Natural versus Synthetic Nutrients

By David Wang, ND

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Wholefood Nutrients versus Isolated Chemicals

At least five servings of fruits and vegetables are recommended to meet minimum essential requirements of vitamins and minerals and other phytonutrients every day. Evidence shows fruits and vegetables have a protective effect against the development of chronic disease.[1,2] A one-serving-per-day increase of vegetable and fruit intake is linked to a 20% reduction in all causes of mortality.[1] Approximately 1.7 million (2.8%) of deaths worldwide are attributable to low fruit and vegetable consumption.[3] According to the World Health Organization, low fruit and vegetable intake is among the top 10 selected risk factors for global mortality. Worldwide, insufficient intake of fruit and vegetables is estimated to cause approximately 14% of gastrointestinal cancer deaths, approximately 11% of ischemic heart disease deaths and approximately 9% of stroke deaths.[3] Global variability in fruit and vegetable consumption may vary according to income levels with approximately 77% of individuals in low- and middle-income countries consuming less than the minimum recommended five daily servings of fruits and vegetables.[4]

Regular consumption of fruit and vegetables is associated with reduced risk of cancer,[5,6,7,8,9,10,11] cardiovascular disease,[12,13,14] stroke,[15,16] Alzheimer's disease,[17] osteoporosis,[18, 19] diabetes,[20,21]and some of the functional declines that are associated with aging. The synergistic effects of phytonutrients in fruit and vegetables are believed to be responsible for their potent antioxidant activities, and the beneficial effects of diets rich in fruit and vegetables may be attributed to this mixture of phytonutrients that are present in whole foods.[22] It has been estimated that more than 5,000 phytonutrients have been identified, but there is a large percentage that still remain unknown. Nevertheless, dietary nutrients have consistently shown to prevent against chronic and degenerative diseases.

Table 1: Dietary Nutrients and their Effects.

Ingredient	Title	Subjects	Outcome
Fruits & Vegetables	"Fruit and Vegetable Intake and Risk of Major Chronic Disease"[2]	71,910 females & 37,725 males	Green leafy vegetables showed strong inverse association with major chronic disease and CVD.
Fruits & Vegetables	"Vegetables, Fruit and Cancer Prevention"[5]	206 human epidemiologic and 22 animal studies	Consistent protective effect from greater fruit and vegetable consumption
Fruits & Vegetables, Olive oil, Margarine	"Consumption of Olive Oil and Specific Food Groups in Relation to Breast Cancer Risk in Greece"[7]	820 women w breast cancer, 1548 control women	Vegetable intake reduced breast cancer risk by 12%, fruits reduced risk by 8%, olive oil reduced risk by 25% whereas margarine increased breast cancer risk by 5%.
Fruits & Vegetables	"Fruit and Vegetable Consumption and Risk of Coronary Heart Disease: A Meta-Analysis of Cohort Studies."[12]	9 studies in the meta-analysis including 91,379 men and 129,701 women	Fruit and vegetable consumption is inversely associated with risk of CHD, risk of CHD was decreased by 4% for each additional portion per day of fruit and vegetable intake
Fruits & Vegetables	"Fruit and Vegetable Consumption and Stroke: Meta-Analysis of Cohort Studies"[15]	8 studies, 9 cohorts, with 257,551 individuals, average follow-up of 13 years	Increased fruit and vegetable intake is associated with reduced risk of stroke, results strongly support recommendations to consume more than 5 servings of fruit and vegetables per day to reduce risk
Fruits&	"Fruit and Vegetable Intake and Incidence of Type 2	6 studies involving 223,512	Greater intake of green leafy vegetables was

Vegetables	Diabetes Mellitus: Systemic Review and Meta-Analysis"[20]	men and women	associated with a 14% reduction in risk of type 2 diabetes, and no significant benefits of increasing the consumption of vegetables, fruit or fruit and vegetables combined

But arguments can be made that even if one were to consume recommended amounts of fruits and vegetables, that it still may not supply adequate nutrition. Processing, packaging and storage of fruits and vegetables decrease their nutritional value. So can our diet be completely disease preventive? What about supplements? They must be able to fill the void with nutritional supplements where diets have fallen short. Many mainstream health professionals believe that "the body cannot tell whether a vitamin in the bloodstream came from an organically grown cantaloupe or from a chemist's laboratory."[23] The truth is that most vitamins in supplements are made or processed with petroleum derivatives, coal tar derivatives or hydrogenated sugars processed with known carcinogens such as formaldehyde, cyanide and nickel.[24,25,26] While they are often called "natural," most vitamins are isolated chemicals which are crystalline in structure and wholefood vitamins are not crystalline and never isolated.[24] Synthetic vitamins were originally developed because they cost less. A landmark study by the University of California showed that 97.5% of 196 "natural" supplements including synthetic nutrients and herbal products caused toxicity (liver toxicity and cytochrome p450 activity), and were not effective (efficacy studies including NK cell enhancement, antioxidant activity and antiviral effect).[27]

Table 2: Synthetic Nutrients, their Effects and Side Effects.

