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A REVIEW ON NUTRACEUTICALS IN HEALTH AND DISEASE MANAGEMENT

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ABSTRACT

This review explores nutraceuticals natural food-derived substances offering therapeutic and preventive health benefits beyond basic nutrition. The term, coined in 1989, blends “nutrition” and “pharmaceutical.” The paper classifies nutraceuticals based on their source (plants, animals, microbes), chemical nature, mechanism of action, and functional use (e.g., dietary supplements, functional foods). It discusses their role in managing lifestyle diseases like cardiovascular disorders, diabetes, obesity, and inflammation. The review also highlights promising compounds such as omega-3 fatty acids, curcumin, plant sterols, and probiotics. Despite their potential, issues like lack of standardization and regulation pose significant limitations to their widespread and effective use.

KEYWORDS: Neutraceutical, Functional Food, Dietery Supplement, Phytochemical, Anti-oxidants, prebiotics, probiotics.

INTRODUCTION

The name "nutraceutical" was established in 1989 by Stephen DeFelice, MD, founder and chairman of the Foundation for Innovation in Medicine (FIM) in Cranford, NJ, merging "nutrition" and "pharmaceutical." A nutraceutical is "a food (or component of a dietary supplements) that provides medical or health benefits, involving preventing and/or treatment of a disease," according to DeFelice. Yet, there is no legal definition for the phrase "nutritraceutical," as it is frequently used in marketing.[1]

This phenomenon has given rise to new ideas including phytonutrients, nutritional treatment, nutraceuticals, and phytotherapy. besides to increasing immune function to avoid certain diseases, these functional or medicinal foods, phytonutrients, and phytomedicines also have the potential to lower side effects and medical expenses.[2]

CLASSIFICATION

1. Based on Sources.[3][4][5]

Sources	Examples
Plants	Flavonoids, carotenoids, polyphenols, alkaloids, Ascorbic acid, Pectin
Animals	Omega-3 fatty acids, collagen, glucosamine, Lecithin, Choline
Microbes	Probiotics, fermented products, Yeast
Mineral	Calcium, Magnesium
Vitamins	Vitamin D, Vitamin C

2. Based on Chemical Nature.[3][4][5]

Chemical Nature	Examples
Nutrients	Vitamin, Mineral, Fatty acid, Amino acids
Herbals	Tincture, oil, Extracts derived from plants and Herbs
Phytochemicals	Polyphenols, flavonoids, carotenoids
Enzymes	Digestive enzyme such as Bromelain, Papain

3. Based on Mechanism of Action.[3][4][5]

Mechanism of Action	Examples
Antioxidants	Vit.C, Vit.E, selenium, resveratrol
Anti-inflamatory Agents	Omega-3 fatty acids, turmeric (curcumin)

Immune boosters	Zinc, echinacea, garlic
Cholestrol-lowering Agents	P lant sterols, soluble fiber

4. Based on Functional Category.[3][4][5]

Functional Category	Examples
Dietary Supplements	Vitamins, Minerals, Amino acids
Functional Food	Fortified milk, probiotic yogurt

Neutraceutical and Disease

1. Cardiovascular disease (CVD)

Problems with the cardiac system and vascular system, including hypertension, clogged arteries, cardiac arrest, and ischemic attacks, are referred to as cardiovascular disease (CVD). Major causes include aging, anxiety, and inadequate nutrition, and unhealthy lifestyle choices.[6] Natural food-based products known as nutraceuticals offer additional health advantages over and above basic nourishment. By strengthening the heart, they can aid in the management or prevention of CVD. As an example, plant-based sterols, water-soluble fiber, and extracted garlic contribute to regulating high blood pressure and cholesterol levels, while omega-3 fatty acids from fish oil decrease swelling and bad cholesterol levels.[7] Blood arteries are shielded from harm by antioxidants such as resveratrol, curcumin, vitamins C, and E. L-carnitine and Coenzyme Q10 are two other nutraceuticals that promote cardiac muscle energy. Nutraceuticals can, in essence, naturally assist the heart, but they should be used in conjunction with health care, fitness, and a balanced diet.[9]

