



Kyäni Sunrise™:

The Science Behind The Vitamins

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Kyäni Sunrise™:

The Science Behind The Vitamins

One of Kyäni's three proprietary products, Kyäni Sunrise™, is a blend of several "Superfoods," vitamins, and trace minerals. Taken in the morning, this product provides a rich blend of anti-oxidants that help fend off free radical damage throughout the day. Among the Superfoods available in Kyäni Sunrise™ is the Wild Alaskan Blueberry. This berry contains potent anti-oxidant levels.

Inclusion of a large number of Superfoods and a comprehensive group of vitamins in Kyäni Sunrise™ also helps cells in organs such as nerves, heart, liver, and others to maximize their metabolism. Interested readers may find the following helpful in understanding why Kyäni incorporated various ingredients in Kyäni Sunrise™. Please note this document discusses the formulation of Kyäni Sunrise™ for the United States. Some foreign countries may have formula variations.

VITAMINS IN KYÄNI SUNRISE™

Vitamin A, Vitamin E, Vitamin C, Vitamin D, Thiamine, Riboflavin, Niacin, Vitamin B6, Vitamin B12, Pantothenic Acid (Vitamin B5), Folic Acid, Biotin, Taurine, Inositol, L-Theanine, and Choline

VITAMIN A

Vitamin A plays a crucial role in vision, bone growth, reproduction, cell division, and cell differentiation. (1-5) It also helps to regulate the immune system, (1, 6-10) and may help lymphocytes fight infections more effectively. Vitamin A promotes healthy surface linings of the eyes and the respiratory, urinary, and intestinal tracts. (8) When those linings break down, it becomes easier for bacteria to enter the body and cause infection. Vitamin A also helps the skin and mucous membranes function as a barrier to bacteria and viruses. (9-11)

Vitamin A is divided into two categories—preformed vitamin A and provitamin A carotenoid. The vitamin is classified according to its original source—from a plant or animal. Preformed vitamin A is the form of vitamin A found in foods that come from animals. It is absorbed in the form of retinol, one of the most easily usable forms of vitamin A. Good sources of preformed vitamin A include liver, whole milk, and some fortified food products. Retinol can be made into retinal and retinoic acid (other active forms of vitamin A) in the body. (1)

The form of vitamin A found in colorful fruits and vegetables is called provitamin A carotenoid, a family of molecules which can be made into retinol in the body. Common provitamin A carotenoids found in foods that come from plants are beta-carotene, alpha-carotene, and beta-cryptoxanthin. (11) Among these, beta-carotene is most efficiently made into retinol. (1, 13-15) Alpha-carotene and beta-cryptoxanthin are also converted to vitamin A, but only half as efficiently as beta-carotene. (1)

Of the 563 identified carotenoids, fewer than 10% can be made into vitamin A in the body. (12) Lycopene, lutein, and zeaxanthin are carotenoids that do not have vitamin A activity but have other health promoting properties. (1) The Institute of Medicine (IOM) encourages consumption of all carotenoid-rich fruits and vegetables for their health-promoting benefits.

Some provitamin A carotenoids have been shown to function as anti-oxidants in laboratory studies. (1)

VITAMIN E

Vitamin E is the collective name for a group of fat-soluble compounds with distinctive anti-oxidant activities. (16) Naturally occurring vitamin E exists in eight distinct chemical forms: alpha-, beta-, gamma-, and delta-tocopherol and alpha-, beta-, gamma-, and delta-tocotrienol. The different forms of vitamin have varying levels of biological activity. (16) Alpha- (or α -) tocopherol is the form that has been studied most extensively. Almost all published studies of Vitamin E have looked at the effects of α -tocopherol.

Vitamin E is a fat-soluble anti-oxidant that stops the production of reactive oxygen species (ROS) or free radicals formed when fat undergoes oxidation. (17) Scientists are investigating whether, by limiting free-radical production and possibly through other mechanisms, vitamin E might help prevent or delay the chronic diseases associated with free radicals.

