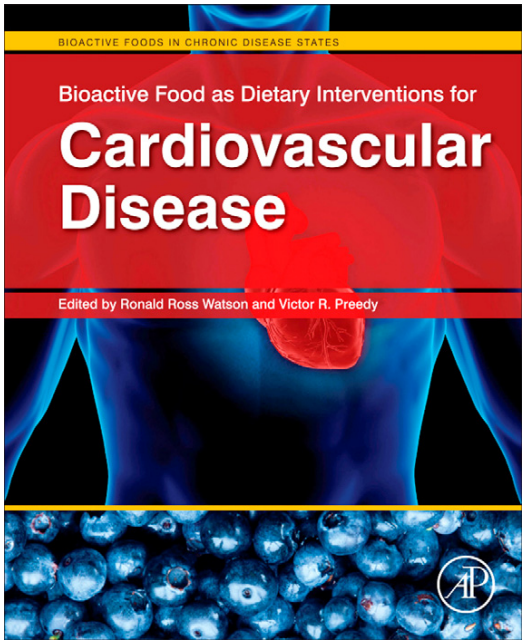

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CHAPTER 6

Cardioprotective Nutrients

R. Jaffe
Fellow, Health Studies Collegium, Ashburn, VA, USA

A range of foods and bioavailable supplements are now available that provide better outcomes and clinically significant leverage in managing the pathophysiology of cardiovascular disease. Targeted supplementation, in combination with individualized diet therapy, are included as are mental and physical exercises aimed at evoking healing responses in proportion to documented risk reductions.

1. INTRODUCTION

Careful risk assessment of the individual utilizing conventional medical guidelines is the first step in quantifying the needs of the patient. Although the following cardioprotective nutrients provide valuable clinical tools, high-risk patients may require pharmaceutical intervention individually or in combination with nutrients.

2. CARDIOPROTECTIVE NUTRIENTS

The beneficial biochemical effects of cardioprotective nutrients include antioxidant protection and repair stimulating anti-inflammatory properties. Immune regulation, endothelial cell protection, cell membrane stabilization, methylation epigenetic support, and healthier blood lipids are among the results (Table 6.1).

2.1 Antioxidant Vitamins and Polyphenolics

Antioxidant nutrients are central in any cardioprotective protocol. Sufficient levels of antioxidants from diet can help to prevent or delay the occurrence of pathological changes associated with oxidative stress. Antioxidants include ascorbate, flavonoids, mixed natural carotenoids, B complex and mixed natural tocopherols, minerals and cofactors such as coenzyme Q_{10} (Giugliano, 2000).

2.1.1 Ascorbate (vitamin C) and cardiovascular health

The role of vitamin C or ascorbate in defending the immune system is recognized. However, the question of which form of ascorbate to recommend (buffered ascorbate or ascorbic acid) has been less clear.

One of the cardioprotective strategies of the Alkaline Way paradigm is the reduction of metabolic acidosis with an alkaline diet and sufficient, available buffering minerals

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Table 6.1 Cardiovascular Diseases: Nutrients to Address Primary Causes and Secondary Consequences

Beneficial nutrients from foods and supplements	Comorbidity
Nutrients from food	• Hypertension
Prebiotic fiber from grains, grasses, tubers, and pulses	• Glucose regulation
Probiotic mixed flora from fermented foods	• Lipid levels – cholesterol
G, G, O, B, E*	• Homocysteine levels
Green tea: ECGC*	• Inflammation
Vitamins and flavonoids	• Free radicals
Ascorbate	• (Endothelial health, plaque risk)
Quercetin dihydrate, soluble OPC, resveratrol, curcumin	
Amino acid cofactor	
Carnitine fumarate	
Taurine	
NAC	
Minerals	
Calcium	
Magnesium	
Potassium	
Trace minerals	
Fatty acids	
Omega 3s	
Omega 6s	
Cofactors	
CoQ_{10}	
Bioactive components of food	
Policosanols	
Red Rice Yeast – (certified as traditional and authentic)	
Plant sterols	
Tocotrienols	
Botanicals	
Hawthorne, Pine tea, bilberry, rosehips, equisetum	

EAA, essential amino acids; GGOBE, ginger, garlic, onions, brassica sprouts, and eggs; NAC, *N*-acetyl cysteine; B complex, vitamins include B_1, B_2, B_3, B_6, B_{12}, folates (B_7); PABA, Para Amino Benzoic Acid; ECGC, epigallocatechin gallate; SAMe *S*-adenosylmethionine; SeMet selenomethionine; carotenoids: alpha and beta-carotene, cryptoxanthine, lycopene, and xeaxanthine.

