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Health Benefits of Nutraceuticals

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Introduction

Hippocrates (460–377 BC), often considered the father of modern medicine, famously said, "Let food be thy medicine and medicine be thy food," emphasizing the connection between suitable foods, health, and their therapeutic properties. Nutraceuticals encompass a wide range of products, including isolated nutrients, herbal remedies, dietary supplements, and specialized diets. They are generally non-toxic and do not typically produce side effects. The term "nutraceuticals" is a combination of "nutrients" and "pharmaceuticals." In the United States, nutraceutical products can include drugs, food ingredients, and dietary supplements.

Classification of Nutraceuticals

Nutraceuticals are classified based on their primary functions and ingredients. Here are some common classifications:

1. **Functional Foods:** Functional foods are foods that provide health benefits beyond their nutritional value. Fortified cereals, probiotic yogurt, and omega-3 boosted eggs are a few examples.
2. **Dietary Supplements:** Dietary supplements are products that are taken orally in addition to a normal diet to provide nutrients that may be missing. These include

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vitamins, minerals, amino acids, herbs, or other botanicals in pill, capsule, tablet, or liquid form.

3. **Herbal Supplements:** These are derived from plants or plant extracts and are used for their medicinal properties Examples echinacea for immune support, ginger for digestive health, and ginkgo biloba for cognitive function.
4. **Probiotics and Prebiotics:** Probiotics are live microorganisms that provide health benefits when consumed in adequate amounts, such as improving gut health. Prebiotics are indigestible fibers that help the good bacteria in the stomach flourish. example of probiotics and prebiotics are yogurt, garlic respectively.
5. **Omega Fatty Acids:** These are essential fatty acids that have numerous health benefits, especially omega-3 and omega-6 fatty acids. They are commonly found in fish oil supplements and flaxseed oil.
6. **Nutraceutical Beverages:** These are beverages fortified with vitamins, minerals, antioxidants, or other bioactive compounds. Examples energy drinks with added vitamins and herbal teas with antioxidant properties.
7. **Sports and Performance Supplements:** These are products designed to enhance athletic performance, recovery, and muscle growth. They may include protein powders, amino acids, creatine, and caffeine-based supplements.
8. **Weight Management Supplements:** These include products designed to aid in weight loss or weight management, such as fat burners, appetite suppressants, and meal replacement shakes.

Each of these classifications plays a specific role in promoting health and wellness, and their effectiveness can vary based on individual needs and conditions.

Significance

1. Boost the nutritional value of our diet.
2. Help us live longer.
3. Assist us in avoiding certain illnesses.
4. Use as the treatment, prevention, cure of diseases.
5. It is used as conventional food.
6. Increase the health benefits effect.
7. Not produce any side effects.

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8. Used any cardiovascular disease and cancer

Benefits of Nutraceuticals

- **Regulatory Body Function**

  Nutraceuticals are therapeutic foods that contribute to maintaining health, enhancing appearance, regulating immunity, and preventing and treating certain illnesses. As a result, one way to conceptualize the Meadow of Nutraceuticals is as one of the misplaced building pieces in the physical condition that humans foster.

- **Role in Cancer**

  Nutraceuticals have the ability to reduce the growth rate of cancer. It also has potential to reduce toxicity associated with chemotherapy and radiotherapy and they inhibit cell proliferation and induce apoptosis in cancer cells. Nutraceuticals can increase natural killer cells function.NF-kB is a transcription factor responsible for development of growth by altering genes of cell, cell adhesion and inflammation and growth. However, certain phytochemicals prevent carcinogenesis by acting on that factor and blocking its activation process.