In addition to its activities as an anti-oxidant, vitamin E is involved in immune function as well as cell signaling, regulation of gene expression, and other metabolic processes. (16) Alpha-tocopherol inhibits the activity of protein kinase C, an enzyme involved in cell proliferation and differentiation in smooth muscle cells, platelets, and monocytes. (18) Endothelial cells with adequate levels of Vitamin E, lining the interior surface of blood vessels, are better able to resist blood-cell components adhering to this surface. Vitamin E also increases the expression of two enzymes that suppress arachidonic acid metabolism, thereby increasing the release of prostacyclin from the endothelium, which, in turn, dilates blood vessels and inhibits platelet aggregation. (18)

Three national surveys—the 2001–2002 NHANES (19), NHANES III (1988–1994) (19), and the Continuing Survey of Food Intakes by Individuals (1994–1996) (20)—have found that the diets of most Americans provide less than the RDA levels of vitamin E.

Heart Health

There are several lines of evidence that vitamin E could help prevent or delay coronary heart disease. *In vitro* studies have found that α -tocopherol inhibits oxidation of low-density lipoprotein (LDL) cholesterol, which is thought to be a crucial initiating step for atherosclerosis. (18) Vitamin E might also help prevent the formation of blood clots that could lead to a heart attack or venous thromboembolism. (21)

Several epidemiological studies have associated lower rates of heart disease with higher vitamin E intakes. One study of approximately 90,000 nurses found that the incidence of heart disease was 30% to 40% lower in those with the highest intakes of vitamin E. (22) In another study of 5,133 Finnish men and women followed for a mean of 14 years, higher vitamin E intakes from food were associated with decreased mortality from Chronic Heart Disease (CHD). (23)

However, the latest published clinical trial of vitamin E's effects on the heart and blood vessels of women included almost 40,000 healthy women ≥ 45 years of age. These women were randomly assigned to receive either 600 IU of natural vitamin E on alternate days or placebo and who were followed for an average of 10 years. (24) The investigators found no significant differences in rates of overall cardiovascular events (combined nonfatal heart attacks, strokes, and cardiovascular deaths) or all-cause mortality between the groups. However, the study did find two positive and significant results for women taking vitamin E: they had a 24% reduction in cardiovascular death rates, and those ≥ 65 years of age had a 26% decrease in nonfatal heart attack and a 49% decrease in cardiovascular death rates.

Eye Health

Vitamin E supplements, taken alone or in combination with other anti-oxidants, may reduce the risk of developing macular degeneration or cataracts. The Age-Related Eye Disease Study (AREDS), a large randomized clinical trial, revealed that participants with early-stage age-related macular degeneration (AMD) could slow the progression of their disease by taking a daily supplement of vitamin E (400 IU dl-alpha-tocopheryl acetate), vitamin C (500 mg), beta-carotene (15 mg), zinc (80 mg), and copper (2 mg) for an average of 6.3 years compared to participants taking a placebo. (25)

VITAMIN C

Vitamin C, also called ascorbic acid or ascorbate, is an essential nutrient for humans, which means that we do not produce it internally and depend upon our diet as a source. Vitamin C is required for a wide range of essential metabolic reactions in all animals and plants. These functions include the synthesis of collagen, carnitine, and neurotransmitters; the synthesis and catabolism of tyrosine; and the metabolism of microsome. (26)

Deficiency of Vitamin C causes the disease called scurvy. (27) Ascorbate is an important anti-oxidant, protecting the body against oxidative stress. (28) It is also a co-enzyme, or cofactor, in at least eight enzymatic reactions including several involving the synthesis of collagen. (29,30) These reactions are especially important in wound healing and in preventing bleeding from capillaries. When ascorbates are not functioning properly, they cause the most severe symptoms of scurvy.

Heart Health

Nobel prize winner Linus Pauling proposed that chronic, long term, low blood levels of vitamin C, which he termed “chronic scurvy,” contributes to the development of atherosclerosis. (31) Moderately higher blood levels of vitamin C measured in healthy persons have been found to be prospectively correlated with decreased risk of cardiovascular disease, ischemic heart disease, and an increase life expectancy. (32) In 2007, a meta-analysis of a large number of studies on anti-oxidants, including vitamin C supplementation, found no relationship between vitamin C and mortality. (33) A more recent population nutrition intervention trial conducted in China (34) studied the effects of daily vitamin C supplements (120 mg) plus molybdenum (30 mcg) for 5–6 years. In this trial, the supplements significantly reduced the risk of cerebrovascular deaths by 8% during 10 years of follow-up after the end of the active intervention. Additional research is required to determine the full impact of vitamin C supplementation on mortality risk from cardiovascular disease.