Ingredient	Title	Subjects	Outcome
Synthetic Vitamin E	"Meta-analysis: High-dosage Vitamin E Supplementation may Increase All-cause Mortality"[28]	19 human clinical trials,135,967 participants	11 of 19 trials testing high Vitamin E dosage (>400IU/d) showed an increase risk for all-cause mortality vs control.
Synthetic Vitamin E	"Vitamin E and Risk of Type 2 Diabetes in the Women's Health Study Randomized Controlled Trial"[29]	38,716 healthy women >45 years old randomly assigned into control group or given 600IU of vitamin E (α-tocopherol) on alternate days, followed for 10 years	No significant benefit for T2DM in healthy women (ie. did not reduce oxidative stress due to ROS in pathogenesis of diabetes).
Synthetic α-tocopherol& β-carotene	"The Effect of Vitamin E and Beta Carotene on the Incidence of Lung Cancer and Other Cancers in Male Smokers"[30]	ATBC Study (α-Tocopherol, β-Carotene), 29,133 male Finnish smokers on 50mg/day of α-tocopherol, or 20mg/d of β-carotene or both or placebo, followed for 5 to 8 years	Increases in lung cancer risk by 18% among men who received β-carotene.
Synthetic β-carotene & Vitamin A	"Effects of a Combination of Beta Carotene and Vitamin A on Lung Cancer and Cardiovascular Disease"[31]	CARET Study (β-Carotene & Retinol Efficacy Trial), 18,314 smokers, past smokers, and exposure to asbestos on 30mg/d of β-carotene and 25,000 IU/d	Significant increase in lung cancer risk by 28% among men who received supplement, with the risk being greatest for the heaviest smokers (>1ppd) and regular alcohol users.

		of retinol from retinyl palmitate	
Synthetic Calcium	"Effect of Calcium Supplementation on Risk of Myocardial Infarction and Cardiovascular Events: Meta-Analysis"[32]	15 trials, with 20,072 participants, follow-up 3-4 years	Calcium supplementation (without co-administering with vitamin D) are associated with an increased risk of myocardial infarction

Nutrients are only natural if they are still contained within their original foods; human beings are meant only to ingest naturally occurring nutrients. Singular vitamins or minerals (even if grouped together) do not qualify as natural; neither do man-made chemicals. So how do dietary nutrients compare to synthetic ones in head-to-head comparison studies? Here are some studies that consistently show that dietary sources of nutrients are superior to synthetic chemicals.

Table 3: Natural versus Synthetic Nutritional Effects

Ingredient	Title	Subjects	Outcome
Dietary Vitamins and Synthetic Vitamins	"Vitamins for Chronic Disease Prevention in Adults"[33]	33 out of 46 epidemiological studies	Vitamin C from fruits and vegetables lowers risk of cancers from oral cavity, esophagus, stomach and breast, but not with synthetic Vitamin C supplementation
Dietary and Synthetic Folic Acid	"Folate Intake and Colorectal Cancer Risk: A Meta-analytical Approach"[34]	7 cohort and 9 case-controlled studies, 354 subjects, 514 controls	25% lower risk of colorectal cancer with highest dietary folate intake compared with lowest; synthetic folate is not protective and may stimulate prostate cancer
Dietary and Synthetic Vitamin E	"Plasma and Dietary Vitamin E in Relation to Incidence of Type 2 Diabetes: The Insulin Resistance and Atherosclerosis Study (IRAS)"[35]	895 non-diabetic adults and followed for 5 years	Protective effect of Vitamin E may exist within the range of intake from food, but not with synthetic Vitamin E supplementation.
Dietary and Synthetic Calcium	"Associations of Dietary Calcium Intake and Calcium Supplementation with Myocardial Infarction and Stroke Risk and Overall Cardiovascular Mortality in the Heidelberg Cohort of the European Prospective Investigation into Cancer and Nutrition Study (EPIC-Heidelberg)"[36]	23,980 participants, aged 35-64 years old free of major cardiovascular events, 11-year follow up	No effect on incidence of stroke, but users of synthetic calcium supplementation had an 86% increase in MI risk and 139% increase risk for MI for calcium supplement only users, while dietary calcium users had a 31% lower risk of MI

General supplementation of individual or combination synthetic nutrients for overall improvement of health and reduction of all-cause mortality is not evidenced-based. In contrast, a diet rich in phytonutrients is correlated with reduction in disease incidence and all-cause mortality. Vitamins are organic compounds that cannot be synthesized by humans and therefore must be ingested through diet to prevent metabolic disorders like scurvy, beriberi and pellagra. Only wholefoods have nutrient components have additive and synergistic effects,[4,37,38] while combining isolated synthetic nutrients can cause complications. Eating vitamin C-rich foods high in compounds such as flavonoids and carotenes enhance the effects of vitamin C and exert favourable effects of their own.[39] But taking synthetic forms of β-

carotene and α-tocopherol at the same time may lead to the β-carotene cancelling out the protective qualities of α-tocopherol.[40] The message clear: Nature has provided nutrients that are in perfect balance and that everyone should consume fruits and vegetables in larger quantities and more often.