The following are a few phytochemicals that are utilized in cancer treatment:

1) **Polyphenols:**

a. **Resveratrol:** It is found in foods such as peanuts, pistachios, grapes, red and white wine, blueberries, cranberries, and even cocoa and dark chocolate. It has natural anti-proliferative activity. It acts as anti-cancer, anti-carcinogenesis.

b. **Epigallocatechin-3-gallate:** EGCG is mainly found in green tea, it also exists in small amounts in other fruits such as cranberries, strawberries, blackberries, kiwis, cherries, pears, Peaches, apples, and avocados. It has limitation due to its less bioavailability and conversion into its inactive methylated Metabolites

2) **Quercetin:** Quercetin is the most abundant flavonoid. The source of quercetin are onions, apples, grapes, berries, broccoli, citrus fruits, cherries and tea. The effects of quercetin are related to induction of cell apoptosis.

3) **Phenolic compounds:** Phenolic compounds such as curcumins, gallic acid, ferulic acid, and caffeic acid have anticancer activity. Turmeric could be a source of curcumin, sources of gallic corrosive are walnuts, jumps, apples, and flax seeds. The sources of ferulic corrosive are pineapple, asafoetida, grains, vegetables, beans, seeds of coffee,

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artichoke, shelled nut and nuts. strawberries, cabbage, apples, radishes, coffee, wine, turmeric are the sources of caffeic acid.

4) **Lycopene:** Major sources of lycopene are the tomatoes, guava, pink grapefruit, water melon. Because of the unsaturated nature of lycopene, it is considered to be a potent antioxidant. It acts via decrease in oxidative stress and damage to DNA.
5) **Tannins**: Tannins are present in grapes, tea, blackberries, blueberries and cranberries. It acts as scavenger harmful free radicals and detoxifies carcinogens.
6) **Saponins:** Saponins are present in peas, soybeans, tomatoes, potatoes, alfalfa, spinach. It has the anti-tumor activity which lowers the risk of cancer. It produces activity preventing cancer cells from growing.
7) **Pectin**: It is soluble fibre found in apples and prevents prostate cancer metastasis by inhibiting cancer cells from adhering to other cells in the body.
8) **Vitamins:** Vitamins A, C and E have antioxidant properties. Vitamin A deficiency enhances tumorigenesis.
9) **Beta carotene**: Beta carotene is found in yellow, orange, green leafy vegetables, and fruits such as tomatoes, sweet potatoes, orange, broccoli, carrots, spinach. It has antioxidant properties and prevents cancer.
10) **Garlic:** Allyl sulphur compounds of garlic have the ability to inhibit the risk of cancer. Flavonoids components of garlic show strong activities of killing cancerous cells.
11) **Marine Nutraceuticals:** Acetylapoaranotin, astaxanthin, siphonoxanthin are the phytochemicals found from marine resources which are used in treatment of colon cancer.

Role in Cardiovascular Disease:

Dietary variables are vital donors to cardiovascular hazard, either straightforwardly or through their impacts on other cardiovascular chance variables counting hypertension. Defensive impacts against CVD have been illustrated for a few nourishments and dietary supplements. A few nutraceutical classes have been suggested to offer possible benefits in the management of cardiovascular disease (CVD); the most well-supported of these are succinctly summarized below.

1. **Flavonoids and polyphenols**: Secondary metabolites in the plant kingdom are polyphenols, which contain the molecules of the flavonoid (Anthocyanins, flavan-3-

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ols, flavonols, flavanones, flavones and isoflavones). Flavonoids are a bunch of phenolic compounds found actually in natural products, vegetables, tea and ruddy wine that have cardioprotective and anticarcinogenic properties.

2. **Vitamins**: Endogenous and exogenous antioxidant defence mechanisms of the hypertensive patient are impaired. Vitamin C is associated in the human body. It shows lower the blood pressure.
3. **Lycopene**: It is obtained from red fruits almost 90% of the total carotenoids that make up the tomato are composed of lycopene.
4. **Garlic**: It shows historical role in good and medicinal importance. It shows anti-inflammatory, antioxidant properties. H_2S is a cardioprotective gas signaling molecule present in garlic.
5. **Spirulina**: It is a rich source of protein, vitamins, minerals, carotenoids, and phycocyanin and has a very long history of use as a human foodstuff with no apparent concerns over safety.
6. **Sterols**: Consumption of plant sterols has been shown to be associated with lower circulating concentrations of total cholesterol in humans.