(Souto et al., 2011). The links between renal acid load and cardiovascular risk factors were evaluated (Murakami et al., 2007) in a population of more than 1100 female participants, aged 18–22. This study evaluated potential acid load due to diet, including dietary protein, phosphorus, potassium, calcium, and magnesium intake and also tracked the ratio of protein to potassium. The data showed that more acidic diets were associated with elevated hypertension, higher total and LDL cholesterol, and increased body-mass index and waist circumference, all primary markers of cardiovascular risk. The findings are especially notable given the young age of the participants.

With the aim of balancing metabolic acidity, a vitamin C source that is fully reduced with buffering minerals such as potassium, calcium, magnesium, and zinc can be more helpful in neutralizing excess cell acids. Adequate amounts of buffered ascorbate are able to provide rest to the body's immune system and boost hormonal and neurochemical function. Additionally, buffered ascorbate functions as a steroid-sparing agent, a detoxifying agent, and an electron donor to enhance cell energy. Ascorbate is uniquely able to donate an electron and restore ATP-generating capacity to the mitochondria of the cell, thus increasing its energy output.

Low ascorbate levels are associated with all aspects of cardiovascular disease (CVD) (Loria et al., 2000). Ascorbate deficiencies adversely influence endothelial functions, smooth muscle cell proliferation, thrombosis, and plaque ruptures. A shortage of antioxidants in the diet promotes coronary heart disease (CHD) through the accumulation of oxidized LDL in macrophages initiating plaque formation. In that light, it is prudent to incorporate adequate buffered ascorbate in a cardiovascular health protocol. How much ascorbate one needs is dependent on how rapidly this vital nutrient is being consumed. Ascorbate calibration provides a practical solution – a method that each individual can use to determine how much ascorbate he/she requires at any given point in time. When ascorbate demands increase, with infections, high stress, or allergic conditions, ascorbate calibration (cleanse) is repeated on a weekly basis until stable ascorbate need is met (Figure 6.1).

2.1.2 Flavonoids: Quercetin dihydrate and OPC flavonoids

The proanthocyanidins (oligomeric proanthocyanidins or OPC) are naturally occurring antioxidants widely available in plant sources, including fruits, vegetables, nuts, seeds, flowers, and bark. Grape seed extract is one the most potent source of OPC, and has demonstrated excellent protection against myocardial ischemia-reperfusion injury and myocardial infarction. In addition, grape seed extract supplementation to high fat diets has been shown to normalize body weight, support epididymal tissue, normalize lipid concentrations, and improve carnitine levels by controlling lipid metabolism. Coupled with quercetin dihydrate, it makes for a formulation that is one of the best in this category.

2.1.3 B complex vitamins

The full range of B complex vitamins affects a tremendously broad range of biochemical processes in the body. Of particular relevance to cardiovascular function and protection is their role in methylation chemistry, insulin sensitivity, lipid regulation, energy production, free radical management, and inflammatory processes.

2.1.3.1 Folate, vitamin B6, and vitamin B12

Naturally occurring in whole, unprocessed foods, B vitamins have been closely linked to cardiovascular health status. Folate, vitamin B6, and vitamin B12 are essential in the

