Examine.com

Cardiovascular Health Supplement Guide

Written by the editors of Examine.com

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Medical Disclaimer

This guide is a general-health document for adults over 18. Its aim is strictly educational. It does not constitute medical advice. Please consult a medical or health professional before you begin any exercise-, nutrition-, or supplementation-related program, or if you have questions about your health.

This guide is built on scientific studies, but study outcomes are never homogeneous: individual results do vary. If you engage in any activity or take any product mentioned herein, you do so of your own free will, and you knowingly and voluntarily accept the risks. While we mention major known interactions, it is possible for any supplement to interact with other supplements, as well as with foods and pharmaceuticals.

A product may not contain the exact compounds and amounts listed on its label. Before you decide whether to take it, investigate it and its manufacturer. More than isolated compounds, herbs are prone to batch-to-batch variability, which can alter their efficacy and safety.

For evidence supporting the claims mentioned in this guide, please visit Examine.com.

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How to Use This Guide

The Examine.com team has been publishing research on nutrition and supplementation since March 2011. Drawing from all we've learned, we've designed this Stack Guide to help you figure out which supplements can help you reach your health goal, and which can hinder you or just waste your money.

Core supplements have the best safety-efficacy profile. When used responsibly, they are the supplements most likely to help and not cause side effects.

Primary options may provide substantial benefit, but only in the right context. A primary option is not for everyone, but if you read the entry and find that you meet the criteria, consider adding the supplement to your stack.

Secondary options have less evidence for their effects. They could work or be a waste of money. Keep them in mind, but think twice before adding them to your stack.

Promising supplements are backed by tradition or by mechanistic, animal, epidemiological, or anecdotal evidence, but not yet by convincing human trials.

Inadvisable supplements are either potentially dangerous or simply ineffective, marketing claims notwithstanding. Do not add them to your stack. At best, they'll be a waste of money; at worst, they can cause you harm.

Now that you've been presented with various supplements worthy of your interest, the time has come to combine them based on your objective. We'll guide you in **assembling your stack**.

Then comes the **FAQ**, in which we cover common questions that may arise when assembling your stack.

Lastly, we include information on **precautions and troubleshooting**.

With all this combined, you should be able to identify and assemble the supplement stack best suited to your objective.

Core Supplements

Cocoa

Why it's a core supplement

Low *nitric oxide* (NO) levels can cause blood vessels to narrow, leading to reduced blood flow. Like the flavonoids in grape seed and pine bark, (-)-epicatechin and other flavonoids in cocoa can help support NO levels, and research shows that cocoa does improve blood flow. Cocoa might also cause a minor decrease in blood pressure in people with hypertension, but it has no effect on heart rate.

Judging from a study on a grape seed extract, the improvement in blood flow from cocoa might be negated by the flavonoid quercetin, whose concurrent supplementation should therefore be avoided.

Taking cocoa with other hypotensive agents could cause low blood pressure. Hypotensive agents can be pharmaceuticals but also supplements — garlic, notably, but also nitrates, grape seed extracts, or pine bark extracts, to mention only the supplements presented in this guide.

How to take it

The standard daily dose for **cocoa polyphenols** is 1 g, which you can get by eating about 30 g of cocoa powder or 40 g of dark chocolate with a 75% cocoa content. Neither milk chocolate nor white chocolate is a good source of polyphenols.

Garlic

Why it's a core supplement

Garlic enhances *nitric oxide* (NO) signaling, but its lowering action on blood pressure is mostly due to its enhancing hydrogen sulfide (H_2S) signaling.

Garlic can also fight atherosclerosis (a hardening and narrowing of the arteries). **First**, garlic can cause a decrease in low-density lipoprotein (LDL) and an increase in high-density lipoprotein (HDL) and thus help prevent

cholesterol from clogging the arteries. **Second**, garlic can help prevent excess calcium from stiffening the arteries.

Garlic has antiplatelet properties. While this is yet another attribute of garlic that can improve blood flow, it may be a problem for people taking blood thinners, be they antiplatelet agents (such as aspirin) or anticoagulants (such as warfarin/Coumadin).

Taking too much garlic, or taking garlic with other hypotensive agents, could cause low blood pressure. Hypotensive agents can be pharmaceuticals but also supplements, such as nitrates, cocoa, grape seed extracts, or pine bark extracts, to mention only the supplements presented in this guide.

Garlic can interact with several pharmaceuticals other than blood thinners and hypotensive agents, notably contraceptives and drugs used to treat tuberculosis and HIV. If you take any medication, talk to your doctor before supplementing garlic.

How to take it

To maximize the benefits of garlic, eat 3–6 cloves daily over several meals. You should first cut or crush them, to activate their bioactive compounds, then cook them or eat them raw.

Supplementation can provide the same benefits. If you dislike the smell or taste of garlic, or if you wish to avoid the bad breath that comes from eating the cloves, take 600–1,200 mg of an aged garlic extract daily.

