



NUTRACEUTICALS

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ABSTRACT

Nutraceutical is a combination of the words "nutrition" and "pharmaceutical." Dietary fiber, prebiotics, probiotics, polyunsaturated fatty acids, antioxidants, and other herbal/natural foods are examples of food products utilized as nutraceuticals. Over 70% of Americans take a nutritional supplement on a daily basis, and the supplement industry is a multibillion-dollar sector with a revenue of over \$28 billion. Supplements, unlike foods and medications, do not need to be registered or approved by the FDA before being manufactured or sold. FDA is limited to post-marketing adverse report monitoring under the Dietary Supplement Health and Education Act of 1994 (DSHEA). Despite widespread use, evidence of health benefits from nutraceutical or supplement use in well-nourished people is sparse. A tiny number of these products, on the other hand, have the potential to cause substantial toxicity. Furthermore, people rarely tell their doctors about their supplement use. As a result, there is a considerable possibility of negative drug-supplement interactions. This section provides an overview of the key supplement and nutraceutical types, as well as known adverse effects and probable drug interactions.

Keywords: Toxicity, multivitamin/multimineral, soy protein isolate, isoflavones, bodybuilding supplements, herb-drug interaction, nutraceutical, functional food, dietary supplement

1. Introduction:

"Any substance that may be regarded a food or part of a food and delivers medicinal or health advantages, including the prevention and treatment of disease," according to the definition. According to this definition, a functional food is a type of nutraceutical.

In recent decades, major scientific and engineering developments have resulted in the development of more expensive, high-tech medical and surgical procedures, as well as medicinal therapies. Simultaneously, the number of people resorting to alternative medical approaches, which highlight the importance of a "healthy diet" in preserving and regaining health, has increased.

Stephen DeFelice, MD, founder and head of the Foundation for Innovation in Medicine, invented the phrase "nutraceutical" in 1989, combining the words "nutrition" with "pharmaceutical."

There are currently no globally agreed definitions for nutraceuticals and functional foods, while there is significant overlap between the definitions supplied by many health-related professional groups. The term "functional" suggests, according to the American Dietetic Association, that the meal has some defined value that leads to health benefits, such as a lower risk of disease, for the individual who consumes it.

Advantages: Nutraceuticals can be utilized to promote health, slow down the aging process, prevent chronic diseases, lengthen life expectancy, and maintain the body's structure and function. Nutraceuticals have recently attracted a lot of attention due to its potential nutritional, safety, and therapeutic benefits.

Disadvantages: Taking more than you require is more expensive and may increase your risk of negative effects. Too much vitamin A, for example, can cause migraines, liver damage, decreased bone strength, and birth abnormalities. Nausea and vomiting are common side effects of too much iron, which can also harm the liver and other organs.

2. Nutraceuticals:

Compounds originating from fruits and vegetables are the most often utilized nutraceuticals. They are typically anti-oxidant or anti-inflammatory substances that are thought to protect against chronic diseases like cardiovascular disease, diabetes, cancer, and osteoporosis. Flavonoid plant pigments including anthocyanins from berries, flavonols from dark chocolate, polyphenols like resveratrol from red grapes, and catechins from tea and quercetin are among the most widely eaten nutraceuticals. There isn't much evidence that these chemicals are harmful. However, metabolites of EGCG – the active catechol in green tea extract that is thought to be responsible for the antioxidant benefits of the beverage – are thought to increase oxidative stress