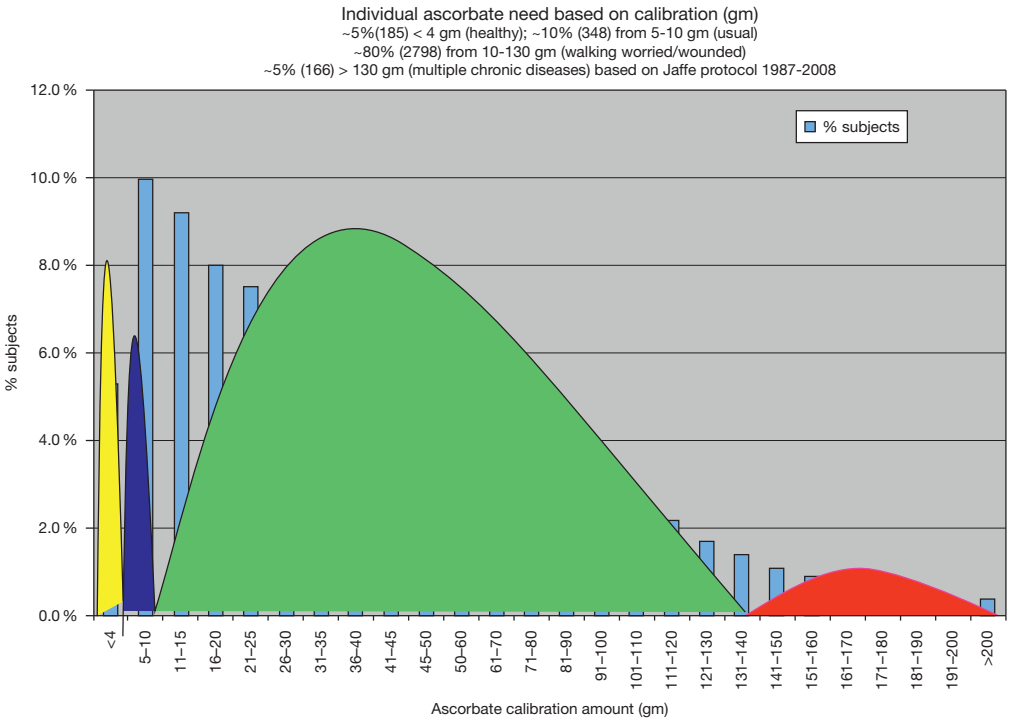

Figure 6.1 Amount of ascorbate needed to achieve calibrated individual need.

conversion of homocysteine into methionine, and without these B vitamins, this conversion process becomes inefficient and homocysteine levels rise. Research has shown that excessive amounts of homocysteine can damage blood vessels, increasing the risk of cardiovascular disease, stroke, and hypertension. Conversely, these risks are reduced among people with higher intakes of folate, those who use multivitamin supplements, and those with higher levels of serum folate (He et al., 2004; Ishihara et al., 2008).

2.1.3.2 Niacin

Niacin assists in vasodilation, enabling improved blood circulation. Additionally, because niacin lowers LDL cholesterol levels, it helps prevent plaque build-up. The result is improved blood flow that reduces the risk of heart attack or stroke. Recent research has demonstrated greater safety and efficacy of niacin supplementation in comparison with certain cardiovascular medications in lowering blood lipids.

2.1.3.3 Pantothenic acid

Pantothenic acid is vital to the healthy production, transport, and breakdown of lipids and in significant amounts helps weight loss. Pantothenic acid supplementation facilitates complete catabolism of fatty acids without the formation of ketone bodies (Leung, 1995).

2.1.4 Carotenoids

Carotenoids are especially important for their antioxidant roles in cardiovascular health. Found in fruits and vegetables, the most abundant carotenoids in the diet are beta-carotene, lycopene, lutein, beta-cryptoxanthin, zeaxanthin, and astaxanthin. In terms of supplementation, natural and mixed carotenoids have been found superior to synthetic single carotenoids. Studies have shown that synthetic beta-carotene does not protect against heart disease (Hennekens et al., 1996). There is a strong association between dietary sources of lycopene and reduced risk of heart attacks. Lutein and zeaxanthin (in the xanthophyll family of carotenoids) have been found to inhibit the thickening of carotid artery walls and to reduce arterial inflammation, combating LDL-induced migration of monocytes to human artery cell walls (Dwyer et al., 2011). Changes in carotid intima-media thickness (IMT), considered a measure of atherosclerotic cardiovascular disease, are also significantly inversely associated with lutein and zeaxanthin levels.

2.1.5 Vitamin D3

Individuals with vitamin D deficiency have increased incidence of CVD. CVD risk is also higher in areas of increased geographic latitude and during the winter months' lack of sunshine (Holick, 2007). These associations are numerous and well documented. Vitamin D deficiency can lead to secondary hyperparathyroidism. Studies have shown CVD risk lined with high parathyroid hormone levels (Lee et al., 2008). In addition, vitamin D deficiency increases systemic inflammation, confirmed by elevated levels of C-reactive protein and interleukin-10. Another vital connection between vitamin D and CVD is the link with metabolic syndrome and diabetes, which significantly increase the risk of heart disease. Increased body fat results in sequestration of vitamin D in adipose tissue, thus lowering serum vitamin D concentrations and, ultimately, leading to insulin resistance and metabolic syndrome. Adequate vitamin D levels are required for healthy insulin secretion. We suggest 25-OH vitamin D levels of 50–80 ng/ml as the healthier target values.

