



Therapeutic Nutraceuticals Potential in Disease Management and Wellness Enhancement

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DESCRIPTION

Nutraceuticals are food-derived substances that have beneficial effects on human health, beyond their nutritional value. They can be used for the prevention and treatment of various diseases, such as viral infections, cancer, diabetes, cardiovascular disorders, and neurodegenerative diseases. Nutraceuticals can be classified into different categories, such as vitamins, minerals, antioxidants, polyphenols, fatty acids, probiotics, and peptides. Some examples of nutraceuticals are honey, berries, green tea, curcumin, omega-3 fatty acids, and milk proteins. Nutraceuticals can modulate various biological processes, such as inflammation, oxidative stress, immune response, cell signaling, gene expression, and epigenetics. They can also interact with specific targets, such as receptors, enzymes, and transcription factors, to exert their therapeutic effects. Nutraceuticals can act as antiviral agents, by inhibiting viral entry, replication, assembly, and release, as well as by enhancing the host immune system. For instance, honey has been shown to have antiviral activity against herpes simplex virus, influenza virus, and coronavirus. Polyphenols, such as green tea catechins and curcumin, have been reported to inhibit the replication of human immunodeficiency virus, hepatitis C virus, and dengue virus. Omega-3 fatty acids have been found to suppress the expression of pro-inflammatory cytokines and chemokines, which are involved in the pathogenesis of viral infections.

Nutraceuticals can also act as anticancer agents, by inducing apoptosis, autophagy, senescence, and cell cycle arrest, as well as by inhibiting angiogenesis, metastasis, and drug resistance. For example, curcumin has been demonstrated to induce apoptosis and inhibit the activation of nuclear factor-kappa B, a key transcription factor involved in inflammation and tumorigenesis. Resveratrol, a polyphenol found in grapes and red wine, has been shown to inhibit the growth and invasion of various cancer cells, such as breast, prostate, colon, and lung cancer cells. Milk proteins and peptides have been reported to modulate the expression of tumor suppressor genes and oncogenes, as well as

to modulate the activity of antioxidant enzymes and DNA repair enzymes.

Nutraceuticals can also act as antidiabetic agents, by improving insulin sensitivity, glucose uptake, glycogen synthesis, and glucose metabolism, as well as by reducing gluconeogenesis, glycogenolysis, and lipolysis. For instance, cinnamon has been shown to enhance insulin signaling and glucose transport in skeletal muscle and adipose tissue. Berries have been found to increase the expression of glucose transporter type 4 and peroxisome proliferator-activated receptor gamma, which are involved in glucose homeostasis and lipid metabolism. Probiotics have been reported to modulate the gut microbiota and improve the intestinal barrier function, which are associated with the development of type 2 diabetes.

Nutraceuticals can also act as cardioprotective agents, by lowering blood pressure, cholesterol, triglycerides, and low-density lipoprotein, as well as by increasing high-density lipoprotein, nitric oxide, and endothelial function. For example, garlic has been shown to reduce blood pressure and cholesterol levels, as well as to inhibit platelet aggregation and thrombosis. Omega-3 fatty acids have been found to reduce the risk of arrhythmias, atherosclerosis, and myocardial infarction, by modulating the expression of cardiac ion channels, inflammatory mediators, and adhesion molecules. Coenzyme Q10, a vitamin-like substance, has been reported to improve the function of the mitochondrial respiratory chain, which is impaired in heart failure.

CONCLUSION

Nutraceuticals can also act as neuroprotective agents, by enhancing cognitive function, memory, learning, and neurogenesis, as well as by preventing neurodegeneration, neuroinflammation, and oxidative stress. For instance, *ginkgo biloba* has been shown to improve cerebral blood flow and oxygen delivery, as well as to scavenge free radicals and inhibit the formation of amyloid beta, which are involved in the pathogenesis of Alzheimer's disease. *Curcumin* has been found

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to modulate the expression of brain-derived neurotrophic factor, a key factor for neuronal survival and plasticity, as well as to inhibit the aggregation of alpha-synuclein, which is implicated in the development of Parkinson's disease. Omega-3 fatty acids have been reported to increase the levels of docosahexaenoic

acid, a major component of neuronal membranes, as well as to modulate the activity of phospholipase A2, cyclooxygenase, and lipoxygenase, which are involved in the synthesis of pro-inflammatory and anti-inflammatory eicosanoids.