and have been linked to liver damage. Given the dearth of major clinical trials, it's also unclear whether these nutraceutical supplements provide true health advantages. The soy-derived isoflavones genistein and daidzein, as well as the daidzein metabolite equol, have been the most extensively investigated nutraceutical flavonoids. In vitro and in animal models, isoflavones in their purified form have been shown to have estrogenic properties, including the ability to cause uterine hypertrophy or reproductive tract malformations, reduce testis size, inhibit androgen production, reduce fertility, and stimulate estrogen-dependent tumor growth. Menopausal women have increasingly turned to nutritional supplements to alleviate symptoms such as hot flashes, depression, and bone loss since evidence of health hazards associated with hormone replacement treatment in post-menopausal women surfaced. According to a recent survey, up to 42% of these women use soy products, including isoflavone extracts and refined isoflavones like genistein. Because these are concentrated or refined compounds, they can obtain far higher plasma levels than isoflavones taken in SPI or soy foods, which are complex combinations of bioactive proteins, peptides, and over one hundred phytochemicals. Endometriosis has been reported in women who take isoflavone supplements, and given the obvious evidence of estrogenicity, there is a possibility of an increased risk of estrogen-sensitive malignancies in isoflavone supplement users.

3.Methods:

3.1 Inflammation and nutraceuticals:

Swelling, discomfort, redness, and heat are all symptoms of inflammation, which is the body's reaction to irritation or injury. Ginger, soybean, unsaponifiable, glucosamine, chondroitin, and S-adenosylmethionine are some of the nutraceuticals whose impact on osteoarthritis has been studied. The results are limited by the heterogeneity of the research and inconsistent results, despite the fact that they are safe and well tolerated. Vitamins C and D are micronutrients that have been shown to be beneficial. Cat's claw has anti-inflammatory properties. The efficacy of cat's claw has been attributed to chemicals known as oxindole alkaloids; however, water-soluble cat's claw extracts without large levels of alkaloids do not have strong antioxidant and antiinflammatory properties.

The phytochemical resveratrol, which is found in the fruits of *Vaccinium myrtillus*, *Vaccinium angustifolium*, *Vaccinium ashei*, and *Vaccinium corymbosum*, has the greatest sirtuin-like deacetylase activity of any known phytochemical. Sirtuins are substances that block the cyclooxygenase-1 enzyme and can help yeast and fruit flies have longer lives. They have anti-inflammation and anti-fungal properties.

Prostaglandins, leukotrienes, and interleukins, which are produced by the omega-3 and omega-6 series, play a crucial role in disease by creating powerful modulatory molecules for inflammatory responses. Linoleic acid, an omega-6 essential fatty acid, is converted to gamma linolenic acid (GLA) in the body.

Osteoarthritis is a crippling joint condition that affects a large percentage of the population. In 2004, the total cost of arthritis was estimated to be around 86 billion dollars. Subjects' physical activity may be reduced as a result of joint discomfort, resulting in energy imbalance and weight increase. Weight gain can aggravate existing problems by putting additional strain on joints.

Glucosamine and chondroitin sulfate are commonly used to relieve osteoarthritis symptoms. These nutraceuticals appear to modulate gene expression and NO and PGE2 generation, which could explain their anti-inflammatory properties.

4. Toxicity potential of nutraceuticals:

Many people believe that nutraceuticals, particularly medicinal plants, are effective treatments for health problems with no adverse effects. This idea stems from the fact that they have been used for a long time without causing major side effects. Although this is true for a wide range of nutraceuticals, and they generally have fewer side effects than pharmaceuticals, traditional medicine holds that if a drug is to be effective, it must unavoidably have harmful or side-effects. Herbal medications are classified as drugs by the medical system, and as such, they must have side effects. As a result, they must be prepared with the proper components and used with prudence.

People consume thousands of plant species and other nutraceuticals to achieve their basic nutritional needs, but only a few have undergone extensive safety testing. Many are still little understood and underdeveloped, and their wild relatives are on the verge of extinction and in desperate need of protection. Stewardship of these priceless plant resources will necessitate a combination of rigorous research and an approach that values and respects traditional knowledge systems.

5.Antitoxicity Nutraceuticals:

Toxic qualities are present in the majority of synthetic pharmaceuticals, and nutraceutical substances, particularly herbal nutraceuticals, have been studied for their potential in mitigating the toxic effects of toxins and other medications.

Despite the fact that drug toxicology is complicated, there is strong evidence that oxidative stress plays a role in the toxicity of a wide range of medications. Apart from different specific techniques to battle poisons and synthetic medications, most plants have antioxidant activity and can lower their toxicity by reducing oxidative stress. The kidney and liver are two organs that are more involved than others in the harmful effects of other medications and poisons. In this regard, numerous research have been conducted to investigate the protective effects of nutraceuticals, particularly medicinal plants, against toxins and other medications, with encouraging results.

