

Heart disease is the number one killer in America and globally.^{1,2} Heart disease is also referred to as cardiovascular disease.³ The cardiovascular system is made up of the heart and blood vessels, including arteries, veins, and capillaries.³ The four main types of cardiovascular disease are aortic atherosclerosis, cerebrovascular disease, peripheral artery disease (PAD), and coronary artery disease (CAD) or coronary heart disease (CHD).³ Aortic atherosclerosis is associated with aneurysms, both thoracic and abdominal; while cerebrovascular disease is associated with strokes or transient ischemic attacks (TIAs).³ Peripheral arterial disease generally involves the limbs and may lead to claudication, the lack of oxygen causing muscle pain.^{3,4} Coronary artery disease is the result of decreased blood flow, followed by angina, that can lead to heart failure, also known as myocardial infarction.³ CAD is responsible for at least one-third of cardiovascular disease cases.³

Cardiovascular disease often stems from atherosclerosis, the formation of plaque (made of fats, cholesterol, and other substances) in the arteries and aorta, which decreases blood flow and can result in blockages and blood clots.^{3,5} Atherosclerosis is multifactorial, including inflammation, endothelial malfunction, dyslipidemia, and immune system phenomena.³ It is these factors that contribute to a “fatty streak” that stimulates plaque formation, beginning in youth.³ The thickening of vessels is accompanied by buildup of lipid-loaded macrophages (foam cells) and extracellular matrix; then the accumulation and multiplication of smooth muscle cells marks the beginning of atheroma plaque formation.³ As these lesions continue to multiply, deeper layers of the vessels experience cell death, bringing additional macrophages which in turn become calcified, ultimately becoming atherosclerotic plaques.³

Major risk factors for cardiovascular disease include high serum low-density lipoprotein cholesterol (LDL-C) levels, diabetes, hypertension, abdominal obesity, and psychosocial circumstances.⁶ Lifestyle factors including smoking, excess alcohol consumption, sedentary behavior, and inadequate fruit and vegetable intake are also considered major risk factors for CVD.⁶ A person with a cardiovascular disease may be asymptomatic or experience symptoms including chest pain, muscle pain in the limbs, or neurological shortfalls, depending on their specific diagnosis.³ Medications for cardiovascular disease and

related issues, like hypertension, include anticoagulants (blood thinners), statins (lower cholesterol), and beta blockers or ACE inhibitors (reduce blood pressure).⁷

Many people seek alternative therapies, including dietary supplements, to help treat their cardiovascular disease. Some of the best-selling supplements for heart health and overall wellness have been fish oils, multivitamins, vitamin D, CoQ10, and probiotics.⁸ Supplements in the “cardiovascular health” category resulted in 3.1% of supplement-related emergency department visits between 2004 and 2013.⁹ There has been much research into vitamins and their effect on cardiovascular disease, and the consensus is that there is not enough evidence to promote the routine use of supplements, specifically vitamins and minerals, for the prevention or treatment of cardiovascular disease.^{10,11} Furthermore, it is often repeated, that there should be more focus on lifestyle change, especially implementing better dietary habits.^{11,12}

Historically, some vitamins have been considered heart healthy, though supplementation may be another story. While low levels of serum vitamin D have been linked with obesity, hypertension, diabetes, metabolic syndrome, and peripheral arterial disease, high serum levels have been associated with increased risk of cardiovascular disease.^{8,10,12} Low vitamin D levels are also connected to statin intolerance.¹¹ It is important to have blood work done to determine vitamin D status, as supplementation is not recommended for those with normal levels, but repletion of low levels can improve statin tolerance, and may reduce morbidity and mortality related to CVD.^{11,12} Excessive vitamin D levels have been implicated in increased vasculature calcification, which increases the risk of cardiovascular disease through atherosclerosis.^{10,12}

Carotenoids and vitamin E have both been looked at for their relation to cardiovascular disease; and are believed to be beneficial due to their antioxidant potential.¹⁰ However, when researchers looked at the nutrients in a reductionist way, not bound to their natural food matrix, they did not produce the hypothesized effects.^{10,11,12} β -carotene was the specific carotenoid studied and the data did not support its supplementation for CVD risk reduction; though some data showed that it may increase the risk of lung cancer and should be avoided.^{10,11} Similarly, data from vitamin E studies do not support supplementation,

but do show that there may be an increased risk of all-cause mortality when taken in excess of 400 IU daily.^{10,11} Vitamin E has also been linked to PAD and claudication; and extra caution should be taken with patients on blood thinners.¹²