2. Diaet related Disease

Diet-related diseases are illnesses caused on by consuming excessive amounts of bad food or by depriving the body of vital nutrients. Obesity, type 2 diabetes, high blood pressure, high cholesterol, and cardiovascular disease are typical instances. Overeating causes excessive blood sugar, extra fat, and nutrient deficiencies, all of which damage the body over time.[8] Natural dietary ingredients with additional health advantages, known as nutraceuticals, can aid in the management or prevention of various conditions.[6] As an example, plant sterols lower bad cholesterol, omega-3 fatty acids from fish oil reduce swelling and protect the heart, and fiber from oats and psyllium regulates blood sugar and cholesterol. Antioxidants that combat cell damage brought on by a bad diet include curcumin, resveratrol, and vitamins C and E. Additionally, probiotics enhance gut health, which influences metabolism in general. To put it briefly, nutraceuticals are natural solutions for food-related health issues; nevertheless, they are most effective when used in conjunction with a healthy lifestyle and balanced diet.[9]

3. Diabetes mellitus

It is a chronic metabolic condition marked by increased blood glucose levels resulting from inadequate insulin synthesis, decreased insulin function, or a combination of both. promise for lowering oxidative stress, controlling glucose metabolism, altering gut microbiota, and increasing insulin sensitivity. Extracts from bitter melon and fenugreek, for instance, have insulin-mimetic properties, while chromium picolinate promotes the cellular uptake of glucose.[6] Nutraceuticals are a promising addition to preventative and therapeutic approaches to diabetes treatment since they may help lower the risk of diabetic complications by addressing the underlying mechanisms of insulin resistance and inflammation.[7][8]

4. Obesity

Excessive body fat buildup is a sign of obesity, a complicated metabolic problem that throws off hormone balance, causes chronic inflammation, and raises the risk of associated conditions like type 2 diabetes, heart disease, and fatty liver disease. It frequently arises from an imbalance between energy expenditure and caloric intake, which is impacted by environmental, behavioral, and genetic variables.[7] Nutraceuticals bioactive substances derived from natural sources are being investigated as helpful alternatives for weight management in addition to diet and exercise. Green tea catechins, conjugated linoleic acid (CLA), hydroxycitric acid-rich Garcinia cambogia, and omega-3 fatty acids are a few examples of nutraceuticals that may improve fat metabolism, reduce appetite, and control lipid synthesis.[6][8] Dietary fibers and probiotics enhance the makeup of the gut microbiota, which affects fat storage and energy balance.

5. Anti-inflamatory Activity

The potential of specific natural food-based substances to lessen or regulate inflammation in the body is known as anti-inflammatory activity in nutraceuticals. The body uses inflammation as a defense mechanism in reaction to stress, injury, or infection, but persistent inflammation can result in conditions like cancer, diabetes, heart disease, and arthritis. Omega-3 fatty acids, curcumin (found in turmeric), resveratrol (found in grapes), and green tea polyphenols are examples of nutraceuticals that can help prevent or reduce the synthesis of pro-inflammatory chemicals like prostaglandins and cytokines. Additionally, they function by lowering oxidative stress, a primary contributor to inflammation and tissue damage.

Lmitation of Neutraceuticals.[6][9]

Limitations

Herbal extracts, vitamins, and functional meals are examples of nutraceuticals that frequently struggle with their lack of standardization. This indicates that there is

no standard procedure to guarantee that the quantity, quality, and purity of active substances in each product are the same. For instance, since they are derived from various sources or undergo different processing, two products created from the same herb may contain significantly varying amounts of the advantageous chemicals. Nutraceuticals are not always subject to the same testing or regulations as pharmaceutical medications, which are subject to stringent quality and dose requirements.[7][8]

This lack of standardization can result in confusion, diminished confidence, and possible health hazards while using nutraceuticals. As a result, the efficacy and safety of these products can vary greatly, making it difficult for consumers and healthcare professionals to rely on consistent outcomes.[9]

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