Combining Food-Grown Micronutrients with Botanical Superfoods to Enhance Cellular Health & Metabolic Homeostasis

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Discussion

PLANT MICRONUTRIENTS AND PHYTOCHEMICALS

A well-balanced diet comprised of a wide variety of foods offers a complex array of nutrients, which in turn supports cellular health, physiological function, developmental processes, and metabolic homeostasis. Nutrient needs vary with individuals, their metabolic/biochemical individuality, and their current health status.[1]

Because many diets worldwide lack sufficient micronutrients and phytochemicals, a host of clinical and subclinical health issues are pandemic. This includes metabolic disease, obesity, type 2 diabetes, hypertension, food allergies, food intolerance, GI disorders, and inflammatory conditions.[2] Plant foods are the main source of micronutrients and phytochemicals. Micronutrients (vitamins and minerals), often required only in small amounts, play key roles in metabolic, cellular, and other processes essential for the survival and health of the organism. Phytochemicals, the bioactive compounds found in plants, include flavonoids, phenols, ellagic acid, and many others. Modern research finds these compounds help prevent metabolic, chronic, and degenerative disease.[2-5]

ALLOSTASIS AND CELLULAR HEALTH

The emerging science of systems biology includes multiple fields and recognizes the complex intricacies of human physiology. Concepts of homeostasis, allostasis, epigenetics, and nutrigenomics weave together a dynamic understanding of health and illness. Allostasis, defined as the body's ability to maintain stability through changes, includes the concept of energy homeostasis. Cellular homeostasis involves intricate monitoring of nutrient levels and regulation of anabolic and catabolic processes to sustain metabolic and physiological health. Chronic stress and prolonged nutrient depletion eventually leads to dysfunction of critical physiological systems and allostatic overload. It is under these conditions that pathology develops.[1,6]

Current research implicates damage to the genome as a causative factor in developmental and degenerative disease.[4] The human genome is effected by exposure to dietary carcinogens, activation/detoxification of carcinogens, and DNA repair, synthesis, and apoptosis.[7] Nutrigenomics recognizes that DNA damage is nutritionally preventable and can be clinically diagnosed through biomarkers.[4,7,8] Diet is a key factor that determines genomic health and stability because of the influence of micronutrients and phytochemicals.[7,8] The fields of nutrigenomics and nutrigenetics find that micronutrient deficiency causes major alteration and dysfunction in the human genome.[7,8] Such deficiencies are found to be prevalent in human populations worldwide.[4,7-9]

MICRONUTRIENTS

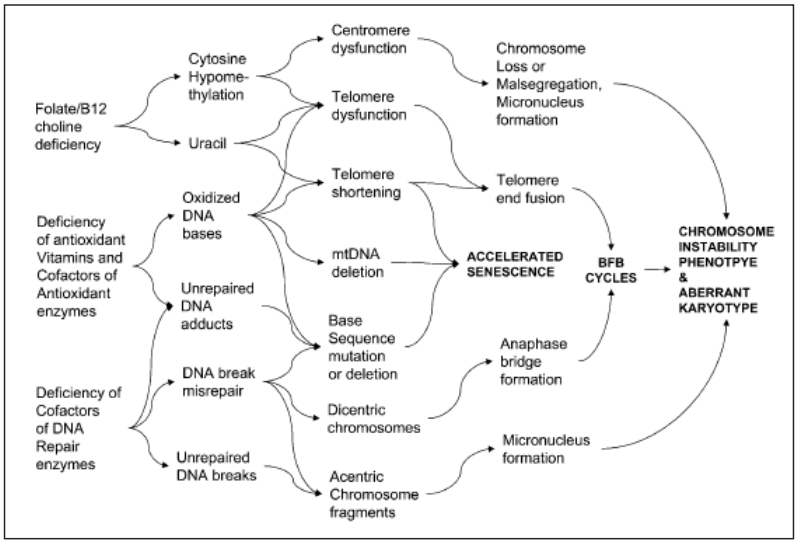
Micronutrients include over 40 essential minerals, vitamins, and other biochemicals required for metabolic and developmental processes.[12]