There are some very popular supplements not falling under the vitamin and mineral umbrella that may have better outcomes. The favorites include red yeast rice, fish oil/omega-3, and CoQ10.^{13,14} Red yeast rice is a traditional Chinese medicinal product made by culturing rice with *Monascus purpureus* yeast.¹⁵ It is marketed as a cholesterol lowering supplement.¹⁵ Due to the lack of supplement regulation though, red yeast rice supplements are not required to disclose the amount of monacolin K.¹⁵ This active compound is identical to the active ingredient in lovastatin, which is a cholesterol-lowering prescription drug.¹⁵ Because of this, red yeast rice supplements may result in the same side effects as some statins; or be unsafe due to an unknown amount of the compound.¹⁵ Red yeast rice may also contain a contaminant called citrinin, which could be dangerous, and develops naturally in the culturing process if not controlled carefully.¹⁵ Despite the unknowns and possible contaminant, red yeast rice supplements may help lower cholesterol levels, depending on the amount of monacolin K they contain.¹⁵ However, there may be something else at work within red yeast rice; in a study of one product, the cholesterol-lowering effects were greater than expected from monacolin K alone.¹⁵ The FDA determined in 1998, that red yeast rice products with a certain amount of monacolin K were new drugs and could not legally be sold as supplements.¹⁵ Since there are no reported studies on red yeast rice with low levels or no monacolin K and cholesterol, more research is needed to determine whether the traditional culinary and medicinal item can be effective as a legal supplement.¹⁵

Omega-3 supplements are often sold as fish oil or algae oil, supplying preformed EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), two long-chain fatty acids.¹⁶ Those long-chain fatty acids are derived from ALA (alpha-linolenic acid), an essential fatty acid that can be found in plants including flaxseed, chia seeds, and walnuts.¹⁶ The preformed long-chain fatty acids are found in fish, but originally synthesized by microalgae that the fish consume.¹⁶ Studies showed many positive outcomes, with some conflicting results.¹⁶ After reviewing studies old and new, the NIH concluded that consuming

fish and other seafood does promote heart health, with a balanced diet.¹⁶ They found that supplementation could result in positive effects for those with low dietary omega-3 intake or existing heart disease, more so than for healthy people.¹⁶ Omega-3 fish oil is also sold as a prescription drug.¹⁶ There is an FDA-approved health claim for items containing EPA and DHA: “supportive but not conclusive research shows that consumption of EPA and DHA omega-3 fatty acids may reduce the risk of coronary heart disease;” they also specify recommending no more than 2 grams per day on supplement packaging.¹⁶

CoQ10, or ubiquinone, also sold as ubiquinol, is an organic molecule found in the mitochondria of cells where it has multiple functions including aiding in cellular energy production.⁸ CoQ10 deficiency is often present in people with various heart diseases including cardiomyopathy and heart failure.⁸ Some literature explains how CoQ10 supplementation can improve heart health by enhancing heart muscle contractility and improving endothelial function.⁸ Despite multiple studies showing positive outcomes, a 2014 Cochrane systematic review concluded there was insufficient evidence to confirm whether CoQ10 supplementation improved heart failure patients, and further research was needed.⁸ Statins may inhibit CoQ10 production and lead to myopathies, however there is no significant link between statin use, low CoQ10 levels, and statin-related myopathies, and there is no consensus on whether supplementation of CoQ10 will improve said myopathies.⁸ The NCCIH found that despite inconclusive results in preventing heart disease or effecting heart failure, CoQ10 may reduce risks of heart surgery complications.¹⁷

As the leading cause of death, it is important to take heart disease seriously. It may be acceptable to take dietary supplements in some situations, but not all; and some supplements may do more harm than good. All treatments (prescriptions, supplements, diet, etc.) should be discussed with the complete healthcare team, including cardiologist, general practitioner, pharmacist, dietitian, and any other providers, allopathic or alternative. Due to unexpected negative outcomes from some, and no difference seen with others, data does not support taking supplements for the prevention or treatment of cardiovascular disease, when levels are sufficient.^{10,11,12} It does however support consuming more plants and following diet patterns including Ornish, PREDIMED, Mediterranean, DASH, and the Weil Anti-inflammatory diet to increase micronutrient and phytochemical intake.^{11,12}

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