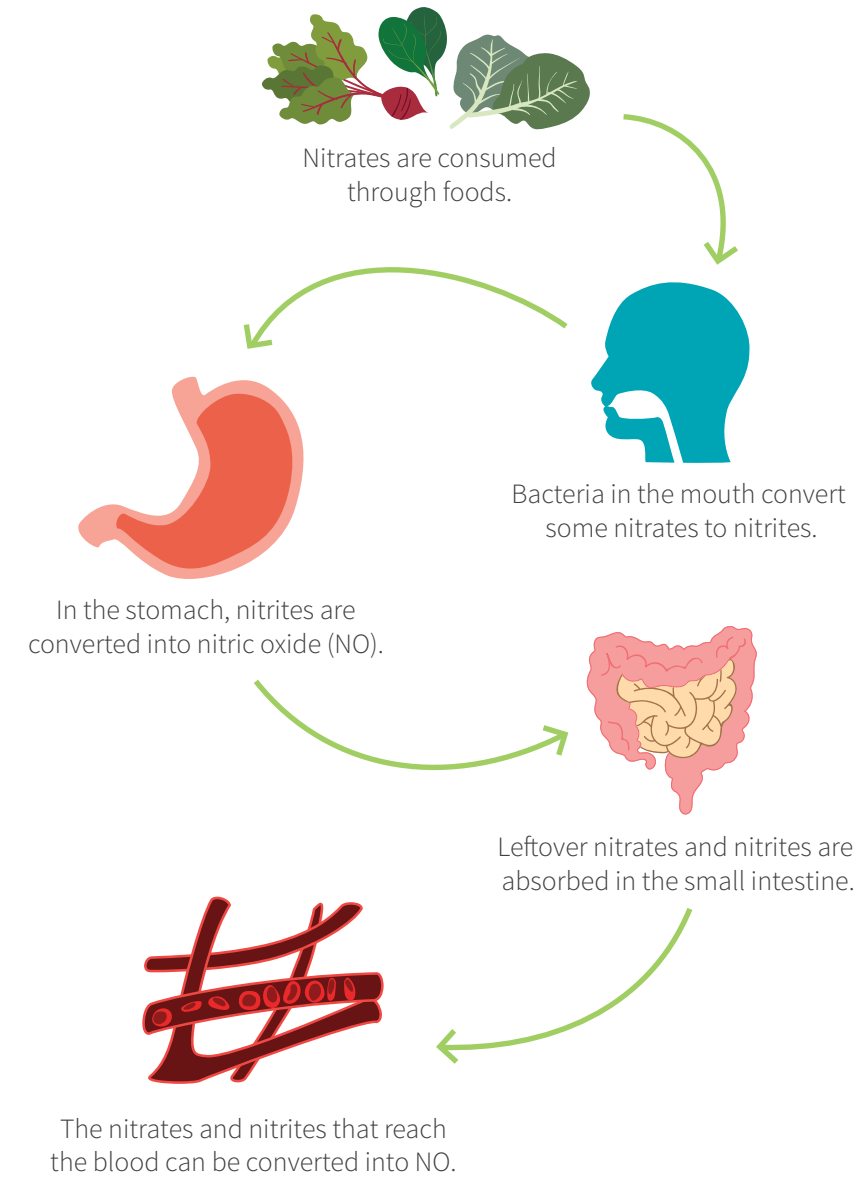
Too much garlic daily (12 cloves) or at once (6 cloves, or 1,200 mg of an aged garlic extract) could cause low blood pressure, especially if taken with other hypotensive agents, and prolong bleeding time. Eating 8 cloves in a day is enough to strongly reduce the efficacy of the anti-HIV drug saquinavir (Fortovase, Invirase).

Nitrates

Why they're a core supplement

Nitrates break down into nitrites, which circulate in the body and are turned into *nitric oxide* (NO) as needed. Elevated NO levels are associated with better blood flow and lower blood pressure.

Figure 1: How nitrates are converted into nitric oxide



Nitrates do not exist as dietary supplements, unfortunately, because of regulations against high quantities of sodium nitrate (a food additive frequently added to meat products). Nitrates can be found in different foods, however, notably beetroot and leafy green vegetables. Beetroot extract capsules will not provide enough nitrates to affect blood flow, but beetroot powder (⅛ the weight of raw beetroot) and beetroot juice are valid options.

Taking nitrates with other hypotensive agents could cause low blood pressure. Hypotensive agents can be pharmaceuticals but also supplements — garlic, notably, but also cocoa, grape seed extracts, or pine bark extracts, to mention only the supplements presented in this guide.

Leafy greens are often rich in vitamin K_1, a fat-soluble vitamin that helps with blood clotting and so might decrease the effectiveness of blood thinners, especially anticoagulants (such as warfarin/Coumadin). If you take a blood thinner, you should consult with your doctor before consuming a lot of leafy greens.

Due to their goitrogen content, cruciferous vegetables can reduce thyroid hormone production if regularly consumed in high amounts, such as those needed for nitrate supplementation. If you eat a lot of cruciferous vegetables (such as cabbage, collard greens, or kale), make sure to also get enough iodine — through iodine-rich foods (such as cod, shrimp, milk, yogurt, or cottage cheese), iodine-fortified foods (such as iodized salt), or supplements (75–150 mcg/day).

How to take them

Aim for 6.4–12.8 mg of nitrates per kilogram of body weight (2.9–5.8 mg/lb).