Micronutrients modulate epigenetic phenomena and genetic expression that influence physiologic and pathologic processes.[10,11] They play key protective roles in optimal cellular function, influence cellular and mitochondrial health, and optimize metabolic function.[12] Micronutrients help promote genomic stability through their involvement with DNA repair, synthesis, and cellular apoptosis.[9,12,13] They act as cofactors or substrates for enzymes that influence the genome[13] and for enzymes that detoxify genotoxins.[4,8]

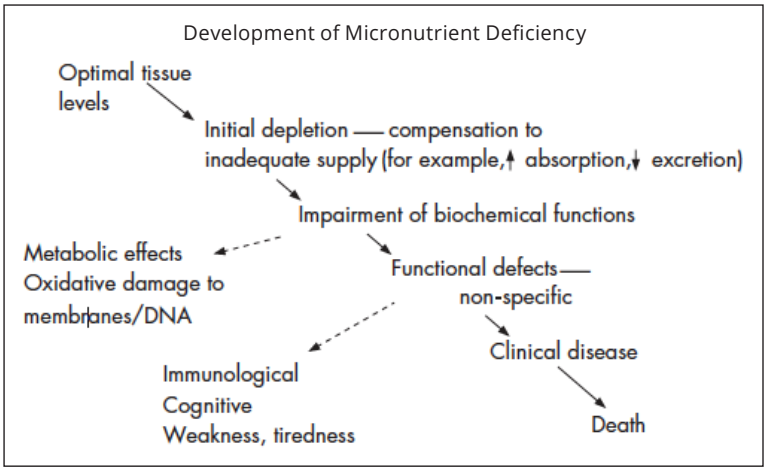
Deficiency of micronutrients is found to lead to DNA damage, such as chromosome breaks, in cultured human cells or in vivo and contributes to mitochondrial and cellular dysfunction.[7,12] For example, evidence shows that even small deficiencies of folate, B12, niacin, or zinc impact chromosomal health and genomic integrity.[7]

Research worldwide reports that because of soil nutrient depletion, the concentration of micronutrients in plants has declined considerably over the last decades. Resulting subclinical and clinically-manifest deficiencies of iron, vitamin A, iodine, zinc and other micronutrients affect over three billion people worldwide, especially in developing nations.[11,14,15] Even a small micronutrient deficiency can result in significant disruption of metabolic processes long before serious depletion.[1,8,12] Subclinical deficiency, usually of numerous micronutrients concurrently, is common and generally difficult to recognize. With the progression to more severe nutrient depletion, individuals pass through stages of metabolic and biochemical change and dysfunction.[11]

Increasing levels of specific micronutrients is found to help prevent genetic alterations and cellular dysfunction.[6,9] Because of this, many researchers suggest reviewing optimal requirements of micronutrients to support the health of and prevent damage to nuclear and mitochondrial DNA.[7] Nutrient supplements are reported to benefit health when taken along with a balanced, nutritious diet.[8,12]



Examples of possible mechanisms by which micronutrient deficiency could cause damage to the genome, accelerate senescence, and promote chromosomal instability.
(See reference #4)



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Micronutrients and Phytochemicals that Promote Optimal Health

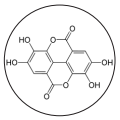
Food-Grown Nutrients

Micronutrients play central roles in metabolism, cellular, and genetic health. Many nutrients are found to modify epigenetic processes including folate, B12, methionine, pantethine, choline, betaine, and niacin.[10,11] Some nutrients, such as zinc and selenium, are metabolic cofactors and modulate enzyme activity. The B complex functions as metabolic coenzymes and influences multiple pathways.[11] Zinc and other micronutrients play a key role in cell transcription.[11] Some micronutrients, including tocopherols and carotenoids, provide potent antioxidant and free-radical scavenging activity.[11] Zinc and other nutrients influence oxidation processes through modulation of multiple pathways at the cellular level.[11]

