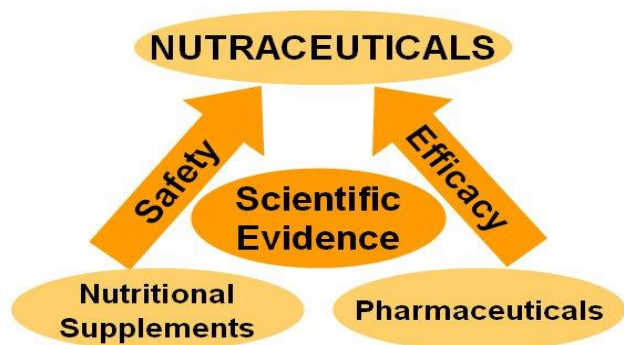


Figure 1 Relation between Nutraceutical, Pharmaceutical and Nutritional supplement⁵

CLASSIFICATION OF NUTRACEUTICALS

They can be organized in several ways based on specific interest of an individual. Cardiologist will be interested in nutraceutical substances which have a positive influence on hypertension and hypercholesterolemia, reducing the risk factors of heart disease. While Oncologist will be interested in substances that are associated with anticarcinogenic activities like augmentation of microsomal detoxification systems and antioxidation defences, or substances which reduce the progression of existing cancer.

Food scientists working on development of a nutraceutical product have classified based upon,

food source, mechanism of action and chemical nature

1 Food source

Many nutraceutical substances are found in plants, animals and in microbes, for example microbes, plants and animals contain choline and phosphotidycholine. Linolenic acid is found in a variety of food sources including animal tissues though it is primarily synthesized in plants and other lower members of the food chain. Most of nutraceutical substances are seen in plants. The substance and plant source is narrated in table 1.

Nutraceutical substance found in animals: The chief nutraceuticals of animal source are Conjugated Linoleic Acid (CLA), Eicosapentaenoic acid (EPA), Docosahexenoic acid (DHA), Sphingolipids, Choline, Lecithin, Calcium, Ubiquione, Selenium and zinc.

Nutraceuticals present in microbes: They are *Saccharomyces boulardii* (yeast), *Bifidobacterium bifidum*, *Bifidobacterium longum*, *Bifidobacterium infantis*, *Lactobacillus acidophilus*, *Streptococcus salvarius*.

Table 1 Nutraceutical substances with its sources

SI No	Nutraceutical Substance/Family	Foods of Remarkably High Content
1	Allylsulfur compounds	Onions,garlic
2	Isoflavones (genestein, daidzein)	Soybeans and other legumes
3	Quercetin	Onion, red grapes, citrus fruit, broccoli
4	Capsaicinoids	Pepper fruit
5	Lycopene	Tomatoes and tomato products
6	Isothiocyanates	Cruciferous vegetables
7	β -Glucan	Oat bran
8	Resveratrol	Grapes (skin), red wine
9	β -Carotene	Carrot, squash,pumpkin, citrus fruit
10	Catechins	Teas, berries, cocoa, apples, grapes
11	Adenosine	Garlic, onion
12	Indoles	Cabbage, broccoli, cauliflower, Brussels sprouts
13	Curcumin	Turmeric
14	Ellagic acid	Grapes, strawberries, raspberries, walnuts



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15	Anthocyanates	Red wine
16	3-n-Butyl phthalide	Celery
17	Cellulose	Most plants (component of cell walls)
18	Lutein, zeaxanthin	Kale, collards, spinach, corn, eggs, citrus
19	Psyllium	Psyllium husk
20	Monounsaturated fatty acids	Tree nuts, olive oil
21	Inulin, Fructooligosaccharides	Whole grains, onions, garlic
22	Lignans	Flax, rye
23	Carnosol	Rosemary
24	EPA and DHA	Fish oils
25	CLA	Beef and dairy
26	Lactobacilli, Bifidobacteria	Yogurt and other dairy

2 Mechanism of action

This method groups nutraceuticals together, regardless of food source, based upon their proven or purported properties. They can be classified based on Antioxidation, Antibacterial, Hypotensive, Hypocholesterolemic, Anti aggregate, Anti-inflammatory, Anticarcinogenic, Osteoprotective actions. Some nutraceuticals have more than one action For eg Omega 3 PUFAs fatty

acids are used as Precursors for eicosanoid substances that locally vasodilate, bronchodilate and deter platelet aggregation and clot formation, prophylactic for asthma and heart disease, it also helps in cell growth signaling mechanism, it inhibits synthesis of fatty acids. Classification of nutraceuticals based on actions is provided in table 2.