Table 1: Nitrate intake

Body weight	2.9 mg/lb (6.4 mg/kg)	5.8 mg/lb (12.8 mg/kg)
100 lbs (45 kg)	290 mg	580 mg
150 lbs (68 kg)	435 mg	871 mg
200 lbs (91 kg)	581 mg	1,161 mg
250 lbs (113 kg)	726 mg	1,452 mg

Table 2: Nitrate-rich vegetables

Nitrate-rich vegetables	Content per 100 g			
	Nitrates (mg)	Oxalate (mg)		Vitamin K_1 (mcg)
		Total	Soluble	
Arugula/rocket	362.4	7.1	< 0.5	108.6
Turnip greens	346.7	50	?	251
Dill	259	159	60	0
Collard greens	254.5	450	?	437.1
Spinach	248.5	656	542.6	482.9
Swiss chard	236.3	964	207.7	830
Turnips	217.4	210	?	0.1
Rhubarb	199.9	805	223	29.3
Beetroot	199.2	121	74.9	0.2
Celery	196.4	17.5	< 0.5	29.3
Mustard greens	187.5	128.7	?	257.5

Radish	177.3	9.2	< 0.5	1.3
Lettuce	168.9	13.6	< 0.5	126.3
Watercress	164	10	< 0.5	250
Bok choy	162	2	?	45.5
Kale	137.5	20	?	704.8
Parsley	130.4	136	76	1640

This table is composed of averages from multiple samples. Farming techniques, transport, storage conditions, and cooking methods can all greatly affect the actual nitrate and oxalate content of your food.

Adapted from Jackson et al. *Nutr Res Rev*. 2017 Dec, Lidder et al. *Br J Clin Pharmacol*. 2013 Mar, Griesenbeck et al. *Nutr J*. 2009 Apr, Siener et al. *Food Chemistry*. 98;2. 2006, Tamme et al. *Food Addit Contam*. 2006 Apr, Hönow and Hesse. *Food Chemistry* 78;4. 2002 Sep, Santamaria et al. *J Sci Food Agric*. 1999 Oct, Oxalic Acid Content of Selected Vegetables (1984). ARS, USDA, Dr. Duke's Phytochemical and Ethnobotanical Databases. ARS, USDA, and USDA Food Composition Databases. ARS, USDA.

Those vegetables can be consumed whole or in liquid form (juice, shake, or purée) over several meals. They can also be drunk in one sitting a couple of hours before exercise.

Since the bacteria in saliva play a role in activating dietary nitrates, do not use an antibacterial mouthwash too often, and especially not shortly before consuming nitrate-rich foods. Moreover, the cooking time, if any, should be brief: although cooking reduces the oxalate content more than the nitrate content, the loss of nitrates after fifteen minutes of cooking can still exceed 50%.

Table 3: Vegetables sorted by nitrate content (mg per 100 g)

Nitrate content	Vegetables
Very high (250+)	Arugula/rocket, collard greens, dill, turnip greens
High (100 to <250)	Beetroot, bok choy, celeriac, celery, kale, kohlrabi, lettuce, mustard greens, parsley, radish, rhubarb, spinach, swiss chard, turnip, watercress
Moderate (50 to <100)	Broccoli, cabbage, cauliflower, endive, savoy cabbage
Low (20 to <50)	Chicory, eggplant, fennel, green beans, green onion, leek, pumpkin/squash
Very low (<20)	Artichoke, asparagus, broad bean, brussels sprouts, carrot, cucumber, dry beans, garlic, lima beans, maize, mushroom, onion, peas, pepper, sweet potato, tomato, white potato

Adapted from Jackson et al. Nutr Res Rev. 2017 Dec, Hord et al. Am J Clin Nutr. 2009 Jul; 90(1): 1–10, and Jones. Sports Med. 2014 May; 44 Suppl 1: S35–45.

Most vegetables rich in nitrates are also rich in oxalate, which can increase the risk of kidney stones. People already at an increased risk of forming kidney stones, as well as people with oxalosis or hyperoxaluria, should keep their oxalate intake to a minimum.

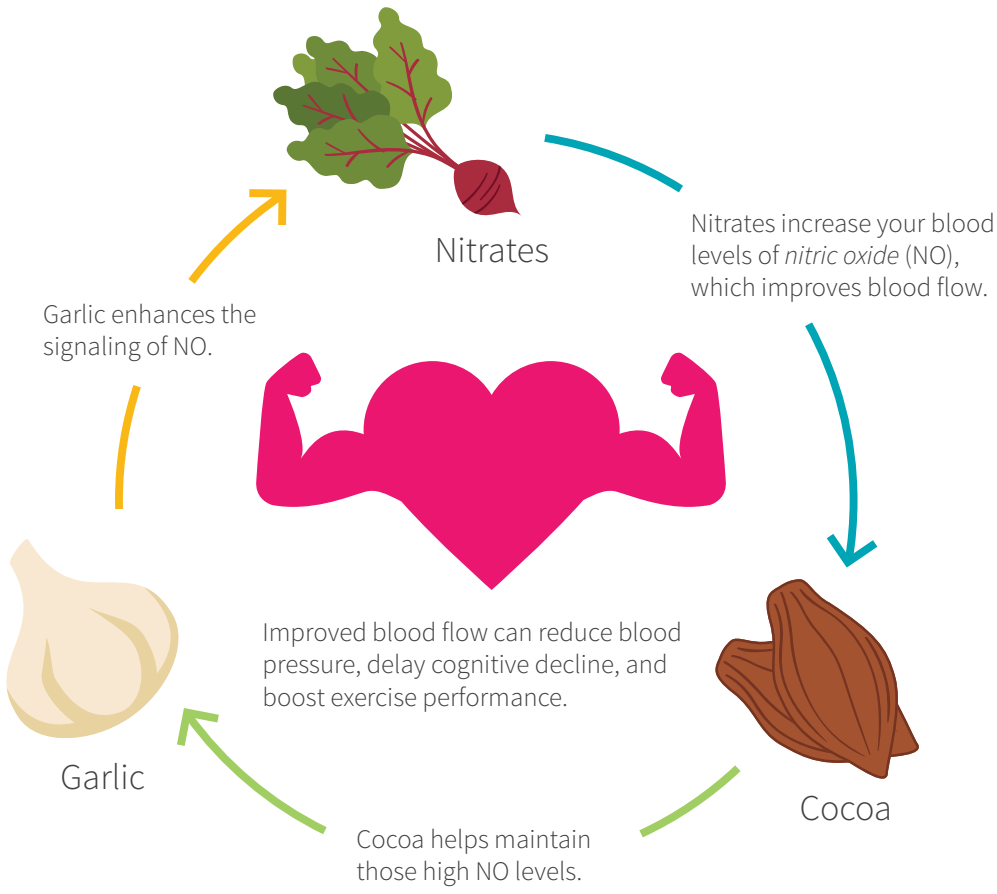
Other people need not ban all oxalate from their diet, but if you consume high amounts of nitrates (and the dosage range in this guide certainly qualifies) more than twice a week, favor oxalate-poor vegetables. And if you do eat oxalate-rich foods on occasion, consider cooking them and/or pairing them with calcium-rich foods, in order to reduce oxalate absorption.