Ascorbic Acid is Not Vitamin C

Most people assume that Vitamin C is Ascorbic Acid (AA), as though they are the same thing. They are not. AA is a crystalline isolate, a synthetic fraction, or a chemical distillate of a naturally-occurring Vitamin C food complex, extracted from cornstarch by pharmaceutical companies. In addition to ascorbic acid in the wholefood complex, Vitamin C must include Rutin, Bioflavonoids, Factor K, Factor J, Factor P, Tyrosinase, Ascorbinogen, and other components.[41] Each of the other synergistic factors in the Vitamin C complex serves a separate function:

- Factor P for blood vessel strength,
- Factor J for oxygen-carrying capacity of red blood cells, and
- Tyrosinase, an essential enzyme for enhancing white blood cell differentiation.[41]

If any of these parts are missing, there is no Vitamin C, and no vitamin activity. When some components are missing, the body will draw on its own stores to make up the difference, so that the whole Vitamin C may be present. This would create deficiencies of other Vitamin C components. The AA is just the antioxidant outer shell – the protector of all these other synergists so they will be able to perform their individual functions. [42]

The analogy would be taking white sugar as a carbohydrate substitute for potato or gelatin substitute for an egg. It is very poor nutritional practice to feed single factors of a natural complex as a substitute for the entire complex, whether it be vitamins, carbohydrates, proteins, or fats….single substances cannot be either vitamins or food principles of any kind, in a practical sense.[42] Even the mineral factors of nutrition have been found useless without their synergists.[42]

The Discovery of Ascorbic Acid

Scurvy is a disease caused by Vitamin C deficiency. It is characterized by bleeding gums, slow wound healing, softening bones, loose teeth, ulcerations of the mouth and digestive tract, general weight loss and fatigue. From 1650 to 1850 half of all seamen on the trans-oceanic voyages died of scurvy. [43] It was discovered by a ship surgeon Thomas Lind in the early 1800s that British sailors were spared the disease altogether simply by a diet rich in citrus fruits.[44] Since limes travelled well, they were the common choice of fruit during the early years and thus the expression “limeys” was coined to describe British sailors.[44] It was later found both at sea and in prison fare that potatoes were equally successful in preventing scurvy, and much cheaper to obtain.[44] There is less than 20mg of Vitamin C found in an average potato.[45] This small amount, complexed in a food form Vitamin C, is all the body needs to prevent and even to reverse advanced stages of scurvy.[46]

Dr. Szent-Gyorgyi discovered Ascorbic Acid (AA) in 1937. In all of his research however, he found that he could never cure scurvy with the isolated AA itself. Realizing that he could always cure scurvy with the “impure” Vitamin C in simple foods, Szent-Gyorgyi discovered that other factors had to be at work in order for vitamin activity to take place. In his book, *Oxidation* (Williams and Wilkins, Baltimore 1939, pp73-74), Szent-Gyorgyi stated:

> "I am talking is such detail about this substance because of a small accident that happened to us at that time. I had a letter from an Austrian colleague who was suffering from a severe hemorrhagic diathesis (vascular type). He wanted to try ascorbic acid in his condition. Possessing at that time no sufficient quantities of crystalline ascorbic acid, I sent him a preparation of paprika that contained much ascorbic acid and the man was cured by it. Later with my friend, St. Rusznyak, we tried to produce the same therapeutic effect in similar conditions with pure ascorbic acid but we obtained no response. It was evident that the action of paprika was due to some other substance present in this plant."[47]

So he returned to the laboratory and eventually made the discovery of another member of the Vitamin C complex, which was Vitamin P (bioflavonoids) from lemon peel and paprika.[47] Eventually he came to understand the Vitamin C nutrient complex, Rutin, AA and the other factors were synergistic: cofactors that together sparked the "functional interdependence of biologically related nutrient factors." Later studies confirmed that natural Vitamin C along with its cofactors is more bioavailable than AA alone.[47,48]

Dr. Royal Lee said this about natural and synthetic vitamins:

> "The synthetic product is always a simple chemical substance, while the natural is a complex mixture of related and similar materials. Pure natural Vitamin E was found three times as potent as pure synthetic Vitamin E. Why do not the people and medical men know these facts? Is it because the commercial promoters of cheap imitation food and drug products spend enough money to stop the leaking out of information?"[47]

For example natural vitamins:

- are colloidal, protein in nature, and in the form of an enzymes or coenzymes
- the crystalline vitamin itself, when found in the natural food complex, is in a critical combination and cannot be split off without destroying its biological activity; if separated, it must recombine with the other members of the complex before it can function as a nutrient again
- the natural vitamin complex carries trace mineral activators without which the vitamin fails as a biochemical catalyst[49,50]

If so-called "high potency" synthetic crystalline vitamins are ingested, they must be put into proper combination, as a complex, before the vitamin-function can be activated. Otherwise, most, if not all, of the crystalline component is lost through the kidneys. Furthermore, Dr. Lee noted that "...synthetic vitamins seem to be dangerous. Irradiated Ergosterol (D) the first synthetic vitamin to be widely marketed, is now known to be extremely dangerous. It has fatally poisoned children in doses smaller than those recommended for treatment of rickets."[51] Yet the Federal Trade Commission has issued orders and interpretations to makers of natural vitamins to "cease and desist" stating that synthetic vitamin is in any way inferior to a natural vitamin.[51]

White Bread vs Whole-grain Bread

In the bread industry, wheat germ with its essential oils had been removed to avoid oil rancidity. In doing so, 22 essential nutrients have been removed in order to increase shelf life. Realizing that many of the nutrients have been stripped, the manufacturer added 4 nutrients back and called it "fortified white bread." This was the start of the functional food industry which is very popular way to market food for its "supposed nutritional value." It gives industries the marketing edge to say that their products have more nutrients than their competitors. How absurd to

strip the nutrients in the first place and then to call them "nutritious" or "wholesome?" In Canada, the adulteration of white flour with synthetic vitamins was a criminal offence.[52] Synthetic vitamins were added to fool the public and the fact that the insects and molds cannot live on "enriched" flour is testament to the poor level of nutrition in that flour.[52] Today, fundamental nutritionists and practitioners are encouraging their patients to go back to the basics and eat "whole-grain bread" so that they are getting all the essential components of grain. [53]