Table 2 Nutraceuticals based on actions

Anticancer	Positive Influence on Blood lipid profile	Antioxidation	Anti inflammatory	Osteogenic /Bone Protective
Capsaicin	Beta Glucan	CLA	Linolenic acid	CLA
Genestein	Gamma tocotrienol	Ascorbic acid	EPA	Soy Protein
Alpha tocotrienol	MUFA	Beta carotene	DHA	Genestein
Gamma tocotrienol	Quercetin	Polyphenols	Capsaicin	Daidxein
CLA	Omega PUFAs	Tocopherols	Quercetin	Calcium
Lactobacillus acidophilus	Resveratrol	Tocotrienols	Curcumine	
Sphingolipids	Tannins	Indole 3 carbonol		
Limonese	Beta Sitosterol			
Diallylsulfide	Saponins			
Ajoene				
Alpha tocoferol				
Enterolactone				
Curcumine				
Ellagic acid				
Lutein				
Carnosol				
L bulgaricus				

3 Chemical nature

This classification helps grouping either in molecular or elemental classification,

Isoprenoid derivatives

(Terpenoids): Isoprenoids and terpenoids are similar terms and they refer same class of



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molecules, these substances are the large groups of secondary metabolites.

Phenolic substances: Phenolic compounds are also considered secondary metabolites. From this structure larger molecules are formed such as anthocyanins, coumarins, phenylpropamides, flavonoids, tannins and lignin.

Carbohydrate and derivatives: Carbohydrates are present in plants as cellulose, hemicelluloses, starch and polysaccharides. Other important carbohydrate derivative with nutraceutical property ispectin.

Fatty acids and structural lipids: The formation of CLA probably serves to help control the vitality of the releasing bacterial population in the rumen while plants and fish used omega 3 fatty acids for their properties in membranes.

Amino acid based substances: This group has the potential to include protein i. e soy protein, polypeptides, amino acids and nitrogenous and sulfur amino acid derivatives. Another nutraceuticals amino acid derived molecule is folic acids, which is believed to be cardio protective in its role of minimizing homocysteine levels.

Microbes (probiotics): This group includes bacteria. A microbe which must be resistant to acid conditions of stomach, bile and digestive enzymes normally found in the human gastrointestinal tract; able to colonize human intestine; safe for human consumption; and have scientifically proven efficacy.

Minerals: Several minerals have been recognized for their nutraceuticals potential and the most

obvious is calcium with relation to bone health and cardiovascular disease.

Why Nutraceuticals?

- ✓ For so many of us, it is impossible to get adequate nutrition from the routine food.
- ✓ Secondly, we live in highly toxic environment, filled with pollution and pesticides that throw off our body's ability to regulate it.
- ✓ Also, consider the number of new ailments that are haunting us: chronic fatigue, Epstein Barr, lupus etc. now they are wide spread in our population.
- ✓ This is more sensible strategy-to strengthen our system or terrain rather than settling for antibiotic which has lost their effectiveness.
- ✓ There are typically side effects from drugs because they are not natural to the body, whereas with good quality supplementation that can be absorbed and utilized by the body, we can truly strength our body and add vitally⁶.

Why Nutraceutical seems attractive?

- Many diets are rich in phenolics component and are daily consumed by human beings.
- They rarely have any side effects.
- They have relatively long half-life
- They can be easily absorbed in the intestine after ingestion.
- They do not require on appointment with a health care provider and are easily available without prescription.
- Many people believe this approach is more natural than using prescription drug. They feel dietary supplements will help them feel stronger



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and healthier, give them more energy and prevent illness.