2.1.6 Vitamin E

Naturally occurring vitamin E exists in eight chemical forms (alpha-, beta-, gamma-, and delta-tocopherol and alpha-, beta-, gamma-, and delta-tocotrienol) that have varying levels of biological benefit to specific parts of the body. Vitamin E particularly gamma tocopherol has effects on immune function, and has been found to decrease platelet aggregation. *In vitro* studies have shown that vitamin E in all its forms inhibits oxidation of low-density lipoprotein (LDL) cholesterol. Vitamin E also appears to prevent the formation of blood clots that can provoke heart attacks or venous thromboembolism (Glynn et al., 2007). As in the case of carotenoids, mixed natural tocopherols are the form of vitamin E that have been shown to provide safer and more effective results. We use only

the mixed natural forms of nutrients. For vitamins E, this means 800–3600 I.U per day, sufficient to quench oxidized HDL/LDL. We never use d-alpha tocopherol succinate or acetate as these are less safe and less effective forms of vitamin E with high toxicity profiles.

2.2 Intermediates and Cofactors

2.2.1 Alpha lipoic acid

As another powerful antioxidant, alpha lipoic acid plays an enormous role in diabetes and associated complications, particularly cardiovascular health. Oral treatment with 800 mg per day for 4 months has supported short-term improvement of cardiac autonomic dysfunction in Type 2 diabetes (Ziegler and Gries, 1997). Increased oxidative stress and inflammation causally contribute to CVDs and increasing age usually exacerbates this issue. Alpha lipoic acid supplementation has been shown to ameliorate these effects (Li et al., 2010). We suggest optimized ascorbate intake as the more clinically effective way to recycle, restore, and enhance alpha lipoic acid levels.

2.2.2 Coenzyme Q10

CoQ_{10} has been found to increase energy production in the heart, improving the heart muscle's ability to contract and lowering blood pressure. CoQ_{10} has been shown to be highly concentrated in heart muscle cells, reflecting their high energy requirements. Conversely, congestive heart failure from a wide variety of causes has been strongly correlated with low blood and tissue levels of CoQ_{10}. Reflecting a dose–response relationship, the severity of heart failure has been found to correlate with the severity of CoQ_{10} deficiency. Deficiency of CoQ_{10} is easily treated with micellized CoQ_{10} supplements (in a suspension of rice bran oil), which is documented to slow the progression of heart failure.

The production of CoQ_{10} is known to reduce with age and with dietary deprivations, such as the lack of healthy fats. Patients with other conditions associated with reduced energy levels in the body, such as depression and chronic fatigue syndrome, have shown significantly depleted CoQ_{10} levels (Maes et al., 2009). Medications such as statin drugs can reduce CoQ_{10} production by as much as 50%. It, therefore, makes sense for anyone on statin medication to supplement with CoQ_{10} for natural, safe cardiac support (Langsjoen, et al., 2005). Individuals who want to maintain cardiovascular health with advancing years might require 30–300 mg per day. Those who want to achieve repletion might need 100–1,200 mg per day for a period of 1 or 2 months until CoQ_{10} levels have been increased and the health of the health of the cell mitochondria has been effectively restored. Intake can then be reduced to a maintenance level of 60–300 mg per day.

2.2.3 Omega-3 Fatty Acids

One of the key issues in omega-3 supplementation is the bioavailability of the source. When using flaxseeds, it is important to note that the alpha-linoleic acid content must

be converted to EPA and DHA in order to be used by the body. The metabolic steps in this conversion are frequently incomplete, dependent on deviations in individual epigenetics, genetics, metabolism, and age (Bloedon et al., 2003). As with any nutrient, the efficiency of metabolism is individual.

Flax cannot be relied upon as a consistent, clinically effective source of omega-3, because consumption of flax oil or flaxseed products does not predictably result in increased physiologic levels of EPA or DHA. Fish oil, which contains both EPA and DHA, provides a more reliable source of those nutrients. The EPA and DHA in fish oil are already in a bioavailable form. A Canadian study (which evaluated daily supplementation with ground flaxseeds) reported significant changes in plasma ALA in younger subjects (aged 18–29) with a decrease in triglycerides. However, subjects aged 49–69 did not achieve statistically significant levels of ALA, nor were there changes in their triglyceride levels (Patenaude et al., 2009). We suggest EPA/DHA in the 2–9 g/day range, sufficient to bring blood pressure and vascular compliance to their healthier levels.

2.2.4 Omega-3 fatty acids from fish oil

A comparative animal study evaluated the effects of omega-3 fatty acids from both flax oil and fish oil on arrhythmogenic cardiomyopathy in boxer dogs. Initially, the incidence of arrhythmia averaged 543 episodes per day. After 6 weeks of supplementation, the median for animals receiving fish oil supplements was reduced to 162 episodes daily (a reduction of ~70%), but no change was observed in the flax oil group or the controls. This suggests that EPA/DHA sources are more effective than ALA as Omega-3 sources.