The analogy here is that taking synthetic vitamins would be similar to eating white bread. Some companies that recognized that Ascorbic acid was missing other components of the Vitamin C complex added the bioflavonoids. This would be equivalence of fortifying the white bread. Study of various commercial formulations with added bioflavonoids did not show increase in absorption.[54] The Ascorbic acid with the bioflavonoids is still not the whole Vitamin C complex!

Where's the *Vis*?

Foundational to Naturopathic medicine is the principle of *Vis medicatrix naturae* (also known as *natura medica*) which is the Latin phrase attributed to Hippocrates.[55] The phrase sums up one of the guiding principles of Hippocratic medicine which is that organisms contain "healing powers of nature." The state of illness, therefore, is not a malady but an effort of the body to overcome a disturbed equilibrium.[55] It is this capacity of organisms to correct imbalances that distinguishes them from non-living matter. From this follows the medical approach that "nature is the best physician" or "nature is the healer of disease." To do this Hippocrates considered a doctor's chief aim was to help this natural tendency of the body by observing its action, removing obstacles to its action, and thus allow an organism to recover its own health.[55] Natural vitamins contain the healing power of nature, but this is clearly not the case with synthesized chemicals that are made in a lab. This is the reason that practitioners who use energetic testing (ETA, Vega, kinesiology tests) will consistently observe compatibility of biological substances for use by humans. In other words, only life can support life.

The Milligram Game

Generally speaking, milligrams refer to the dosage of synthetic nutrients but it is not the reality of wholefood nutrients. The more that isolates are used, the greater the deficiency problem. Synthetic vitamins are refined, high potency chemicals, and therefore may be accurately measured in milligrams, just like drugs. This has nothing to do with vitamin activity or nutrition, and everything to do with marketing and profit!

The mega-vitamin theory doesn't really hold when it comes to synthetics: if a little is good, more is better. Macro doses of Vitamin E and Vitamin D have been shown to decrease immune function significantly. It stands to reason vitamins by definition are necessarily in phenomenally small in dosage and so more is not necessarily better. Although vitamins from naturally occurring sources are of a relatively low potency, they are actually much more effective at these lower potencies than synthetic vitamins for the simple reason that the body can easily assimilate their nutrients, and can do so without the toxic side effects of synthetic ingredients.[52]

The Synthetic Vitamin Conspiracy

Stanley Adams, Roche's World Product Manager in Basel, contacted the European Economic Community in 1973 with evidence that Roche had been breaking antitrust laws, engaging in price fixing and market sharing for vitamins with its competitors.[56] Roche was fined accordingly, but a bungle on the part of the EEC allowed the company to discover that it was Adams who had blown the whistle. He was arrested for unauthorised disclosure — an offence under Swiss law — and imprisoned. His wife, having learnt that he might face decades in jail, committed suicide.[56] Adams was released soon after but arrested again more than once before eventually fleeing to Britain, where he wrote a book about the affair, *Roche Versus Adams*. [56]

In 1999 Roche was the worldwide market leader in vitamins, with a market share of 40%. Between 1990 and 1999, the company continued to participate in an illegal price fixing cartel for vitamins, which also included BASF and Rhone-Poulenc SA. [56] In 1999, Roche pleaded guilty in the United States and paid a US$500 million fine, then the largest fine ever secured in the U.S. [56] The European Commission fined Roche €462 million for the same infraction in 2001, also a record fine at the time. [56] On May 20, 1999, Assistant U.S. Attorney General Joel Klein of the U.S. Justice Department describes the vitamin industry this way:

> "The vitamin cartel is the most pervasive and harmful criminal antitrust conspiracy ever uncovered. The criminal conduct of these companies hurt the pocketbook of virtually every American consumer – anyone who took a vitamin, drank a glass of milk, or had a bowl of cereal. This cartel was truly extraordinary. It lasted almost a decade and involved a highly sophisticated and elaborate conspiracy to control everything about the sale of these products. These companies fixed the price; they allocated sales volumes; they allocated customers; and in the United States they even rigged bids to make absolutely sure that their cartel would work. The conspirators held annual meetings to fix prices to carve up world markets, as well as frequent follow-up meetings to ensure compliance with their illegal scheme. The enormous effort that went into maintaining this conspiracy reflects the magnitude of the illegal revenues it generated as well as the harm it inflicted on the American economy." [57]

Roche sold its vitamin business in late 2002 to the Dutch group DSM.[56]

Synthetic Vitamins are Toxic!

Even as far back as 1934, studies showed differences between synthetic and food-based vitamins. Dr. Casimir Funk, who actually coined the term "vitamine" said, "The synthetic product is less effective and more toxic."[58] Toxic? Yes. Synthetic vitamins exert a drug-like effect, not a nutritive one. It may surprise you to learn that synthetic vitamins are not only inferior; they are dangerous and can actually create nutritional deficiencies because the missing synergists are required to transform the vitamins into energy for the body. So the body has to rob its own stores, making synthetic vitamins actually "anti-nutrients!" It is often said that what the body doesn't need will "just pass through." This isn't true. Eliminating things from the body also takes energy and uses up stores of other nutrients and enzymes.