6. Evaluation research:

6.1.1Animal study:

6.1 Biological evaluation:

The Nutraceutical powder formulation may enhance test animals' swimming time to fatigue, as well as muscle building and creatinine kinase levels. These findings show that when compared to marketed formulation, nutraceutical powder formulation has anti-fatigue activity and increased swimming time as well as creatinine kinase, with day-by-day increasing activity, but 6 mg (table no. 9) concentration dose of formulation gives positive results within limits, i.e. 100-900 U/L, and can elevate exercise performance.

Table No.1: Effect of creatine kinase in force swim test on rat

Duration	Control (Vehicle) (U/L)	Test(U/L)			Standard (U/L)
		6mg	8mg	10mg	
Day 1	226±40.45	651±51.73	712±36.58	812±35.64	326±41.66
Day 2	235.4±34.17	704±14.45	814.6±44.33	836.18±35.35	322.8±25.50
Day 3	256±61.09	724.2±16.51	804.6±96.44	874.4±18.35	342.66±20.42
Day 4	299.2±12.59	726.8±11.94	834.12±49.00	904.8±15.15	375.8±33.54
Day 5	227.8±21.75	768.4±31.48	851±28.14	969±20.65	397.6±33.24
Day 6	300±69.5	899±47.54	972.6±25.55	1066.42±36.49	446.44±37.89
Day 7	312±58.8	879±25.70	989.64±29.5	1098±32.12	459±12.34
Day 8	358 ±41.18	99.48±66.39	1020.78±75.78	1146.18±43.58	590±67.34
Day 9	258±34.67	1008±23.25	1077±21.23	1187±45.76	603±34.34
Day 10	298.23±43.23	1034±32.78	1127±34.21	1204.32±52.02	640±45.23
Day 11	312.09±43.12	1043.32±12.54	1148±62.12	1289.32±31.12	734±54.03
Day 12	353.6±32.28	1057.4±28.16	1166±65.89	1304±28.65	798.72±38.84
Day 13	305.2±21.63	1139.22±3.30	1234±33.89	1321.74±28.65	841.72±41.84
Day 14	317.70±19.43	1176.31±6.48	1249±51.04	1343.3±69.83	865.46±25.57

6.2 Sensory evaluation:

- Determination of the sample for percent size to statistical calculation (StatCal) V 1.1 in order to satisfy Likert's Test
 - The best estimate of the population size is 400 people.
 - The best estimate of the population growth rate is 10%.
 - The maximum discrepancy that can be tolerated is 10%.
 - Desired level of confidence in the outcome = 93 percent
- The sample size required is 27.

Table no. 2: Sensory Evaluation

	Parameter	Very Poor	Poor	Good	Very Good	Excellance
T1	Flavor	16	11	-	-	-
	Taste	20	7	-	-	-
	Consistency	8	19	-	-	-
	Color	17	10	-	-	-
T2	Flavor	15	6	-	-	-
	Taste	14	13	-	-	-
	Consistency	14	13	-	-	-
	Color	18	9	-	-	-
T3	Flavor	17	6	4	-	-
	Taste	6	15	6	-	-
	Consistency	3	19	5	-	-
	Color	6	1	20	-	-
T4	Flavor	-	6	12	8	1
	Taste	-	5	9	9	4
	Consistency	-	4	13	8	2
	Color	-	6	12	7	2

6.3. Testing methods:

Identification, purity, and microbiological testing are the most common nutraceutical quality tests. There are further tests for pesticides, residuals, and heavy metals, as well as impurities.

Microbiological testing is currently used to validate environmental and equipment cleanliness measures, identify the microbial quality of inputs such as irrigation water or compost, monitor wash water quality, screen raw goods before to harvest, and test completed products prior to shipment.