Immune System

Vitamin C is found in high concentrations in immune cells, and is consumed quickly during infections. It is not certain how vitamin C interacts with the immune system; it has been hypothesized to modulate the activities of phagocytes, the production of cytokines and lymphocytes, and the number of cell adhesion molecules in monocytes. (35) In the 1970s, Linus Pauling suggested that vitamin C could successfully treat and/or prevent the common cold. (36) Results of subsequent controlled studies have been inconsistent, resulting in considerable controversy, with a high degree of public interest. (37,38) In 2007, a Cochrane review examined placebo-controlled trials involving the use of at least 200 mg/day vitamin C taken either continuously as a prophylactic treatment or after the onset of cold symptoms. (38) In the general population, prophylactic use of vitamin C did not significantly reduce the risk of developing a cold, although it did modestly reduce the duration of a cold by 8% in adults and 14% in children. However, in trials involving marathon runners, skiers, and soldiers exposed to extreme physical exercise and/or cold environments, prophylactic use of vitamin C in doses ranging from 250 mg/day to 1 g/day reduced cold incidence by 50%. Vitamin C taken after the onset of cold symptoms did not affect cold duration or symptom severity. Overall, the evidence to date suggests that regular intakes of vitamin C at doses of at least 200 mg/day may not reduce the incidence of the common cold in the general population, but such intakes might be helpful in people exposed to extreme physical exercise or cold environments and those with marginal vitamin C status, such as the elderly and chronic smokers. (38-40)

Vitamin C and Cancer Risk

A number of epidemiological studies have found an inverse relationship between vitamin C consumption and cancer risk (28, 41) (those with the highest vitamin C consumption had the lowest risk of cancer). Data from intervention trials failed to show a significant reduction in colon cancer risk of vitamin C supplementation. (42) However, this may be because most subjects had already achieved tissue saturation with vitamin C, which is tightly controlled in humans.

VITAMIN D

Vitamin D is actually a group of fat-soluble vitamins with steroid-like structures, called secosteroids. In humans, vitamin D is unusual in two ways: it functions as a prohormone and the body is able to synthesize it (as vitamin D3) when sun exposure is adequate. For this reason, it is sometimes known as the "sunshine vitamin."

Vitamin D3 has several forms (43):

- Cholecalciferol, (sometimes called calciol), an inactive, unhydroxylated form of vitamin D3
- Calcifediol (also called calcidiol, hydroxycholecalciferol, 25-hydroxyvitamin D3 and abbreviated 25(OH)D), one of the forms measured in the blood to assess vitamin D status
- Calcitriol (also called 1,25-dihydroxyvitamin D3), the active form of D3

Calcitriol is made in the kidneys and circulates as a hormone, regulating the concentration of calcium and phosphate in the bloodstream and promoting the healthy growth and remodeling of bone. Vitamin D prevents rickets in children and osteomalacia in adults, and, together with calcium, helps to protect older adults from osteoporosis. Vitamin D also affects neuromuscular function, inflammation, and influences the action of many genes that regulate the proliferation, differentiation, and death of cells. (44)

The evidence for the health effects of vitamin D supplementation in the general population is inconsistent. (45-47) Published studies have suggested benefits in cardiovascular health, diabetes mellitus, cancer, multiple sclerosis, allergy, asthma, infection, psychiatric health, pain and overall mortality. (43) The best evidence of benefit is for bone health (48) and a decrease in mortality in elderly women. (49)

There is a U-shaped mortality curve associated with vitamin D levels – in other words, it is not good to have either too little or too much. (50) Experts are divided as to the lower limit of the normal range (51), but most reports suggest that optimal levels on testing in the blood are between 40 and 50 ng/mL. The current Reference Daily Intake (RDA) is 400IU. It is important to note that many, many people have very low levels of vitamin D.

THIAMINE

Thiamine, also known as vitamin B1, is a water-soluble, B vitamin necessary for metabolism of proteins, carbohydrates, and fats. Thiamine serves as a cofactor, or coenzyme to numerous enzymes. It is essential for ATP production via the Krebs cycle, a crucial function for every cell in the body.