Table 4: Vegetables sorted by oxalate content (mg per 100 g)

Oxalate content	Vegetables
Very high (100+)	Beetroot, collard greens, dill, mustard greens, parsley, rhubarb, spinach, swiss chard, turnips
High (10 to <100)	Cauliflower, celery, kale, lettuce, turnip greens
Moderate (2 to <10)	Arugula/rocket, asparagus, carrot, radish, sweet potato, watercress
Low (<2)	Bok choy, cabbage, radicchio

Because glutathione may slow down the rate of NO breakdown in the bloodstream, adding 200 mg of N-acetylcysteine (NAC) to your nitrates might prove synergistic.

Figure 1: Synergistic core supplements



Primary Options

Carnitine

Why it's a primary option

Carnitine plays a major role in cognition, energy metabolism, and cardiovascular health. Your body can synthesize it out of lysine and methionine, two other amino acids, but three-fourth of the carnitine in omnivorous people comes from the meat products they consume.

People who have suffered a heart attack can supplement carnitine to lower the risk both of ventricular arrhythmia (abnormal heartbeats) and of angina (pain in the chest or limbs caused by impaired circulation).

How to take it

For people at risk but who have not yet suffered cardiovascular complications, 500–2,000 mg of **L-carnitine** per day might offer some protection. People who have already suffered a heart attack, however, would need at *least* 2,000 mg (i.e., 2 g) and preferably 5,000–9,000 mg (i.e., 5–9 g) to see a reduction in arrhythmia, angina, and all-cause mortality.

L-carnitine can also be consumed as **L-carnitine L-tartrate** (LCLT) or **glycine propionyl-L-carnitine** (GPLC). You can supplement 500–2,000 mg of L-carnitine through 750–3,000 mg of LCLT or GPLC. You can supplement 5,000–9,000 mg of L-carnitine through 7,500–1,350 mg of LCLT or GPLC. However, neither LCLT nor GPLC has proven advantages over regular L-carnitine, both are more expensive, and GPLC also clumps easily in moist environments.