2.2.5 Omega-3 fatty acids from flax

Despite the conversion issues, flax can make a significant contribution to nutrition. In another study of flax, the most significant improvement noted was a 23.7% reduction in markers of insulin resistance after 10 weeks and also 15% lower Lp(a) (Bloedon et al., 2003). Dosage reported was 30 g daily (two tablespoons). However, no sustained reductions were noted in inflammation, oxidative stress, or LDL cholesterol. This suggests that flax fiber may be helpful aside from its Omega-3 and Omega-6 essential fat content.

2.3 Minerals and Trace Minerals

Impaired insulin–glucose metabolism is the central underlying biochemical error in CVD. As in diabetes, assessment for mineral status and repletion of deficiencies can be critically important. Foremost among the minerals are chromium and magnesium for better sugar metabolism, although deficiencies of other trace minerals can also complicate recovery.

2.3.1 Magnesium and choline citrate

The minerals that buffer the cells are principally magnesium and potassium (Quamme and de Rouffignac, 2000). Magnesium is the fourth most abundant cation in the body, and its vital functions are extensive. Magnesium activates hundreds of cellular enzymes. Adequate magnesium avoids or mitigates atherosclerosis, hypertension, coronary spasm, cardiac irritability, arrhythmias, preeclampsia of pregnancy, pain syndromes, headaches, restless leg syndrome, hypokalemia, hypocalcemia, and muscle irritability and spasm (Jaffe and Brown, 2000). The majority of the body's magnesium (~60%) is found in the bones and ~40% in cells. Ionized magnesium is in dynamic equilibrium with intracellular, bioactive magnesium. Consequently, the measurement of ionized magnesium is a more predictive measure of intracellular, functional magnesium status than total Mg, RBC Mg, or serum Mg.

In supplementation, enhanced magnesium uptake is observed when choline citrate and ionized, soluble magnesium salts are taken at the same time. Only the choline citrate form is effective. Choline bitartrate does not enhance magnesium uptake. Choline builds acetylcholine, a relaxing neurotransmitter, providing cholinergic bile salts and improving the production and solubility of bile. This citrate form alkalinizes and energizes mitochondrial ATP energy production. A sustained increase in plasma-ionized magnesium has been observed after concurrent administration of choline citrate.

The preferred combination of active magnesium salts is magnesium as glycinate, citrate, and ascorbate. Sustained increase in ionized magnesium is observed over a 4-week

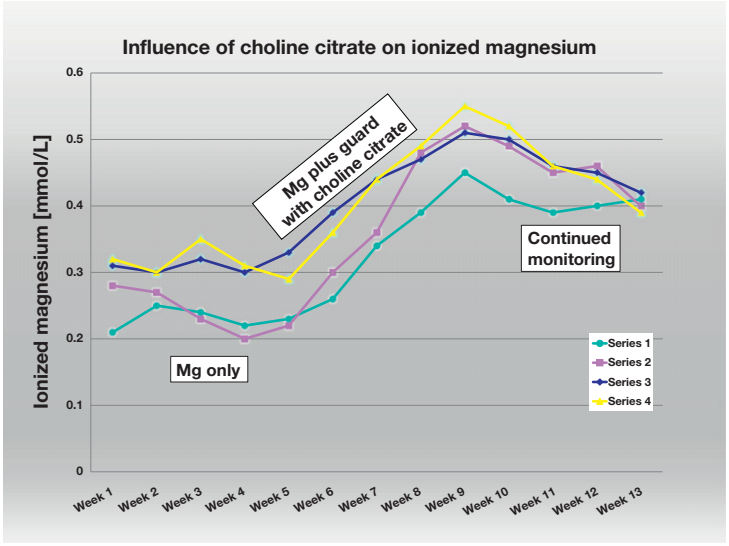

Figure 6.2 Choline citrate enhances ionized magnesium levels. Weeks 1–4: Magnesium only. Weeks 5–8: Magnesium salts with concurrent choline citrate. Weeks 9–12: Continued monitoring with only magnesium.

period in subjects previously found to be refractory to or blocked in magnesium uptake. When choline citrate and ionized magnesium are taken together, a neutral 'nano' size droplet is formed that is readily absorbed through the neutral pores of the intestinal enterocytes. This form of supplementation becomes important when the calcium, magnesium ATPase enzyme system is inhibited, preventing the usual uptake of magnesium and calcium (Jaffe and Brown, 2000) (Figure 6.2).