Where do our nutrients come from?

We cannot draw nutrients from our soil because the molecules are too tightly bound by ionic bonding. However, Nature can draw these nutritional elements from the ground through photosynthesis and create the plant that we eat and absorb as nutrients. That plant changed the ionic bonding to covalent and other loosely bound molecules that make up the food that we eat. Sadly, the great majority of vitamins on the market are synthesized in the lab. Look at the comparison chart and you will see these man-made vitamins have been made from everything but food.

Table 4: Nutrient Sources and their Comparisons.[23,24,25, 59,60, 61,62,63,64,65]

Nutrient	Synthetic Nutrient Form	Source of Synthetic Nutrient	Whole Food Nutrient Form	Source of Whole Food Nutrient	Comparison
Vitamin A or β-carotene	Retinoic acid and Retinyl Acetate or palmitate, and β-carotene may cause cirrhosis,[66] birth defects if use >8,000IU/d when pregnant and mortality[67,68,68]; Interaction with Vitamin E reduces Vitamin E utilization[70]	Vitamin A acetate from methanol, vinyl, acetylene gas, or coal tar; Vitamin A palmitate from fish oil; β-carotene from aldehyde and acetylene	Retinyl ester food complex as Retinols, Retinoids, Retinal, mixed Carotenoids, Carotenes, plus Fatty acids, Chlorophyll, Vitamins C, E, B, D, enzymes and minerals	Oranges, Cantaloupe, Mangoes, Papaya, Carrots, Pumpkins, Yams, Squash, Spinach, Kale, Sweet potato leaves	Wholefood form is less toxic & absorbs 1.54x more than USP form
Vitamin B1	Thiamin HCl or Mononitrate forms, a salt, more stable and used for food fortification and stable for storage & processing	Grewediamine (a coal tar derivative), processed with hydrochloric acid; acetonitrole with ammonia	Thiamin food complex as pyrophosphate, monophosphate and Thiamin, an alkaline natural food complex, sensitive to heat; found as Thiamin pyrophosphate in the body, but rapidly destroyed > pH 8, radiation, heat[71]	Rice Bran, Oatmeal, Brown rice, Vegetables, Potatoes, Yeast, Legumes, Guava, Lemon, Holy Basil;	Natural form is absorbed 1.38x more into blood and retained 1.27x more in liver than Thiamin HCl
Vitamin B2 (was Vitamin G)	Riboflavin, an orange amorphous solid, some analogs have weak vitaminic activity	Synthetically made with 2N-acetic acid; in crystalline form	Riboflavin food complex, a weak base, sensitive to light, some coenzyme forms in plants, processing losses due to leaching of light-sensitive flavin into water; pasteurization of cow's milk reduces bound form of Riboflavin from 13.6% to 2%[72]	Bananas, Popcorn, Green beans, Asparagus; Guava, Lemon, Holy Basil;	Wholefood form retains 1.92x more in liver than USP Riboflavin
Vitamin B3 (was Vitamin PP)	Niacinamide analogs, some have antivitamin activity, may cause GI upset, and hepatotoxicity	Coal tar derivatives, 3-cyanopyridine; process involving formaldehyde & ammonia; as crystalline form	Niacin food complex, metabolically active coenzyme forms of Niacin are NAD and NADP; Nicotinamide or Niacinamide is more water & alcohol soluble & have fewer side effects than Niacin, processing losses due to water leaching	Many vegetables, Mushrooms, Tree nuts, Legumes, Cereal grains, Yeast, Guava, Lemon, Holy Basil	Natural form does not cause GI upset or hepatoxicity that synthetic forms do, it absorbs 3.94x more in the blood, retains 1.7x more in liver than synthetics
Vitamin B5	Pantothenic acid consists of Pantoic acid linked to β-alanine; most multivitamins uses more stable Panthenol form	Condensing isobutyraldehyde with formaldehyde, then with hydro-cyanic acid then linked to β-alanine	Pantothenate food complex (AKA Vitamin B5), not in Pantothenic acid form, sensitive to heat from cooking resulting in losses of 37-78% in vegetables	Avocados, Whole grains, Yeast, Broccoli, Guava, Lemon, Holy Basil	