CoQ_{10}

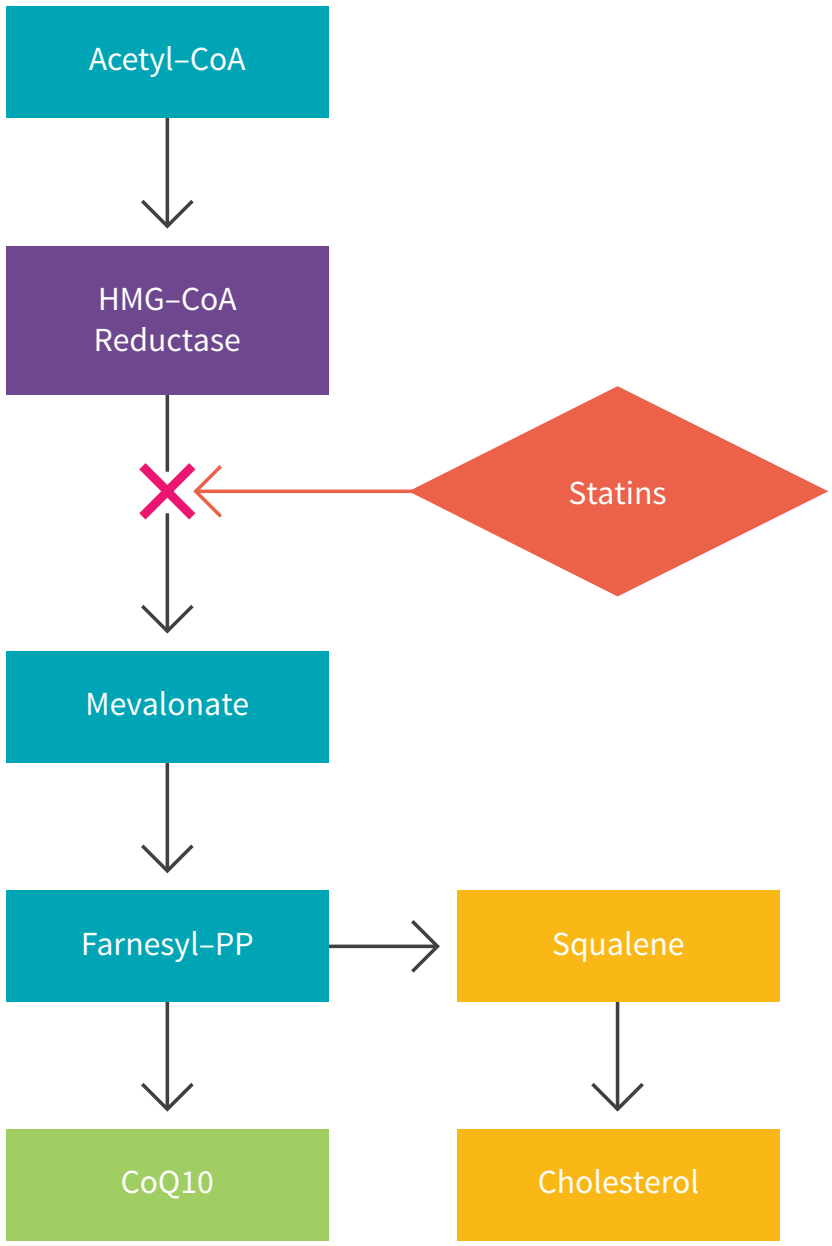
Why it's a primary option

Coenzyme Q_{10} (CoQ_{10}) is found mostly in mitochondria, the "power plants" in our cells. Our bodies produce it, yet supplementation can provide additional

benefits, such as reducing the risk of further heart complications in people who have suffered a heart attack. More research is needed to determine if CoQ_{10} can also benefit people with less severe cardiac damage.

Statin medications can lower CoQ_{10} levels in the body. If you are taking statins, talk to your doctor about supplementing CoQ_{10}.

Figure 3: How statins can deplete CoQ_{10}



Statins, such as atorvastatin (Lipitor), inhibit the enzyme HMG–CoA reductase in the mevalonate pathway. In such a way, they can decrease your cholesterol levels, but also your production of CoQ_{10}. Supplementing CoQ_{10} can help offset this decrease.

How to take it

Take 90–150 mg of CoQ_{10} once a day with a meal containing fat.

Higher doses (200–300 mg) result in higher levels of CoQ_{10} in the body, but more research is needed to determine if those higher levels translate into greater cardiovascular protection.

Fish Oil

Why it's a primary option

Essential fatty acids (EFAs) are polyunsaturated fatty acids (PUFAs) your body needs and cannot produce. There are only two kinds of EFAs: linoleic acid (LA) and alpha-linolenic acid (ALA). Neither is very active, so your body transforms the former into notably arachidonic acid (AA) and the latter into eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). LA and AA are omega-6 fatty acids, while ALA, EPA, and DHA are omega-3 fatty acids. EPA and DHA make for most of the PUFAs in fish oil.

Fish oil can reliably reduce triglyceride levels. Even in people with normal triglyceride levels, it can reduce inflammation and high blood pressure, and consequently plaque formation and the risk of atherosclerosis (a hardening and narrowing of the arteries). In this fashion, fish oil can benefit cardiovascular health, though most recent studies have found no evidence that it actually lowers the risk of heart attack.

Supplements with only EPA or DHA are also available. Whereas DHA is marginally better than EPA at reducing triglycerides levels, it can cause a modest increase in low-density lipoprotein (LDL, the "bad cholesterol")

Though to a lesser extent than garlic, omega-3 fatty acids have antiplatelet properties. While this is yet another attribute of EPA or DHA that could improve blood flow, it might be a problem for people taking blood thinners, be they antiplatelet agents (such as aspirin) or anticoagulants (such as warfarin/Coumadin). Omega-3 fatty acids may also lower blood pressure and increase fasting blood sugar levels.

How to take it

To reduce triglyceride levels, get 4 g of combined EPA and DHA per day by eating fatty fish (e.g., 280 g of salmon) or by taking fish oil softgels (with food, to reduce the chance of fishy burps). Vegans and vegetarians have the option of taking algal oil softgels.

For general health and cardiovascular support, take 300–600 mg of combined EPA and DHA a day. This dose can be achieved simply by eating fatty fish several times a week.

If your LDL levels are too high, you could replace the EPA+DHA combination by an equal dose of just EPA.

Taking fish oil with a food reduces the chance of fishy burps.

Grape Seed

Why it's a primary supplement

Low *nitric oxide* (NO) levels can cause blood vessels to narrow, leading to reduced blood flow. Like the flavonoids in cocoa and pine bark, procyanidins and other flavonoids in grape seeds can help support NO levels.

Studies on grape seed extracts have reported minor reductions in heart rate and, possibly as a consequence, in blood pressure. There was no improvement in blood flow, or only to a small extent in people with vascular risk factors, such as high blood pressure. This possible improvement in blood flow may be negated by the flavonoid quercetin, whose concurrent supplementation should therefore be avoided.

Taking a grape seed extract with other hypotensive agents could cause low blood pressure. Hypotensive agents can be pharmaceuticals but also supplements — garlic, notably, but also nitrates, cocoa, or pine bark extracts, to mention only the supplements presented in this guide.

How to take it

Take 200–400 mg of a grape seed extract once a day with a meal.

Resveratrol

Why it's a primary option

Much of the initial excitement surrounding resveratrol (a fat-soluble

polyphenol found notably in peanuts, berries, grapes, and red wine) stemmed from cell culture studies and animal trials. As the research progressed into humans, evidence began to emerge that resveratrol could raise insulin sensitivity and decrease fat stores, blood lipids, blood pressure, and inflammatory markers; however, media articles much overhyped the relatively small effects seen in these studies.