2.3.2 Selenomethionine

Selenium is a trace mineral with potent antioxidant effects, and selenomethinine has been found to be the safer, more bioactive form. Selenium supplementation increases the ratio of HDL to LDL cholesterol and inhibits platelet aggregation. Overall benefits to the cardiovascular system stem from antioxidant effects of selenium in the production of glutathione peroxidase. Due to this function, selenomethionine also has an important role in autoimmune thyroiditis, prostate cancer prevention, and the treatment of autoimmune conditions, such as rheumatoid arthritis, eczema, and psoriasis. Deficiency of selenium and also vitamin E has been shown to increase markers of free radical damage.

2.4 Amino Acids

2.4.1 Glutamine and Arginine

L-Arginine is a precursor to nitric oxide, which relaxes endothelial cells and helps regulate blood pressure. Clinically, L-arginine supplementation improves large artery elasticity index (LAEI) in patients with multiple cardiovascular risk factors. This improvement is associated with a decrease in systolic blood pressure and peripheral vascular resistance, as well as a decrease in aldosterone levels reducing the risk of hypertension (Guttman et al., 2010). Arginine also improves systemic and pulmonary hemodynamics, aiding in the treatment of diastolic heart failure (Orea-Tejeda et al., 2010). Glutamine, another conditionally essential amino acid, has found its place as a cardioprotective agent especially in patients with ischemic heart disease (IHD) patients. In addition, along with Omega-3 fatty acids, it has a positive effect on oxidative metabolism, lipolysis, and inflammation.

2.4.2 S-adenosylmethionine and methionine

S-adenosylmethionine (SAMe) is a natural mood stabilizer formed by adenylation (the modification of the amino acid methionine by SAMe synthase). SAMe is a primary methyl donor in virtually all known biological methylations, playing an important role in detoxification. Once a SAMe molecule loses its methyl group, it breaks down to form homocysteine. However, with adequate vitamin B12, B6, folate, and trimethylglycine (TMG, betaine), the body can convert homocysteine to glutathione or remethylate it to methionine. This role in homocysteine metabolism is an important link with cardiovascular health. An association between hyperlipidemia and hyperhomocysteinemia (HHCY) has been suggested. This link is clinically important in management of vascular risk factors. Hypomethylation associated with HHCY is responsible for lipid

accumulation in tissues. Decreased methyl groups will impair the synthesis of phosphatidylcholine, a major phospholipid required for very low-density lipoprotein (VLDL) assembly and homeostasis (Obeid and Herrman, 2009).

2.4.3 Carnitine fumarate and GABA

Carnitine is an amino acid required for the vital transport of fatty acids in the process of energy metabolism. Cardiovascular health is supported by enhanced fat burning in the heart muscle, significantly lowering LDL cholesterol and triglycerides, while raising HDL levels (Elisaf et al., 1998). Carnitine helps to keep coronary arteries clear and can lower blood pressure in those with hypertension. Studies have shown that carnitine supplementation can considerably improve the health of cardiac cells even at an advanced phase when valve replacement is being seriously considered (Xiang et al., 2005).

For adequate cardiac support, a good formulation of carnitine should include at least 500 mg of L-carnitine derived from an alkaline and energy-enhancing source such as carnitine fumarate, found in medium chain triglycerides (MCTs). This supports the delivery of carnitine to the body through 'micellization' or nano droplet formation. Since MCTs also tend to provide a sense of satiety, they tend to enhance weight management.

The addition of a calming neurotransmitter such as GABA (gamma amino butyric acid) can achieve the changes in neuronal activity, that support effective weight loss. In addition to functions as a calming neurotransmitter essential for brain metabolism, GABA *decreases* neuron excitation and prevents over-firing of brain neurons, thereby reducing anxiety and stress levels. In some cases, the addition of kelp extract to this type of formulation not only helps detoxify but also gives the required thyroid hormone support that is synergistic with weight management.

2.5 Food Constituents and Botanicals

Food constituents and botanicals can play a surprisingly important role in CVD management. For example, more than 300 clinical trials have confirmed the importance of dietary fiber in health and disease prevention. Adjusting the diet to include larger quantities of these familiar foods is a practical, accessible aspect of a dietary intervention program (Table 6.2).