Vitamin B6	Pyridoxine HCl, not found in food; one analog found to inhibit natural Vitamin B6 action[73]	Pyridoxine HCl from petroleum ester & hydrochloric acid with formaldehyde; P5P made from phosphorus oxy-chloride ±adenosine triphosphate and pyridoxal; as crystalline structure	Pyridoxine 5'-β-D-glycoside and other glycosylated forms of pyridoxine, these forms only found in plant foods[73]	Vegetables, Tree nuts, Bananas, Yeast & Rice bran, Guava, Lemon, Holy Basil	Natural form absorbs 2.54x more in blood,[67] retained 1.56x more in liver
Vitamin B7 or Biotin (Vitamin H)	Crystalline Biotin is not protein bound	Fumaric acid (trans-1,2-ethylene) or biotin l-sulfoxide from pimelic acid	Natural Biotin as d-(+) biotin usually protein bound	Peanuts, Some vegetables	Biotin l-sulfoxide <1% activity as natural biotin
Vitamin B9 or Folate (Vitamin M)	Ptyeoylglutamic acid (AKA Vitamin M & Folic acid), large doses can cause B12 deficiency; "Enriched" products must be fortified with folic acid according to FDA,[75] improves vitamin B12 & homocysteine levels in elderlies,[76] prevents neurotube defects[77]	Processed with petroleum derivatives and acids, acetylene; in crystal form	Folate food complex (AKA Pteroylglutamate) found in foods, but Folic acid is not found in foods, susceptible to protracted cooking or canning which may destroy 50-95% of Folate in food	Pasta, Cereal, Green leafy vegetables, Some fruits, Guava, Lemon, Holy Basil	It absorbs only 1.07x more into blood, but retains 2.13x more in the liver
Vitamin B12	Cyanocobalamin analogs developed due to cost considerations when raw liver was given for pernicious anemia[78]; some forms interfere with natural Vitamin B12 activity in the body[79]; oral as effective as IM administration in Vitamin B12 deficient patients[80]	Cobalamins fermented with cyanidein crystalline form or purified from sewage sludge	Vitamin B12 food complex in co-enzyme form as methylcobalamin and deoxyadenosylcobalamin without cyanide, non-toxic and conjugated with peptide linkage	Liver, Eggs, Animal products, Blue-green Algae, Spirulina	It absorbed 2.56x more into blood and retained 1.59x more in the liver than synthetic form
Vitamin C	Isolated Ascorbic acid (AA), adding bioflavonoids did not significantly improve absorption[54]; 1000 mg/d of AA lowered protein glycation by 33% after 3 months[81]; Ascorbic acid could be useful for preventing/treating common cold exposed to brief periods of severe physical exercise[82]	Fermenting GMO corn starch into sorbitol, then hydrogenated to sorbose, then add acetone to break molecular bonds to create isolated crystalline ascorbic acid	Vitamin C food complex, or Dehydroascorbic acid (DHAA) both forms found in food[83,84]; 5 servings of fruits & vegetables per day will provide >210mg of Vitamin C& lowers cancer risk[84]; 1000 mg/d Vitamin C decreased protein glycation by 46.8% in 1 month[85]; 41% more effective than AA in reducing galactiol when cataracts were present[86]	Various fresh fruits & vegetables, Acerola berries, Amla berries, Camu camu	In human studies, it absorbs 1.35 to 1.74x more into the blood,[87,88] and decomposes more slowly[89]; over 15.6x more potent as antioxidant[90] & 2.2x more effective in lowering blood

					sugar than synthetic form[91]
Vitamin D	Vitamin D forms as Vitamin D1, D2, D3, and D4 do not have promoting metabolites, & are biologically inactive; new analogues such as Vitamin D3 with greater effects on calcium utilization[92] and breast cancer[93]; Vitamin D decrease mortality in elderly women in institutions but when combined with calcium significantly increased nephrolithiasis[94]; significant increase in GI symptoms and renal disease associated with vitamin D or its analogues, Calcitriol increases incidence of hypercalcaemia[95]	Vitamin D1 without antirachitic effects, made with benzene; D2 made by bombarding ergosterol with electrons, & recovered with solvent extraction; D3 & D4 made by irradiated animal fat or cattle brains and spinal cords	1,25-dihydroxyvitamin D is the biologically active form with promoting metabolites, as a combination of substances; B & T lymphocytes have receptors for natural Vitamin D which affects phagocytosis and even anti-proliferative effect on cancer cells; Ergocalciferol from lyophilized mushrooms is well absorbed in humans,[96] Vitamin D2 from mushrooms is shown to absorb as well as D3 in maintaining 25-hydroxyvitamin D[97]	Cod liver oil, Eggs, Liver; Mushrooms, Lichens	synthetic form does not have all the benefits of natural Vitamin D; Has over 10x anti-rachitic effect versus synthetics[98]
Vitamin E	Synthetic Vitamin E include dl-alpha-tocopherol (AKA all-rac-alpha-tocopherol) along with 7 other epimers which have isomer & ester differences that can affect absorption & utilization all in acetate form; natural Vitamin E increases VLDL while synthetic form increases mortality[69]; Vitamin E in preterm infants reduced the risk of intracranial hemorrhage but increased the risk of sepsis[99]	Trimethylhydro-quinone (TMHQ) coupled with isophytol	Natural Vitamin E is d-alpha-tocopherol (AKA RRR-alpha-tocopherol), with other tocopherols and trocotrienols; the placenta, the fetal liver are able to discriminate between natural (RRR-) and synthetic (all-rac) alpha-tocopherol[100]; natural RRR- form of Vitamin E preferentially increased VLDL[101,102]	Green leafy vegetables, Wheat germ oil, Unrefined vegetable oils, Annatto seeds	Has 2x availability[103] absorbs 3.5x more in cord blood during pregnancy,[104] absorbs 2.7x more,[105] retains 2.6x more, less tumorogenicity[106] and up to 4x free radical scavenging strength versus synthetic forms
Vitamin K	Vitamin K3 (Menadione), Menadione is irritating to skin and the respiratory tract, implicated in producing hemolytic anemia, hyperbilirubinemia, and kernicterus in the newborn, especially in premature infants,[107] Menadione can induce hemolysis G6PD deficient individuals,[108] Excessive oxidative stress and resultant damage to kidney and liver cells, FDA does	USP K1 produced with p-allelic-nickel; Dihydro-Vitamin K1 from hydrogenated vegetable oils (trans fatty acid)[110,111]; USP K3 from naphthalene which is a coal tar derivative, to make naphthoquinone	Vitamin K1 (Phylloquinone) from plants and Vitamin K2 (Menaquinone) from animals, fermented foods (natto) and by human bowel bacteria; Food-based Vitamin K lowers cancer risk[112]	Green leafy vegetables (lettuces), Broccoli, Spinach, Swiss chard, Hemp seeds, Liver and Fish meal[113]	There are no documented toxicity symptoms for dietary Vitamin K so the Institute of Medicine at the National Academy of Sciences chose not to set a Tolerable Upper Limit (UL) for Vitamin K in