In people with hypertension or prehypertension, resveratrol can produce a minor reduction in blood pressure: about 5 mmHg systolic and 3 mmHg diastolic. These numbers may fail to impress you, but keep in mind they are averages over hundreds of people — individual results do vary.

Resveratrol is an umbrella term for different isomers, the most active being *trans*-resveratrol.

How to take it

Take 150–3,000 mg of ***trans*-resveratrol** a day, with or without food.

Maximum benefit is usually experienced after three months of continuous supplementation.

Taurine

Why it's a primary option

Taurine (L-taurine) is one of the most abundant amino acids in the body, with particularly high concentrations in the heart tissue, where it is thought to help maintain cell membranes and regulate heartbeats. It is not an essential amino acid, since our bodies can make it from vitamin B_6, methionine, and cysteine; however, supplementation can modestly but reliably reduce blood pressure in people with congestive heart failure, hypertension, or prehypertension. Likewise, in people with congestive heart failure, taurine can modestly but reliably improve cardiac function.

How to take it

Daily dosage ranges from 1.5 to 6 g, though 3 g is currently considered the upper limit for safe lifetime supplementation. Whichever dosage you go with, split it into 2 or 3 doses a day, with or without food.

Venotropics

Why they're a primary option

Venotropics can improve the rate at which the blood returns to the heart. They are used to treat chronic venous insufficiency (CVI), which is characterized by blood pooling in extremities. They can also be used to treat leg swelling caused by prolonged sitting or to reduce varicose veins.

Daflon (90% diosmin, 10% hesperidin) was the first venotropic, but it is slightly less effective than Pycnogenol. Butcher's broom (*Ruscus aculeatus*) and horse chestnut (*Aesculus hippocastanum*) also have venotropic properties.

Pycnogenol is a patented pine bark extract standardized to 65–75% procyanidin. Grape seed extracts, being also rich in procyanidins, might offer similar benefits, but there is currently no study on the subject.

How to take them

Take 100–200 mg of **Pycnogenol** with breakfast. Alternatively, take one of the following options twice a day, 12 hours apart: 375–750 mg of **butcher's broom** (i.e., 750–1,500 mg/day), 50–75 mg of **horse chestnut** (i.e., 100–150 mg/day), or 400 mg of **diosmin** with 100 mg of **hesperidin** (i.e., 1,000 mg/day in total).

Vitamin K

Why it's a primary option

Vitamin K is an umbrella term for a variety of molecules with similar but distinct structures. Phylloquinone (K_1) is a molecule found in plants, whereas menaquinone (K_2) is a group of molecules found in animal products (mostly K_2 MK-4) and fermented foods (mostly K_2 MK-7). In all its forms, vitamin K is fat soluble and supports blood clotting and calcium regulation; by inhibiting the calcification of soft tissues, such as the coronary arteries, it can reduce cardiovascular risk.

After absorption, K_1 is taken up by the liver at a higher rate than MK-4, whereas MK-4 is taken up by soft tissues at a higher rate than K_1. This should make K_1 better at supporting coagulation, and MK-4 better at preventing

coronary calcification. Some K_1 converts indirectly to MK-4, but how much is unknown; diets naturally rich in K_1 do not seem to reduce cardiovascular risk, but trials supplementing high K_1 doses have seen some success.

MK-7 is good at both supporting coagulation and preventing coronary calcification, and unlike MK-4, it has been used in trials looking at arterial stiffness and atherosclerosis. It is important to note that cardiovascular research has not compared K_1 to K_2, or MK-4 to MK-7. Different forms of vitamin K have different metabolisms and distributions within the body, so taking more than one form seems warranted.

Vitamin K is usually safe, but it should not be supplemented by people taking anticoagulants (such as warfarin/Coumadin), a kind of blood thinner that works by hindering vitamin K's blood-clotting properties.

How to take it

With a meal containing fat, take 200 mcg of **MK-7**. Adding 500–1,000 mcg of **K_1** may provide additional benefits. MK-4 is theoretically better than K_1 (for cardiovascular health), but there are not enough data to support a dosage.

As shown in the Nitrate-rich vegetables table, some vegetables rich in nitrates are also rich in **K_1**. For instance, some 3,500 mcg of K_1 can be found in 500 g of kale (about 7.5 cups). K_1 is also present in fish, meat, dairy products, and eggs, but only in very small amounts.

MK-4 is present in small amounts in fish (less than 1 mcg per 100 g of salmon), meat (about 1 mcg per 100 g of beef; about 10 mcg per 100 g of chicken), eggs (about 30 mcg per 100 g of egg yolk), and dairy products (about 15 mcg per 100 g of butter; about 5 mcg per 100 g of hard cheese; less than 1 mcg per 100 ml of whole milk).

MK-7 is present in high amounts only in natto (about 1,000 mcg per 100 g).

Secondary Options

D-Ribose

Why it's a secondary option

Adenosine triphosphate (ATP) has been called "life's energy currency"; it powers our cells. Its levels remain depressed following events that damage the heart tissue, such as heart attacks. Without enough ATP, the heart can suffer from dysfunctions, such as the inability to pump properly (and thus fill up with adequate amounts of blood).

D-Ribose is a monosaccharide that helps replenish ATP stores. Its supplementation when ATP levels are depressed looks beneficial, but research is still limited. To date, only four studies have investigated D-ribose supplementation in seniors with congestive heart failure, all of whom were on various medications to treat their condition. The majority were senior males, with only ten females being included across all four studies.