2.5.1 Prebiotic fiber

A diet high in soluble-type dietary fiber has been found to decrease the risk of CVD, while lowering total and LDL cholesterol levels and aiding in the control of glucose levels. Studies have confirmed that an optimal low-cholesterol, low-fat diet, which includes high levels of soluble dietary fiber, can reduce blood cholesterol significantly more than the same diet with a lower fiber content. The prebiotic nature of dietary fiber increases bacteria growth in the intestines necessary for complete digestion and optimum nutrient absorption (Jenkins et al., 1999; Parnell and Reimer, 2010).

Table 6.2 Cardiovascular diseases: Nutrients in relation to primary cause and secondary consequence risk

	Hypertension, CAD, PAD, ASHD	Glucose regulation/ insulin resistance	Lipid status	Homocysteine detox status	Free radical status	Inflammation repair deficit	Hypercoagulation, stroke, heart attack
Diet	Prebiotic fiber Green and herbal tea Water Alkaline, mineral-rich foods Substitutes for reactive foods and meds	Choose based on glycemic load and individual food sensitivities	Healthy fat (uncontaminated and unoxidized) with omega 3 dominance recommended <20% of calories	Avoid black tea Prebiotic fiber Green and herbal tea Water Alkaline, mineral-rich foods Substitutes for reactive foods and meds	Prebiotic fiber Green and herbal tea Water Alkaline, mineral-rich foods Substitutes for reactive foods and meds	Avoid simple carbs and processed sugar, as well as reactive foods and meds that are acidifying and proinflammatory	Prebiotic fiber Green and herbal tea Water Alkaline, mineral-rich foods Substitutes for reactive foods and meds
Food nutrients	Prebiotic fiber Low glycemic load meals GGOBE Green tea/ ECGC	Prebiotic fiber Low glycemic load meals Flax, sesame, or hemp seeds	Prebiotic fiber Low glycemic load meals GGOBE Green tea/ ECGC	Prebiotic fiber Low glycemic load meals GGOBE Green tea/ ECGC	GGOBE Green tea/ECGC Flax, sesame, or hemp seeds	Prebiotic fiber Low glycemic load meals GGOBE Green tea/ ECGC	Ascorbate Prebiotic fiber Low glycemic load meals GGOBE Green tea/ECGC
Vitamins and polyphenolics	Ascorbate Quercetin dihydrate Flavonoids	Ascorbate Quercetin dihydrate Flavonoids	Ascorbate Quercetin dihydrate flavonoids and	B6, B12, folates TMG (B_{15}) DMG	Ascorbate Quercetin dihydrate Vitamins E +	Ascorbate Quercetin dihydrate Flavonoids and	Ascorbate Quercetin dihydrate flavonoids and

Continued

Table 6.2 Cardiovascular diseases: Nutrients in relation to primary cause and secondary consequence risk—cont'd

	Hypertension, CAD, PAD, ASHD	Glucose regulation/ insulin resistance	Lipid status	Homocysteine detox status	Free radical status	Inflammation repair deficit	Hypercoagulation, stroke, heart attack
	and LMW OPC flavonols B complex vitamins Carotenoids Vitamin D_3 Vitamins E + SeMet	and LMW OPC flavonols B complex vitamins Carotenoids Vitamin D_3 Vitamins E + SeMet	LMW OPC flavonols B complex vitamins Carotenoids Vitamin D_3 Vitamins E + SeMet		SeMet Selenomethionine	LMW OPC flavanols B complex vitamins Carotenoids Vitamin D_3 Vitamins E + SeMet	flavonols B complex vitamins Carotenoids Vitamin D_3 Vitamins E + SeMet
Amino acids	Taurine Alpha lipoic acid EAAs, NAC	Taurine Alpha lipoate EAAs	Aminos Carnitine fumarate	SAMe and glycine/ MgAsp/ methionine	Carnitine fumarate Taurine Cysteine, NAC Glutamine PAK	EAAs Glutamine PAK	Carnitine fumarate Taurine Alpha lipoic acid Cysteine, NAC
Minerals	Calcium, magnesium, potassium, zinc	Calcium, Magnesium, potassium, vanadium, zinc	Magnesium	Magnesium, potassium	Magnesium, potassium	Magnesium	Magnesium, potassium
Fatty acids	EPA/DHA GLA	EPA/DHA CLA	EPA/DHA CLA	Phosphtidyl-serine	EPA/DHA	EPA/DHA CLA	EPA/DHAGLAs
Intermediates	CoQ_{10}		CoQ_{10}		CoQ_{10}	CoQ_{10}	CoQ_{10}
Bioactive components of foods	Tocotrienols Polycosanols Plant sterols	Tocotrienols Polycosanols Plant sterols Red rice yeast	Tocotrienols Polycosanols Plant sterols	Tocotrienols Polycosanols Plant sterols	Tocotrienols Polycosanols Plant sterols	Tocotrienols Polycosanols Plant sterols Red rice yeast	Tocotrienols Policosanols Plant sterols