	not allow vitamin K to be sold as a dietary supplement in Menadione form[109]	, now considered dangerous			2000[109]
Calcium	Calcium carbonate, acetate, lactate, gluconate, and citrate salts and calcium from whole milk were similar in absorption rates (31±3%)[114]	Rocks (calcite, aragonite, vaterite), Coral, Shells of crustaceans, Eggshells	Plant-based Calcium significantly increased Calcium deposition in human osteoblast cells and reduced oxidative stress vs. Calcium carbonate or citrate[115]	Kale, Seaweed	Dietary calcium 7x more effective in raising serum ionic calcium levels;[116] Absorption from Spinach is 5.1%,[117] Sardine bones 23%,[118] Kale 40.9%![119]
Magnesium	Magnesium chloride, oxide, gluconate, malate, orotate, glycinate and citrate forms for oral supplements; oxide form is the least absorbable[120]	$MgCl_2$ made from Mg ammonium chloride hexahydrate with HCl; Mg oxide from magnesite ores		Green vegetables, Spices, Nuts, Cereals, Coffee, Cocoa, Tea,	Better absorbed & retained than synthetic forms
Chromium	Chromium picolinate, does not contain GTF; meta-analysis of chromium supplementation studies showed no association between chromium and glucose or insulin concentrations for non-diabetics, and inconclusive results for diabetics[121,122]	Chromium (III) and picolinic acid	Chromium GTF (glucose tolerance factor) a very easily absorbed form of chromium, naturally bound to glycine, glutamic acid, cysteine and niacin;	Yeast, Whole grain, Moringa	Up to 25x more bioavailable than synthetic form, toxic levels are 10,000x safer than 200mcg of synthetic Chromium
Iron	Iron (II) sulfate, Iron (III) chloride, fumarate, citrate or other chelates like glycine[123]	Mining of metallic ores (hematite, magnetide)	Iron in meat (heme iron) is more easily absorbed than iron in vegetables, but some studies suggest that heme/hemoglobin from red meat may increase risk of colorectal cancer[124,125,126]	Lentils, Beans, Leafy vegetables, Watercress, Molasses, Curry leaves	Non-constipating, better absorbed than synthetics
Selenium	Selenium oxide, citrate	Selenium oxide made by burning selenium in oxygen ± nitrogen dioxide	Selenium-methionine in plant foods has higher bioavailability than Selenium-cysteine in animal products, which may account for higher plasma levels of Selenium in vegetarians[127]	Mustard seed	It is nearly 2x better retained
Zinc	Zinc citrate	Zinc carbonate and citric acid		Guava	It has better absorption, better form[121]

Numerous published studies have concluded that supplements containing food nutrients are better than USP synthetic isolates. Food nutrients contain important enzymes, peptides, and phytonutrients critical to the utilization of vitamins and minerals that are not present in synthetic ones.

Phytochemicals are Essential Too!

Epidemiological studies have consistently shown that regular consumption of fruits and vegetables is strongly associated with reduced risk of developing chronic diseases, such as cancer and cardiovascular disease. It is now widely believed that the actions of the antioxidant nutrients alone do not explain the observed health benefits of diets rich in fruits and vegetables, because taken alone, the individual antioxidants studied in clinical trials do not appear to have consistent preventive effects. Studies performed by researchers have shown that the major part of total antioxidant activity is from the combination of phytonutrients.

Researchers proposed that the additive and synergistic effects of phytonutrients in fruits and vegetables are responsible for these potent antioxidant and anticancer activities and that the benefit of a diet rich in fruits and vegetables is attributed to the complex mixture of phytonutrients present in whole foods.[128] This explains why no single antioxidant can replace the combination of natural phytonutrients in fruits and vegetables to achieve the health benefits. The evidence suggests that antioxidants or bioactive compounds are best acquired through whole-food consumption, not from expensive dietary supplements. Researchers believed that a recommendation that consumers eat 5 to 10 servings of a wide variety of fruits and vegetables daily is an appropriate strategy for significantly reducing the risk of chronic diseases and to meet their nutrient requirements for optimal health.[128]