Preliminary evidence suggests that D-ribose may help the heart pump blood, with results ranging from very minor effects to moderate improvements.

How to take it

Take 5 g of D-ribose three times a day (i.e., 15 g/day) with or without food.

Olive Leaf

Why it's a secondary option

The oxidation of low-density lipoprotein (LDL, the "bad cholesterol") is one of the main contributors to plaque formation. Oleuropein and other phenolic compounds in the leaf of the olive tree (*Olea europaea*) can reduce LDL oxidation. Therefore, olive leaf extracts should reduce plaque buildup in arteries, but this has yet to be confirmed by dedicated studies.

How to take it

Choose an olive leaf extract standardized to at least 16% oleuropein. To reduce LDL oxidation, take 500 mg/day. To more reliably reduce blood

pressure, take 1,000 mg/day. Since LDL oxidation increases after a meal, taking your extract with a meal might be optimal.

Some studies have found benefits from doses as low as 10 mg/day. Consuming olive oil as part of your diet may provide you with the same cardiovascular benefits as supplementing such a low dose of olive leaf extract.

Pine Bark

Why it's a secondary supplement

Low *nitric oxide* (NO) levels can cause blood vessels to narrow, leading to reduced blood flow. Like the flavonoids in cocoa and grape seeds, procyanidins and other flavonoids in pine bark can help support NO levels.

Pycnogenol is a patented pine bark extract standardized to 65–75% procyanidin. It is the best-studied source of procyanidins, but also the most expensive. It can improve blood flow, might cause a minor decrease in blood pressure in people with hypertension, but has no effect on heart rate. In short, its effects are similar to cocoa's, though less potent and with less supportive evidence.

Figure 4: Trials on Pycnogenol and blood flow

Source	Sample	Duration	Dose	Result
Enseleit et al. *Eur Heart J*. (2012)	23 elderly, overweight men and women with coronary artery disease	8 weeks	200 milligrams of Pycnogenol daily	Improved blood flow independent of changes in blood pressure
Nishioka et al. *Hypertens Res*. (2007)	16 healthy young male adults	2 weeks	180 milligrams of Pycnogenol daily	Improved relaxation response in blood vessels
Liu et al. *Life Sci*. (2004)	58 middle-age to elderly healthy men and women	8 weeks	100 milligrams of Pycnogenol daily	Improved blood flow and a trend toward higher NO levels

Sources: Enseleit et al., *Eur Heart J*. (2012); Nishioka et al., *Hypertens Res*. (2007); and Liu et al., *Life Sci*. (2004)

Judging from a study on a grape seed extract, the improvement in blood flow from pine bark extracts might be negated by the flavonoid quercetin, whose concurrent supplementation should therefore be avoided.

Taking a pine bark extract with other hypotensive agents could cause low blood pressure. Hypotensive agents can be pharmaceuticals but also supplements — garlic, notably, but also nitrates, cocoa, or grape seed extracts, to mention only the supplements presented in this guide.

How to take it

Take 100–200 mg of Pycnogenol once a day with a meal.

Promising Supplements

Arjuna

Water extracts from the bark of the arjuna (*Terminalia arjuna*) have long been used in Ayurvedic medicine to improve cardiovascular health. Preliminary studies support this traditional use, but more research is needed to confirm the benefit they reported and determine both its magnitude and its mechanism of action.

In rodent studies, arjuna prevented abnormal heart rates and protected cardiac tissue from damaging stressors. Should these effects extend to humans, arjuna might also benefit healthy people by increasing cardiovascular capability during exercise.

Until more human studies confirm its benefits, however, arjuna can only rank as a promising supplement.

Inadvisable Supplements

Stimulants

People with heart problems are more likely to suffer from the side effects of stimulants, which include increased blood pressure, arrhythmia, and a greater risk of traumatic cardiovascular injuries, such as heart attacks.

If you choose to take a stimulant, respect the recommended dosage. Should tolerance develop, do not increase the dosage, but stop using the stimulant long enough for sensitivity to return.

Be aware that most fat burners and pre-workout supplements contain stimulants, such as caffeine or synephrine. Be especially careful if you take several such products, as their effects (and side effects) can cumulate or even synergize.

Assembling Your Stack

Incorporating Core Supplements

Take 1 g of cocoa polyphenols, for instance by eating about 30 g of cocoa powder or 40 g of dark chocolate with a 75% cocoa content.

Take 3 to 6 cloves of garlic (or 600–1,200 mg of an aged garlic extract) over several meals.

Take nitrate-rich vegetables. Aim for 6.4–12.8 mg of nitrates per kilogram of body weight per day (2.9–5.8 mg/lb/day), either over several meals or in one sitting a couple of hours before exercise.

Those three supplements are hypotensive agents, so start at the low end of the dosage range and monitor your blood pressure. Continue for at least two weeks before you consider increasing the dosage, then for at least two more weeks before you consider adding one of the following options.

Incorporating Options

For people with no heart complications practicing preventive care

In addition to the core supplements, take 200 mcg of vitamin K_2 MK-7 with a meal containing fat. (Adding 1,500 mcg of vitamin K_2 MK-4 and/or 500–1,000 mcg of vitamin K_1 may provide additional benefits.)

Adding to this meal 500 mg of an olive leaf extract standardized to at least 16% oleuropein can reduce LDL oxidation — an effect thought to be cardioprotective. For a better chance to also reduce blood pressure, you could try increasing the dose to 1,000 mg (i.e., 1 g).