Botanicals	Hawthorne Pine tea Bilberry Rosehips Equisetum	French lilac Bitter melon/ Marah Huckleberry/ bilberry *Agnus castus* Phosphatides Banaba (corosolate) *Gymnema* *sylvestre*		Hawthorne Alginates	Hawthorne	Hawthorne

2.5.2 Catechins in green tea

Catechins, the major polyphenolic compounds in green tea, exert vascular protective effects through several mechanisms, including antioxidative, anti-hypertensive, anti-inflammatory, anti-proliferative, anti-thrombogenic, and lipid-lowering effects (Babu and Liu, 2008). Catechins are also critically involved in the suppression of proinflammatory signaling pathways and have proved to be potent agents for the treatment and prevention of inflammation-related CVDs (Suzuki et al., 2009) (Figure 6.3).

2.5.3 GGOBE (Ginger, Garlic, Onions, Brassica, and Eggs)

The anti-inflammatory properties of ginger have been known and valued for centuries. During the past 25 years, scientific research has substantiated these benefits. Ginger's inhibitory effects on prostaglandin biosynthesis were shown in the early 1970s and have been replicated several times. Found to be as effective as over-the-counter medication, ginger demonstrates a better therapeutic profile with fewer side effects than non-steroidal anti-inflammatory drugs (NSAIDs) (Grzanna et al., 2005). Gingerols calm inflammation by inhibiting prostaglandin release (of cyclooxygenase-1 and cyclooxygenase-2) and possibly by reducing levels of arachidonic acid (5-lipoxygenase) produced by imbalances in the body's fatty acid levels. Ginger can help lower elevated blood pressure, one of the major risk factors for stroke and CHD, and dosages of 5 g or more have demonstrated significant anti-platelet activity in human trials.

Garlic and onions contain a number of sulfides that can lower blood lipids and reduce blood pressure. Onions are also natural anti-clotting agents since they possess substances with fibrinolytic activity that can suppress platelet clumping and break down the products of coagulation. The anti-clotting effect of onions also closely correlates with their sulfur content (Amagase et al., 2001).

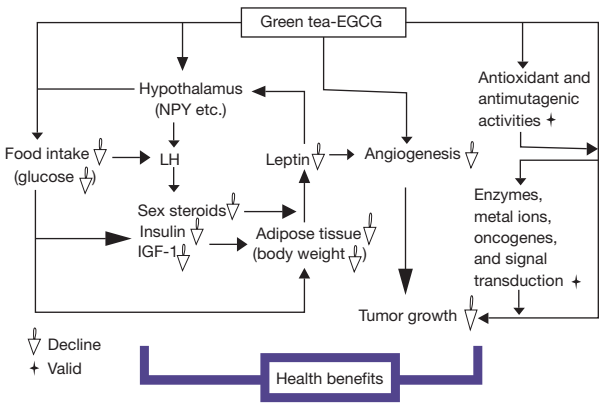

Figure 6.3 Beneficial effects of active constituents in green tea.

Sulfur-rich vegetables such as cauliflower and broccoli are rich in lignans (estrogen-like chemicals that serve as antioxidants) and in aromatic polyphenolic plant compounds. A lignan-rich diet has demonstrated benefits in decreasing risk of CVD as well as certain cancers due to the toxin-binding effects of insoluble fiber. Further, GGOBE foods (ginger, garlic, onions, brassica sprouts, and eggs) are antioxidant rich and repair promoting, and, thus, anti-inflammatory in action (Vanharanta et al., 2002).

3. CONCLUSION

An approach based on *Physiology First* employs functional understanding of biological systems to enhance heart and vascular health. This approach rethinks cardiovascular health from a functional, integrative, comprehensive, holistic, and systems-dynamics perspective. The goal is to apply low-cost, low-risk clinical strategies that remove obstacles to recovery, providing better care and better outcomes. These integrative strategies are a synthesis of classic wisdom and evidence-based advanced insights into individual needs for protective nutrients and other health-promoting factors, including physical and mental exercise, meaningful work, and a tolerable environment. The Alkaline Way of integrative health care management described here provides safer and more effective outcome results in cardiovascular risks. While we await results of larger trials using the above approach, we are confident that these benefits can be applied individually today.

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