1. Food microbiology begins with a check for the existence, types, and numbers of MO and/or their metabolites in foods.
2. When utilizing these procedures, keep in mind that none of the generally used methods will yield an exact count of the MO in a product due to unique development requirements or constraints among distinct MO.
3. If you're looking for pathogenic organisms or their poisons, you just want to know if they're present.
4. Surface methods: While recovering all germs from a surface is not always practicable, frequent surface testing of certain regions in a food plant provides vital insight into that area's relative cleanliness.

6.4 Swabbing:

MOMO is collected off a surface with sterile cotton or calcium alginate swabs (alginate swabs are ideal since the alginate dissolves easily in hexametaphosphate), transferred to broth, dislodged, then diluted and utilized with other tests to determine total counts. Larger areas can be swabbed using sponges, which can then be placed in a buffer-filled bag.

- a. Simple to execute
 - b. Low-cost
 - c. Adaptable to a variety of surfaces, including those that are flexible, uneven, and extensively polluted.
- 8.2 Rodac plates (contact plates) — a raised agar plate that is pressed against a surface and incubated.

Advantages:

1. For smooth, firm, and nonporous surfaces, this is the method to use (e.g. vat in a cheese plant)
2. You can utilize any form of media.

Disadvantages:

1. Enumeration on extremely contaminated surfaces is challenging due to colony proliferation.
2. Removes just around 0.1 percent of contact flora, which is far less than swabs.

The agar syringe or "sausage" is a modified variation of this technique. Samples are pressed against a surface in an agar tube and then sliced off into a Petri plate for incubation.

6.5 Excision method

a plug of known surface area is removed from the food, followed by a 1-3 mm section of the surface end being removed, homogenized, and plated to ascertain total numbers. Whole beef cuts are frequently used.

7. Conclusion:

Many nutraceuticals, functional foods, and naturally occurring substances examined and reported in various studies revealed that these products are extraordinarily active, have substantial effects on cell metabolism, and have few side effects. It's only natural that people's attention is turning to a proactive approach to disease prevention in order to stay healthy. Nutraceuticals is a scientific field that has been developed all over the world. Nutraceuticals have an advantage over synthetic medications being developed by the pharmaceutical sector in many circumstances. It is unique pharmacological activity that has piqued curiosity due to its potential clinical application in the prevention and treatment of a variety of disorders. The majority of pharmaceutical corporations are typically unmotivated to pursue these patent challenges. It is hoped that government organizations and research centers will fund more nutraceutical research.

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Reference:

- 1.Stauffer JE. Nutraceuticals.Cereals Food World. 1999; 44(2): 115-116.
- 2.Brower V. Nutraceuticals: poised for a healthy slice of the healthcare market. National Biotechnol.1999; 16: 728-731.
- 3.Kessler RC, Davis RB, Foster DF, et al. Long Term Trends in the Use of Complementary and Alternative Medical Therapies in the United States. Ann Intern Med. 2001; 135(4): 344-351.
- 4.Shashank B.Capacity building in the Indian food industry: Opportu-nities and Challenges, Proc. Ind. symp, CFTRI Mysore (India), June23-25, 2006.
- 5.Bass IS and Young AL. Dietary Supplement Health and Education Act. The Food and Drug Law Institute, Washington DC, 1996.
- 6.Scarlett T. How modernized is FDA now? FDLI Update. 3:1, 1998.
- 7.Ohama H, Ikeda H and Moriyama H. Health foods and Foods with health claims in Japan. Toxicology. 2006;221:95-111
- 8.Hathcock J. Dietary supplements: How they are used and regulated. J. Nutrition. 2001; 131: 1114-1117.
- 9.Allen LV. Nutritional Products, In: Covington TR, Berardi RR, Young LL, et al. Editors. Handbook of Nonprescription Drugs. Washington DC:

American Pharmaceutical Association; 1997.

10. Tyler VE, Foster F. Herbs and phytochemicals, In: Covington TR, Berardi RR, Young LL et al. editors. Handbook of Nonprescription Drugs. Washington DC: American Pharmaceutical Association; 1996.