For people who have suffered a heart attack

After consultation with your doctor, take the core supplements with 5–9 g of carnitine, 1.5–3 g of taurine, and 15 g of D-ribose, in three divided doses spread through the day. Take 90–150 mg of CoQ_{10} with a meal containing fat.

For people with varicose veins or with leg swelling caused by sitting

If the core supplements do not solve the problem within a month, add a venotropic — either 100–200 mg of **Pycnogenol** at breakfast or one of the following options twice a day, 12 hours apart: 375–750 mg of **butcher's broom** (i.e., 750–1,500 mg/day), 50–75 mg of **horse chestnut** (i.e., 100–150 mg/day), or 400 mg of diosmin with 100 mg of hesperidin (i.e., 1,000 mg/day in total).

Like the core supplements (cocoa, garlic, and nitrates), Pycnogenol is a hypotensive agent.

Other Options

People with elevated triglycerides can add fish oil to any stack. Get 4 g of combined EPA and DHA per day by eating fatty fish (e.g., 280 g of salmon) or by taking fish oil softgels (with food, to reduce the chance of fishy burps). Vegans and vegetarians have the option of taking algal oil softgels. People with elevated LDL levels have the option of taking a supplement with only EPA (4 g still). EPA and DHA are weak antiplatelet agents; combined with other blood thinners (such as garlic, a core supplement), they may prolong bleeding time.

People with hypertension or prehypertension can add *trans*-resveratrol to any stack: 150–3,000 mg/day, with or without food.

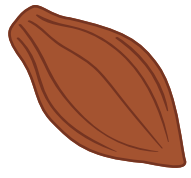
Because glutathione may slow down the rate of *nitric oxide* (NO) breakdown in the bloodstream, adding 200 mg of glutathione to your nitrates might prove synergistic.

Should the core cocoa polyphenols (1 g) fail to help you after a month, you could try replacing them by a grape seed extract (200–400 mg). Should the grape seed extract fail to help you after a month, you could try replacing it by Pycnogenol (100–200 mg). Take your grape seed extract or Pycnogenol once a day with a meal.

Figure 5: Procyanidin dose chart

Pycnogenol

100–200 mg/day



Cocoa polyphenols

1 g/day
OR
Cocoa powder: 30 g/day
OR
Dark chocolate with a 75% cocoa content: 40 g/day

Grape seed extract

200–400 mg/day

FAQ

Can I add to my stack a supplement not covered in this guide?

Supplement your current stack for a few weeks before attempting any change. Talk to your doctor and research each potential new addition in advance. Check for known negative interactions with other supplements in your current stack, but also for synergies. If two supplements are synergistic or additive in their effects, you might want to use lower doses for each.

Can I modify the recommended doses?

If a supplement has a recommended dosage range, stay within that range. If a supplement has a precise recommended dose, stay within 10% of that dose. Taking more than recommended could be counterproductive or even dangerous.

Should I take my supplements with or without food? And at what time?

Answers are provided in each supplement entry whenever the evidence permits. Too often, however, the evidence is either mixed or absent. Besides, a supplement's digestion, absorption, and metabolism can be affected differently by different foods. Fat-soluble vitamins (A, D, E, K), for instance, are better absorbed with a small meal containing fat than with a large meal containing little to no fat.

Starting with half the regular dose can help minimize the harm a supplement may cause when taken during the day (e.g., tiredness) or in the evening (e.g., insomnia).

Can *nitric oxide* (NO) supplements be stacked?

The three types of NO supplements in this guide can be stacked, for they have different mechanisms of action. The flavonoids in this guide (in cocoa, grape seeds, and pine bark) can increase the rate of NO production. Nitrates bring raw material that can be turned into NO without help from the nitric oxide synthase (NOS) enzyme. As for garlic, it enhances NO signaling, but its lowering action on blood pressure is mostly due to its enhancing hydrogen sulfide (H_2S) signaling.

Can I get enough nitrates from fruit?

In short, no. Even "nitrate-rich" fruits, such as melons and strawberries, pale in comparison to most vegetables. Compare, for instance, 100 g of beetroot (199.2 mg of nitrates) with 100 g of melon (32.5 mg), strawberries (17.2 mg), banana (7.6 mg), apple (2 mg), or orange (0.9 mg).

Why take NAC to make glutathione? Why not take glutathione directly?

Oral glutathione gets digested into its constituent amino acids: cysteine, glycine, and glutamic acid. Of those three, cysteine is the rate-limiting factor in endogenous glutathione production. Oral N-Acetylcysteine (NAC) is simply a more efficient (and cheaper) way of providing your body with cysteine. Multiple studies have reported greater increases in circulating glutathione from oral NAC than from (an equal dose of) oral glutathione.

Precautions and Troubleshooting

Stack components are seldom studied together. The safest way to add supplements to your daily routine is one at a time, at least a couple of weeks apart, to better assess the effects (and side effects) of each new addition. Start at half the regular dose for a week, then slowly increase to the regular dose if you are not experiencing the desired effects.

Since minerals and vitamins (especially the fat-soluble vitamins: A, D, E, and K) can accumulate in the body, it is best to consider supplementation only after a dietary evaluation. Track what you eat for a week; if, on average, you are getting less than 80% of your Recommended Dietary Allowance or Adequate Intake, supplementation becomes an option, though first you should try eating more foods rich in the desired vitamin or mineral.