Food-grown nutrients are a unique form of nutritional supplement that is highly bioavailable because they are recognized and assimilated by the body as food. Human physiology is designed to obtain nutrients from plants and natural foods where nutrients occur as a natural synergy of complexes. Nutrients in foods are most often contained within a natural cellular compartment or microstructure (matrix) within the whole food complex. Nutritional compounds delivered in a food matrix offer nutrients contextually along with naturally-occurring supportive cofactors as a food complex, rather than a nutrient isolate.

Food-grown nutrients are incorporated into a food matrix through a natural process. This process leads to a biologically active form of the nutrient, which is bonded in a food matrix and nutrient complex just as it would naturally be in food. This is achieved through a process utilizing site-selective carriers that integrate supplemental vitamins and minerals into the food matrix. This food matrix consists of proteins, complex carbohydrates, lipids, bioflavonoids, and fiber.

The physical properties of the food matrix influence the bioavailability of nutrients.[16] Food-grown nutrients used in Natura's formulas are carefully and naturally processed to enhance release of nutrients from the food matrix during digestion for optimal absorption.



Phytochemicals

Plants provide a wide variety of micronutrients and phytochemicals, all of which play essential roles in cellular, metabolic, and physiological function.[2,14,17] Phytochemicals are bioactive plant constituents and are highly studied for their impact on human health. They are found to exert a profound influence on multiple metabolic and cellular pathways, to modulate inflammation, and to play key roles in gene expression and genetic health. Even very low concentrations of these dietary compounds are found to significantly support regulation of gene expression. They regulate metabolic functions of proteins, enzymes, transporter, receptor, and signaling transduction proteins at the cellular level.[2,17,18]

Over 10,000 phytochemicals have been identified while a large percentage remain unknown.[19] Compounds such as polyphenols, carotenoids, anthocyannins, alkaloids, glycosides, saponins, tannins, sterols, and terpenes from plants offer multiple influences, demonstrate multiple beneficial activities in vitro, in vivo, and in clinical trials.[19-21] Many phytochemicals, such as flavonoids and others, show potent antioxidant scavenging activity of ROS (reactive oxidative species).[2,17,22] Polyphenols and carotenoids are two well-known examples of antioxidant phytochemicals and there are many others.[19,20]

A strong association is noted between consumption of fruits and vegetables and decreased risk of developing chronic and degenerative disease.[23,24] Studies find that the combination of phytochemicals found in whole foods, rather than specific isolated constituents, exerts the most potent antioxidant and anti-proliferative activity.[24] Optimizing the nutritional benefits of a healthy diet by supplementation with plant phytochemicals is highly studied for its potential in preventive and treatment applications.[25]

Nutritional Benefits of Greens

Chlorophyll is a natural, fat-soluble pigment found in plants and algae that is responsible for their green color. Studies find chlorophyll is able to bind to various potentially toxic environmental and dietary compounds and to decrease their gastrointestinal absorption thus lessening their potential influence. Chlorophyllin is able to neutralize oxidants in vitro and can help decrease oxidative damage caused by external substances.[26]

Nutrient-dense Nettle leaf offers a wide spectrum of highly-absorbable minerals including iron, potassium, calcium, and silica. High in chlorophyll, Nettle leaf provides a rich source of carotenoids along with vitamins C, K, and B. Stinging Nettle is well-known for its ability to enhance healthy immune response and overall health.[27]

Berries and Fruits

Berries and fruits are known for their multiple nutritive and bioactive components. They contain an abundance of phenolic compounds, including flavonoids, tannins, and phenolic acids, which exert potent antioxidant activity.[28-31] Anthocyanins, some of the most notable polyphenols in berries, give berries their red, blue, and purple colors. Flavonoids and anthocyanins modulate inflammatory status.[32] Berries are found to exert an anti-inflammatory influence.[29,30,32]