Deficiency of thiamine causes a disease called beriberi and results in a variety of disease states including Wernicke-Korsakoff psychosis in its most extreme form. Thiamine deficiency has been documented in adolescents eating an average American diet (52), in 38 percent of a group of non-alcoholic psychiatric patients (53), 33-55 percent of geriatric populations (54), and 30-80 percent of alcoholic populations. (55, 56)

Alcoholism

Thiamine deficiency in alcoholism stems from a variety of causes. In addition to low intake, absorption is inhibited and hepatic activation of thiamine coenzymes is decreased. (57) Psychosis resulting from chronic alcohol use is believed to be primarily a result of thiamine deficiency, and appears to be on the rise worldwide. (58)

HIV/AIDS

Moderate to severe thiamine deficiency has been observed in up to 23 percent of HIV positive or AIDS-diagnosed, non-alcoholic individuals. (59) In prospective epidemiological studies, thiamine intakes above 7.5 mg (the RDA is 1.5 mg) were associated with increased survival. The highest levels of vitamin B1 and vitamin C intake were associated with significantly decreased progression from HIV to AIDS. (60) Thiamine-deficiency encephalopathy has been seen in HIV/AIDS patients with no alcohol abuse history. (61)

Congestive Heart Failure (CHF)

The etiology of heart failure is complex, but there is clear evidence for the role of micronutrients, particularly thiamine. (62) Thiamine deficiency leads to impaired oxidative metabolism in cardiac muscle cells. Subsequently, levels of pyruvate and lactic acid increase, leading to metabolic acidosis, vasodilation, and retention of water and sodium (leading to edema). This form of heart failure is known as “wet beriberi,” and it is reversible with thiamine replacement.

Other causes of “wet beriberi” may include the use of cardiac medications (specifically furosemide and digoxin), some of which decrease thiamine uptake in myocytes (muscle cells). Low whole blood levels of thiamine have been seen in CHF patients treated with loop diuretics. (63) Thiamine supplementation in patients with CHF improves left ventricular ejection fraction and raises blood pressure an average of 10 mm Hg, reversing of the cardiac pathology seen in beriberi. (64)

Mood and Cognitive Performance

Two studies point to a benefit of thiamine for mood and cognitive performance. The first was a controlled, one-year trial in which 127 young adults were given 15 mg thiamine, along with other B vitamins at dosages 10 times the RDA. (65) The study found the most significant association to be enhanced cognitive function and improved thiamine status in females. Note that based on the design of this trial, it is not possible to assess whether the thiamine alone or in combination with the other B vitamins contributed to the improvement in cognitive function. Another controlled trial gave 80 elderly females with borderline thiamine status 10 mg thiamine daily for 10 weeks. (66) Improvements noted in the experimental group, compared to baseline assessment and placebo, were increased appetite, body weight, energy intake, and general well-being, reduced daytime sleep, improved sleep patterns, less fatigue, and greater activity levels.

RIBOFLAVIN

Riboflavin, also known as vitamin B2, plays a key role in energy metabolism, and for the metabolism of fats, ketone bodies, carbohydrates, and proteins. It is required for a wide variety of cellular processes. Riboflavin has also been used in a variety of clinical and therapeutic situations.

High dose riboflavin appears to be useful alone or along with beta-blockers in the prevention of migraine. (67-69) Riboflavin has also been used as a muscle pain reliever. (70)

Riboflavin in combination with UV light has been shown to be effective in reducing the ability of harmful pathogens found in blood products to cause disease. (71-73) When UV light is applied to blood products containing riboflavin, the nucleic acids in pathogens are damaged, rendering them unable to replicate and cause disease. (73,74) Riboflavin and UV light treatment has been shown to be effective for inactivating pathogens in platelets and plasma and is under development for application to whole blood. Because platelets and red blood cells do not contain a nucleus, (i.e. they have no DNA to be damaged) the technique is well-suited for destroying nucleic acid containing pathogens (including viruses, bacteria, parasites, and white blood cells) in blood products. (75)

Recent studies have demonstrated the utility of riboflavin as a therapy to slow or stop the progression of the keratoconus corneal disorder. This process is called corneal collagen crosslinking (CXL). Riboflavin

drops are applied to the patient's corneal surface and ultraviolet A light therapy applied, once the riboflavin has penetrated through the cornea. This induces collagen crosslinking, which increases the tensile strength of the cornea. (76,77)

NIACIN

Niacin, also known as nicotinic acid, is known to increase HDL and decrease total cholesterol, triglycerides, VLDL, LDL-C and lipoprotein(a). (78,79) Niacin has a favorable effect on LDL particle number. (80) In addition to effects on lipids, niacin has favorable effects on endothelial function and inflammatory markers. (81) Moreover, dietary niacin may protect against Alzheimer's disease and age-related cognitive decline. (82)