Nuts, whole grains, fruits and vegetables contain an abundance of phenolic compounds, terpenoids, pigments and other natural antioxidants that have been associated with protection from and treatment of chronic disease such as heart disease, cancer, diabetes and hypertension as well as other medical conditions.[129] Foods that have the highest anticancer activity include garlic, soybeans, cabbage, ginger, licorice, and the umbelliferous vegetables (carrot, celery, parsley).[129, 130] Citrus, in addition to providing an ample supply of vitamin C, folic acid, potassium, and pectin, contains a host of active phytochemicals.[131] There are more than 60 flavonoids in citrus which have a wide variety of properties including anti-inflammatory and anti-tumor activity, inhibition of blood clots, and strong antioxidant activity.[131] In a natural oil, the tocopherol is accompanied by phospholipids, low molecular weight phenolic compounds, free fatty acids, acting together confer a stability from 10 to 100 times more than synthetic tocopherol.[132]

An *in vitro* study performed with digital ORP meter demonstrated that a citrus food vitamin C has negative ORP, but that ascorbic acid has positive ORP. It takes negative ORP to clear up oxidative damage, and since ascorbic acid has positive ORP, it can never replace vitamin C no matter what the quantity![133] Phytochemicals in grains include plant sterols, phytases, phytoestrogens, tocotrienols, lignans, ellagic acid and saponins.[133] Refining wheat causes about a 200- to 300-fold loss in phytonutrient content.[133]

Nutritional Genomics

Nutrigenomics is a new field of study concerned with the ways in which food consumption can affect whether our genes will trigger disease. Dr. Weston Price was perhaps the first scientist in the 1930's who discovered the connection between food choice and genetic expression. In native populations that adopted diets of "civilized" Western peoples, Dr. Price saw signs of physical degeneration.[134] This is because tradition diets provided at least four times the amount of water-soluble vitamins, calcium, and other minerals, and at least 10 times the amount of fat-soluble vitamins, compared with Western diets.[134] Dr. Price discovered that radical changes in the diet that lead to nutritional deficiencies can cause dental caries, facial deformities in children born to parents consuming refined and devitalized foods resulting in narrowed facial structure and dental arches, along with crowded teeth, birth defects and increased susceptibility to infectious and chronic disease.[134] Significantly, when some natives returned to their traditional diets, open cavities ceased progressing and children now conceived and born once again had perfect dental arches and no tooth decay.[134]

Britain's Institute of Food Research, for instance, in a 2002 review of all nutrigenomics research up until that date came to this firm conclusion:

> "Evidence that diet is a key environmental factor affecting the incidence of many chronic diseases is overwhelming. The food we eat contains thousands of biologically active substances, many of which may have the potential to provide substantial health benefits."[135]

Phytonutrients protect cartilage in the joints of our body and prevent joint pain and other symptoms of arthritis. These plant-derived phytonutrients block the activity of any enzyme that triggers inflammation in joints.[129] Researchers stated that "they detoxify certain cancer-causing agents and damaging free radicals in tissue, including cells that line blood vessels." [136] These phytonutrients can be found in cruciferous vegetables, such as broccoli.

Conclusion

Most vitamins sold are not from wholefood – they are synthetically made from petroleum by-products or hydrogenated sugars even if they say "natural" on the bottle. They are not the same chemical or structural form as vitamins from foods, and therefore not natural for the body. Real food-based vitamins are superior to synthetic ones as they are absorbed and/or retained better by the body. Isolated, synthetic vitamins are only partial nutrients which may be toxic and even cause disease in the body. Drug companies that make these synthetic vitamins do not want you know the problems associated with these products because they want you to continue purchasing them.

Natural molecules differ substantially from synthetic ones. Most previous molecular studies had failed to distinguish natural products and natural product derivatives, molecules that contain both natural and synthetic elements and concluded that neither the synthetic nor the partially synthetic molecular compounds could match the natural in the benefits afforded the human body.[137] A key difference was the four-times-higher numbers of "chiral center" in the natural molecules, a term that refers to binding sites that enable molecules to be absorbed by the human body." [137]

Dr. Gunter Blobel, a cell and molecular biologist at Rockefeller University in New York, received the 1999 Nobel Prize award in Physiology for his discovery on protein signals. [138] He found that proteins possess inherent signals or information that determine which cells attract and absorb them and where in the cell the protein belongs.[138] This is another reason for differences at the molecular level between natural and synthetic nutrients. Nutrients do not simply wander around inside the body, instead it is as if nutrients have postal codes that enable them to be delivered directly to cells containing the receptors with that same postal code. This is nature's delivery system with the body, and synthetic isolates cannot match the efficiency and effectiveness of that system. It is a system that helps to explain why natural nutrients are much more absorbable and bioavailable to us.

One of the hallmarks of natural nutrient is its energy or life force – a poorly understood, elusive component that at its core cannot be identified. Unfortunately, life energy is not measurable by chemical or any other accepted scientific methods, and yet it is the secret of life itself.[139] Life force is the inherent electrical charge from Nature that regenerates human health. It is most readily accessible in living foods.[140] It energizes the human cell because it is the most direct connection between the sun, our plants and our bodies. Nature's food is living food, a complex, energy-emanating substance that is harmonious with the human organism. When altered in any way at the hands of the scientist or manufacturer, Nature's food become unbalanced and infused with the potential to create imbalance and disease.[135] The introduction of chemicals, isolated vitamins, drugs and other inharmonious substances to the human body creates unpredictable side effects and disease.[141] The only natural nutrients we can take are real, whole foods and whole food concentrates. Natural food concentrates have not the advantage of condensing high vitamin potencies into small tablets. Nature's building material as they were balanced in Nature's own laboratory, a balance that does not exist in man-made vitamin formulae.[142]

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