➤ Some people turn to these products when they feel standard treatments for their specific illnesses have failed.⁷

AN AYURVEDIC PERSPECTIVE

Ayurveda is a unique science, most ancient yet most scientific and systematic. Ayurveda keeps health at the epicenter and discusses concepts and methods to maintain it or acquire it in case of disease. Ayurveda believes that man and diseases both are born out of *ahara* (food/diet) (*aharasambhavamvasturogaschaaharasambhava*)⁸. *Ahara* is an integral part of treatment for any disease, *vihara* (behavioural regimen) and *aushadha* (medicine) being the other components of comprehensive treatment regime. Ayurveda classifies the *dravya* (drugs) into *aharadravya* (foods) and *aushadhadravaya* (medicines) with a thin distinction in property as *rasapradhanamaharadravyam*, *veeryapradhanamaushadhi dravyam*⁹. Effectively one is predominantly nutritive in nature and the other is curative. Acharya Charaka states that the food/diet which besides providing the basic nutrition to the body, helps maintenance of healthy state of the body and prevents the manifestation of diseases should be consumed.

It is important to learn that Ayurveda lays a great emphasis on the quality of nutritious

food/herbs/medicine/modified foods for (i) preventing the degenerative changes caused by ageing (*Rasayana*), (ii) convalescence after an illness (*Samsarjanapathya/Balya*), (iii) enhancing the defence system (*Roga Pratibandhaka Rasayana*), (iv) maintaining the vigor (*Vajikarana*), and (v) for maintaining the vitality (*Jeevaniya*)¹⁰. *Rasayana* drugs are divided into three varieties, *Kamya* (for longevity, vitality, intellect etc.), *Naimmitika* (for specific diseases) and *Ajasrika* (general). *Ajasrika rasayana* deals with the daily consumption of specific food products to rejuvenate the body. These food products are meant to improve the quality of life by offering protection from internal and external assaults or stressors. Their usage can be also classified depending upon the age of the individual, season of consumption, time of consumption, physiological conditions and according to the target organ. These are some of the contexts in ayurvedic literature wherein nutraceutical actions can be implied.

Since the definition of nutraceutical rallies upon the nutraceutical substance present in foods having their role in disease, hereafter a table 3 is depicted which focuses on 12 *aharavarga* of Acharya Charaka¹¹ with few examples. And other concepts of *rasayana*, *jeevaniya* etc have been kept out of the scope of this paper.

Table 3 *Aharavarga* of Charakasamhita with nutraceutical inferences.

Sl No	<i>Aharavarga</i>	Perticulardravya (substance)	Health Benefits
1	<i>Shukadhanya</i>	<i>Shukadhanya</i> (all) <i>raktashaali</i>	<i>Mutrala</i> , <i>Shukrala</i> <i>TrushnaNashaka</i>