VITAMIN B6

Vitamin B6 is a water-soluble vitamin and is part of the vitamin B complex group. There are seven different forms of vitamin B6. Pyridoxal phosphate (PLP), the active form, serves as a cofactor in many reactions of amino acid metabolism. These include transamination (movement of an amino group from one molecule to another), deamination (removal of an amino group), and decarboxylation (removal of a carboxyl group). PLP is also necessary for the enzymatic reaction governing the release of glucose from glycogen, histamine synthesis, regulation of gene expression, and hemoglobin synthesis and function. Overall, the Enzyme Commission has catalogued more than 140 PLP-dependent activities, corresponding to ~4% of all classified enzymatic activities. (83) Pyridoxine (PN) is the form of vitamin B6 that is most commonly given as dietary supplement.

Obesity, Weight Management and Diabetes

In one study published by Nakamura and colleagues in 2007 (84), PLP protected kidneys in a rat model of diabetes by inhibiting the formation of advanced glycation endpoints (AGEs). The authors propose that PLP may be a useful supplement for the prevention of AGE-linked complication of diabetes such as diabetic nephropathy and diabetic retinopathy.

Brain Health

Pyridoxine improved the behavioral and anatomical outcomes in a rat model of brain injury (85), with dose-dependent effects of vitamin B6 on recovery of function.

In a study suggesting that B6 may help protect the brain from the development of the β -amyloid plaques associated with Alzheimer's disease, Hashim et al (86) found that four different vitamin B6 compounds served as inhibitors of oxidative chemical reactions known to lead to Alzheimer's disease-related β -amyloid peptides.

Healthy Vision

Data from a large, randomized trial of women at high risk of cardiovascular disease (87) suggest that daily supplementation with folic acid, pyridoxine, and cyanocobalamin may reduce the risk of age-related macular degeneration.

Heart Health

Friso and colleagues (88) reviewed the current state of knowledge regarding the relationship between vitamin B6 deficiency and the risk of cardiovascular disease. High doses of pyridoxine reduce homocysteine levels and improve the lipid profiles of patients in chronic renal failure (89), thus reducing the risk of atherosclerotic coronary artery disease. Low vitamin B6 levels are known to be associated with an increased risk of venous thromboembolism (VTE). (90)

Digestive Health

Intake of vitamin B6 was significantly associated with the severity of irritable bowel syndrome (IBS) symptoms in a large study published in 2011. (91) In this cohort, an inverse association between the intake of vitamin B6 and the severity of IBS symptoms was observed; a high symptoms score was associated with low vitamin B6 intake.

VITAMIN B12

Vitamin B12, also called cobalamin, is the largest and most structurally complicated vitamin. (92) Like all of the B-complex vitamins, it is water-soluble. Vitamin B12 was first recognized as a result of its relationship to the disease pernicious anemia, (93,94) an autoimmune disease in which parietal cells of the stomach responsible for secreting intrinsic factor are destroyed. Because intrinsic factor is crucial for the normal absorption of B12, a lack of intrinsic factor causes vitamin B12 deficiency.

Vitamin B12 plays a key role in the normal functioning of the brain and nervous system, (95,96) and for the formation of blood (97), but is involved in the metabolism of every cell of the human body. Vitamin B12 has an especially important role in DNA synthesis and regulation and is also required for fatty acid synthesis and energy production. By lowering homocysteine levels in the blood, vitamin B12 may help reduce the risk of adverse cardiovascular events. (98,99)

PANTOTHENIC ACID (VITAMIN B5)

Pantothenic acid is a water soluble, B-complex vitamin, also known as vitamin B5. Its name is derived from the Greek word “pantothén,” meaning “from everywhere,” because small quantities of this vitamin are found in almost every food. (100) Articles in the peer-reviewed literature suggest that Pantothenic acid may have health benefits in terms of obesity, weight and diabetes management, adrenal support, anti-microbial activity, acne, wound healing, and cancer.

Obesity and Weight Management

In a study looking at mice with experimentally induced obesity, Naruta and colleagues found that pantothenic acid derivatives reduced fat stores by reducing resistance to insulin and activating lipolysis (degradation of fat molecules) in serum and adipose tissue. (101)

Adrenal Support

A 2008 study (102), performed in rats, found that pantothenic acid supplementation enhances the ability of adrenal cells to manufacture corticosterone and progesterone. Additionally, the study found that pantothenic acid supplementation enhanced responsiveness of the adrenal gland to ACTH (“instructions” from the pituitary gland to make corticosterone).