Role in Diabetes

Diabetes mellitus is distinguished by abnormally high blood glucose levels, which are caused by either inadequate insulin invention or its ineffectiveness. The most common types of diabetes are type 1 diabetes, which is an auto-immune disorder. Type 2 diabetes, which is associated with obesity. Gestational diabetes happens throughout pregnancy. The total number of people with diabetes is expected to increase from 171 million in 2000 to 366 million in 2003.

1. **Vitamin C:** It is a chain breaking antioxidant, has scavenging property and prevents the propagation of chain reaction that would lead to reduction. Vitamin C level impair insulin resistance.
2. **Vitamin D/Calcium:** High calcium intake acts as protective to develop diabetes. It acts by suppressing secretion of parathyroid hormone and good calcium/vitamin D level helps to prevent diabetes mellitus.
3. **Vitamin E:** It mainly acts as an antioxidant. Low level of vitamin E produces increase in frequency of diabetes.

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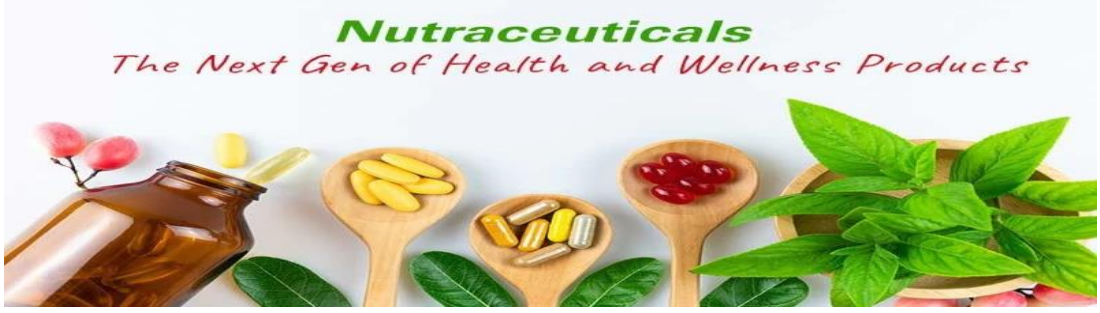
4. **Fibres**: sources of fibre are fruits and vegetables. It provides protective effects against chronic diseases.
5. **Omega-3- fatty acids:** Reduce glucose tolerance. Ethyl Ester of n-3 fatty acids beneficial in diabetic patients. Lipoic acid an antioxidant used in diabetic neuropathy.
6. **Polyphenols**: Polyphenols such as gallic acid, ferulic acid, caffeic acid, coumaric acid have an antioxidant activity. Pineapple, asafoetida, grains, vegetables, beans, coffee seeds, artichoke, kiwi, strawberries, cabbage, apples, radishes, coffee, and turmeric are the sources of polyphenols.
7. **Minerals**: Minerals such as chromium, manganese, magnesium and zinc are essential for the treatment of diabetes. Chromium increases the number of insulin receptors in target tissue and also enhances the binding of insulin within the receptor. Magnesium is a cofactor in glucose oxidation and increases insulin secretion.

Conclusion:

In conclusion, nutraceuticals represent a diverse array of therapeutic compounds derived from natural sources, ranging from functional foods to dietary supplements and herbal remedies. Their classification based on primary functions and ingredients underscores their broad applicability in promoting health and wellness. Through their various mechanisms of action, nutraceuticals play significant roles in disease prevention, treatment, and management, offering benefits across multiple domains of human health.

The significance of nutraceuticals is evident in their ability to increase the health value of diets, potentially extend lifespan, and aid in the avoidance of specific medical conditions. Their utilization spans from conventional food to targeted treatments for diseases with minimal to no side effects. With a focus on cardiovascular disease, cancer, and diabetes, nutraceuticals exhibit promising effects in modulating physiological functions, reducing risks, and enhancing overall well-being.



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