Chia Seeds (*Salvia hispanica*)

Chia is an edible seed with a long history of use by indigenous peoples of Central and South America where they were known for promoting energy and endurance. Chia contains protein, carbohydrates, dietary fiber, vitamins, and minerals.[33,34] It is high in alpha-linolenic acid and is known as an outstanding source of omega-3 fatty acids.[33] Antioxidants in Chia seed include chlorogenic acid, caffeic acid, quercetin, and kaempferol. These demonstrate cardiac- and hepatic-protective effects and anti-aging influence.[33]

Ancient Whole Grains

Ancient whole grains have been a staple food since the beginning of civilization. Whole grains are a major source of macronutrients (carbohydrates, fatty acids, and amino acids), micronutrients, and phytochemicals. Regular consumption of whole grains is associated with reduced risk of chronic and degenerative diseases including cardiovascular disease and type 2 diabetes.[35-38] Many of the compounds in whole grains are found to exert powerful antioxidative activity.[35,37,38] Research reports that whole grain foods are more beneficial than their individual isolated components.[35] Whole grains contain unique bioactive compounds that complement those found in fruits and vegetables.[35,38]

For more information on any of the ingredients listed here, including extensive research or individual monographs compiled by Donnie Yance, please email info@naturaedu.com.

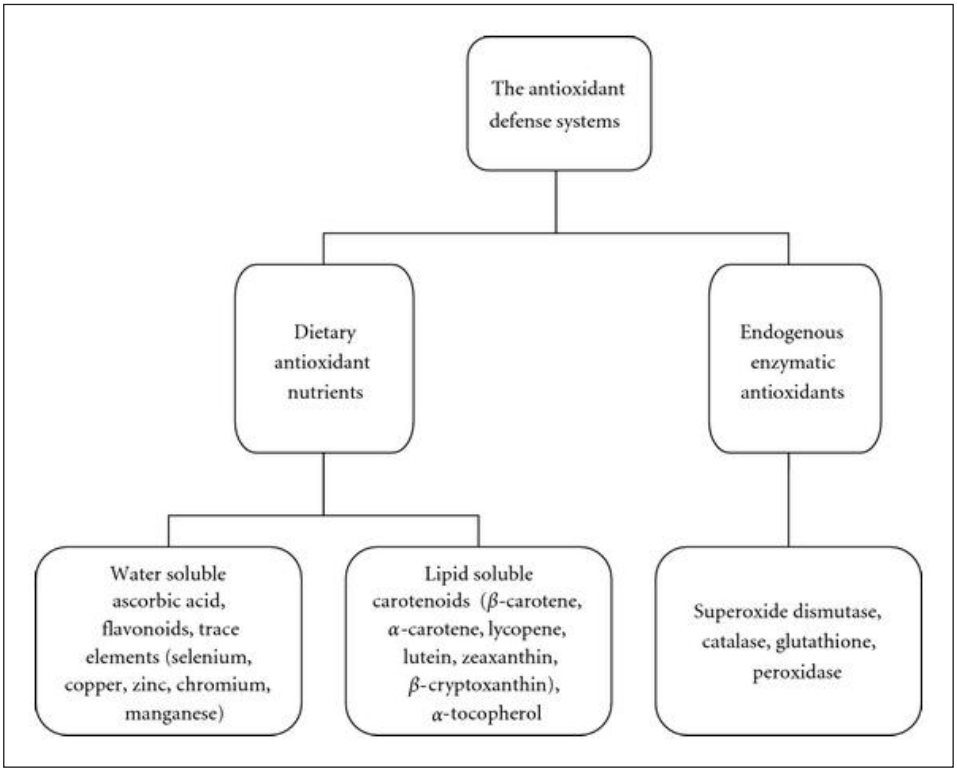


Image Source: *See reference #22*

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