Anti-Microbial Activity

The provitamin pantothenol has been found to inhibit the growth of the malaria parasite in red blood cells. (103)

Acne

A small study was published in the late 1990’s suggesting that pantothenic acid might have efficacy in the treatment of acne vulgaris. High doses of vitamin B5 were found to resolve acne lesions and reduce pore size. (104)

Wound Healing

A study in 1999 demonstrated several effects on cell cultures that could translate into improved wound healing. (105) Cell cultures grown with pantothenic acid had increased cell migration, and the fibers ran directionally with several layers, whereas the cell cultures without pantothenic acid healed in no orderly motion, and with fewer layers. In addition, cell proliferation increased with pantothenic acid supplementation. It remains to be seen whether these benefits translate into improved wound healing in animal or human studies.

Cancer

Pantothenic acid (vitamin B5) demonstrated anti-tumor properties under the influence of ionizing radiation. (106) In well-controlled studies of *E. coli* bacteria, these findings were reported: (i) vitamin B5 possesses anti-tumor activity, (ii) it exerts a strong synergistic effect on mitomycin C, and (iii) the oxidizing species (OH^* , O_2^{*-}) appears to be most important in the initiation of the observed effect. It is possible that pantothenic acid may enhance the therapeutic effects of chemotherapy through this mechanism.

FOLIC ACID

Folic acid (also known as vitamin B9) and folate (the form of vitamin B9 naturally occurring in the body), are forms of the water-soluble vitamin B9. (107) Folic acid and folate are essential to numerous bodily functions. Folate helps produce and maintain new cells. (108) The human body needs folate to synthesize DNA, repair DNA, and methylate DNA. It also helps prevent changes to DNA that may lead to cancer. (109) Both adults and children need folate to make normal red blood cells and prevent anemia. (110) Folate is also essential for the metabolism of homocysteine and helps maintain normal levels of this amino acid.

Prevention of Birth Defects

Folic acid is very important in pregnancy for the prevention of neural tube defects (111) and other birth defects including cleft palate. (112)

Heart Disease

A deficiency of folate, vitamin B12, or vitamin B6 may increase blood levels of homocysteine. Folate supplementation has been shown to decrease homocysteine levels and to improve endothelial function. (113-115) Evidence does support a role for supplemental folic acid for lowering homocysteine levels. There is at least one study has linked low dietary folate intake with an increased risk of coronary events. (116) Clinical trials proving that folate supplementation reduces coronary events are still ongoing.

Folic Acid and Cancer

There are some data associating low blood levels of folate with a greater risk of cancer. (117) Because folate is involved in the synthesis, repair, and function of DNA, our genetic map, it has been suspected that a deficiency of folate can cause damage to DNA that may lead to cancer. (117) Several studies have associated diets low in folate with increased risk of breast, pancreatic, and colon cancer. (118,119)

BIOTIN

Biotin is a water-soluble, B-complex vitamin, also known as vitamin B7. (120, 121) Biotin serves as a co-factor, or coenzyme, to enzymes important in the synthesis of fatty acids and the amino acids isoleucine and valine and it plays a role in gluconeogenesis (production of glucose).

Biotin is necessary for many physiological processes, including cell growth, the production of fatty acids, and the metabolism of fats and amino acids. It plays an important role in the citric acid cycle, the process

by which biochemical energy is generated during aerobic respiration. Biotin is also known to be helpful in maintaining glucose homeostasis (maintaining a steady blood sugar level). (122)

One study, published in 1999, proposed that joint administration of high doses of biotin, along with chromium picolinate, may prove to be helpful in the management of both types I and II diabetes. (123) Indeed, in 2007, a double-blind, placebo-controlled trial found that a combination of chromium and biotin improved cardiovascular risk factors in patients with hyper-cholesterolemia and type II diabetes mellitus. (124) Benefits were noted in improved total cholesterol and LDL-C levels, HgbA1C, and fasting glucose. Biotin also seems to be helpful in reducing triglyceride levels, in both diabetic and non-diabetic patients. (125)

Sugita and colleagues (126) found that biotin reduced the gluconeogenic pathway in the liver (suppressed the production of glucose) by reducing the expression of genes involved in this metabolic pathway. This represents a mechanism of improved glucose control that is independent of insulin signaling.