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	<i>Yava</i>	<i>Purishavardhaka, Balya</i>
	<i>Godhuma</i>	<i>Sandhaniya, Jeevaniya, Brumhaniya, Vrushya</i>
2	<i>Shamidhanya</i>	<i>Masha</i> <i>Vrushya, Balya, Purishavardhaka</i>
	<i>Rajamasha</i>	<i>Ruchikara, Amlpittahara,</i>
	<i>Kulattha</i>	<i>Grahi, Kasa, ShwasaHikka, Arshoghna</i>
	<i>Tila</i>	<i>Twachya, Keshya, Balya</i>
3	<i>Mamsavarga</i>	<i>Prasaha</i> <i>Balya, Arsha, Grahani, Shosha</i>
	<i>Avika</i>	<i>Brumhana</i>
	<i>Mayura</i>	<i>Balya, Vrushya</i>
	<i>Hamsa</i>	<i>Varnya, Balya</i>
	<i>Kukkuta</i>	<i>Vrushya, Brumhana, Balya</i>
	<i>Chataka</i>	<i>Balya, Vrushya</i>
	<i>Mahisha</i>	<i>Vrushya, Nidraprapti</i>
4	<i>Shakavarga</i>	<i>Kakamachi</i> <i>Vrushya, Rasayana, Kushthagna</i>
	<i>Rajakshavaka</i>	<i>Grahani, Arshas</i>
	<i>Changeri</i>	<i>Arsha, Grahani</i>
	<i>Upodika</i>	<i>Vrushya, Mada</i>
	<i>Trapusa, ervaru</i>	<i>Mutrala, Trushna</i>
	<i>Utpala</i>	<i>Kshaya</i>
	<i>Poushkarabeeja</i>	<i>Raktapitta</i>
	<i>Vidarikanda</i>	<i>Jivaniya, Brumhaniya, Vrushya, Mutrala</i>
	<i>Amlika</i>	<i>Grahani, Madatyaya</i>
5	<i>Phalavarga</i>	<i>Mrudvika</i> <i>Trushna, Jwara, Raktapitta, Shwasa, Kasa, Kshaya,</i> <i>Madatyaya, Vrushya</i>
	<i>Kharjura</i>	<i>Vrushya, Brumhana,</i>
	<i>Narikela</i>	<i>Balya</i>
	<i>Kapittha</i>	<i>Vishaghna, Grahi</i>
6	<i>Haritavarga</i>	<i>Surasa</i> <i>Hikka, Shwasa,</i>
	<i>Palandu</i>	<i>Balya, Vrushya, Ruchya</i>
	<i>Lashuna</i>	<i>Krimighna, Kushthagha, Gulmagha</i>
7	<i>Madyavarga</i>	<i>Sura</i> <i>Grahani, Arsha, Stanyajanana</i>
	<i>Madira</i>	<i>Hikka, Shwasa, Pratisyaya,</i>
	<i>Arishtha</i>	<i>Jwara, Shosha, Pandu, Grahani, Arsha</i>
8	<i>Jalavarga</i>	<i>NA</i> <i>Not Available</i>
9	<i>Gorasavarga</i>	<i>Go dugdha</i> <i>Jeevaniya, Rasayana</i>
	<i>Mahishadugdha</i>	<i>Anidra</i>
	<i>Ushtradugdha</i>	<i>Anaha, Krimi, Shotha, Udara, Arsha</i>
	<i>Aja</i>	<i>Atisara, Kshaya, Kasa</i>
	<i>Dadhi</i>	<i>Vrushya, Pinasa, Atisara, Mutrakruhra</i>
	<i>Takra</i>	<i>Shopha, Arsha, Grahani, Udara, Aruchi, Pandu</i>
	<i>Go Ghruta</i>	<i>Unmada, Shosha, Rasayana</i>
10	<i>Ikshuvarga</i>	<i>Gudasharkara</i> <i>Vrushya,</i>
	<i>Sharkara (all)</i>	<i>Trushna, Raktapitta</i>
	<i>Madhu</i>	<i>Raktapitta, Sandhaniya</i>
11	<i>Krutannavarga</i>	<i>Cannot be considered</i> <i>Because they are prepared foods that fall in the category of normal, modified or functional foods</i>
12	<i>Aharayogi</i>	<i>Erandataila</i> <i>Vatarakta, Gulma, Hridroga</i>
	<i>Sarshapataila</i>	<i>Kushta, Kotha</i>
	<i>Shunthi</i>	<i>Hridya</i>
	<i>Yavakshara</i>	<i>Hridroga, Pandu, Pliha, Arsha</i>

CONCLUSION

Nutraceuticals have proven health benefits and their consumption will keep diseases at bay and

allow humans to maintain an overall good health.

They are safe and can be used for long time and are put in clinical practice. Ayurvedic literature has advocated the health benefits of certain food



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substances which can be a logical parallel for nutraceuticals. However, in the current scenario, the list of food substances listed in *aharavarga* with preventive and curative effects needs scientific validation.



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