TAURINE

Taurine is an amino acid that plays an important role in many biological processes, including calcium signaling, bile metabolism, and cell membrane stabilization. (127) It is crucial for cardiovascular functioning and for the development of many different systems in the body, including the musculoskeletal system and the central nervous system. Taurine provides protection against glutamate toxicity (128) and may help prevent epileptic seizures. (129) There is some data that it may help in the prevention of obesity. (130-132) One study from 2004 showed that taurine supplementation helped reduce cholesterol levels and body weight in young adults. (133) Several studies have demonstrated that taurine serves as an anti-oxidant (134,135) and can help prevent the oxidative effects of exposure to heavy metals, including cadmium (136) and lead. (129)

INOSITOL

Although it is sometimes considered among the B vitamins, inositol is technically a carbohydrate. It has the chemical formula of $C_6H_{12}O_6$. (137)

Inositol and some of its mono and polyphosphates function as the basis for a number of signaling and secondary messenger molecules. They are involved in several biological processes including:

- Insulin signal transduction (138)
- Cytoskeleton assembly
- Nerve guidance (Epsin)
- Intracellular calcium (Ca^{2+}) concentration control (139)
- Cell membrane potential maintenance (140)
- Serotonin activity modulation
- Breakdown of fats and reducing blood cholesterol (141)
- Gene expression (142,143)

Inositol has been studied in a number of psychiatric conditions, including depression (144), panic disorder (145), and obsessive compulsive disorder (146), and shown to have a beneficial effect in all three of these disorders. Laboratory studies of inositol hexaphosphate (IP6) showed significant anti-cancer properties (147), but clinical studies in humans have not yet been published.

L-THEANINE

L-theanine is an amino acid, also called gamma-glutamylethylamide. It is closely related to glutamic acid and is found almost exclusively in the tea plant, *Camellia sinensis*. L-theanine is synthesized in the root of the plant and concentrated in the leaves, where it is converted to polyphenols by sunlight. (148)

Relaxation Properties

L-theanine crosses the blood-brain barrier. In rats, it has been shown to increase production of both serotonin and dopamine. (149) It increases alpha brain wave activity, a change in the brain activity associated with increased relaxation. (150) A small study, performed in Japan with University students as subjects, found an increased sense of relaxation along with increased alpha brain wave activity within 40 minutes after oral consumption of 200 mg of L-theanine. (150) L-theanine is also thought to be responsible for the fact that green tea is often used as a relaxing beverage, even though it can contain more caffeine than coffee. Another study, performed in rats, found that L-theanine seems to counteract the stimulant effect of caffeine to some degree. (152)

Healthy Blood Pressure

Studies in hypertensive rats have demonstrated a reduction in blood pressure after intravenous administration of L-theanine. (152,153) Additional studies are required to understand its effect on humans.

Cancer

There have been many studies looking at potential benefits of L-theanine as an adjunct in cancer therapy. (154-157) These studies have shown that L-theanine may increase the potency of some cancer chemotherapy, while protecting normal cells from damage.

Obesity

One study, performed in mice, demonstrated that the components of green tea, including catechins, caffeine, and L-theanine, alone or in a number of different combinations, reduced weight gain in animals fed a standard diet. (158)

CHOLINE

Choline is a water-soluble essential nutrient. (159-163) It is usually grouped within the B-complex vitamins. Choline is the precursor molecule for the neurotransmitter acetylcholine, which is involved in many functions including memory and muscle control.

Choline must be consumed through the diet in order for the body to remain healthy. (164) It is used in the manufacture of the structural components of the body's cell membranes. In 1998, the Food and Nutrition Board of the Institute of Medicine established dietary recommendations for choline intake, estimating an Adequate Intake (AI) at 550 mg per day for men and 425 mg per day for women. The 2005 National Health and Nutrition Examination Survey found that only 2% of postmenopausal women consume the recommended intake for choline. (165)

Choline has been used in the treatment of liver disorders, (166,167) Alzheimer's disease, (168) and bipolar disorder. (169) In some studies, choline has been used as a supplement in treating hepatitis, glaucoma, (170) atherosclerosis, and some neurological disorders. (160) In older literature, as well as a more recent study, choline also has been shown to have a positive effect on those suffering from alcoholism. (171,172)

CONCLUSION

Kyäni Sunrise™ is a liquid dietary supplement containing numerous vitamins. There is substantial scientific and medical evidence supporting the use of these vitamins in achieving optimal health and wellness. For more information about Kyäni Sunrise™ and the other Kyäni products, please visit www.kyaniscience.com.

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