B vitamins

- Vitamin B1 (thiamine) was found in a systematic review to improve cardiac function and lessen the symptoms of heart failure (DiNicolantonio JJ, Congest Heart Fail. 2013).
- Vitamin B3 (niacin) reduces oxidative stress in dyslipidaemia (Hamoud S, Am J Med Sci. 2013). It also reduced incidence of coronary artery revascularisation, nonfatal myocardial infarction, stroke and TIA (Duggal JK, J Cardiovasc Pharmacol Ther. 2010).
- Vitamin B5 (pantothenic acid) improves dyslipidaemia (Evans M, Vasc Health Risk Manag. 2014).
- Vitamin B6 (pyridoxine) significantly lowered systolic and diastolic blood pressure in hypertensives (Aybak M, Arzneimittelforschung. 1995).
- Folic acid: A 2019 meta-analysis found that cardiovascular disease patients who received folic acid therapy had significantly decreased risk of stroke (Wang Y, Medicine (Baltimore), 2019). This may be explained by the finding that 5mg/day folic acid for 18 months was associated with significant regression of carotid intima-media thickness (Ntaios G, Int J Cardiol. 2010). In patients with coronary artery disease, 5mg/day folic acid lowered plasma homocysteine and improved endothelium-dependent dilatation (Yilmaz H, Acta Cardiol. 2007), while 5mg/day significantly improved cardiac and vascular sympathetic baroreceptor sensitivity in hypertension (Béchir M, J Cardiovasc Pharmacol. 2005).
- Higher intake of vitamin B6 (pyridoxine) and folate were found in a meta-analysis to be associated with a lower risk of coronary heart disease (Jayedi A, Crit Rev Food Sci Nutr. 2019). However, a Cochrane Review found that vitamins B6 and 12 and folate did not reduce the risk of non-fatal or fatal myocardial infarction, stroke or death by any cause (Martí-Carvajal AJ, Cochrane Database Syst Rev. 2009), although a 2016 meta-analysis found that the combination lowered stroke risk (Lan X, Zhonghua Liu Xing Bing Xue Za Zhi. 2016). A combination of vitamin B12 and folic acid improved coronary blood flow (Bleie Ø, Coron Artery Dis. 2011).

Berberine

- In patients with hypercholesterolaemia, 2 studies showed that berberine induced a significant reduction in plasma total cholesterol, LDL cholesterol and triglyceride levels and raised HDL levels (Cicero AFG, Am J Cardiol. 2019; Derosa G, Expert Opin Biol Ther. 2013). A third study found that berberine lowered lipids in more hypercholesterolaemic patients than ezetimibe (Pisciotta L, Lipids Health Dis. 2012).
- A systematic review found that berberine and metformin offered a greater blood pressure reduction than metformin alone (Suadoni MT, Complement Ther Clin Pract. 2021).
- In cardiomyoblasts from patients undergoing percutaneous coronary intervention, berberine reduced myocardial injury partly by reducing myocardial autophagy and apoptosis (Qing Y, Biomed Pharmacother. 2018).
- In patients with chronic congestive heart failure, berberine at 1.2-2.0 g/day, there was a significantly greater increase in left ventricular ejection fraction, exercise capacity, improvement of the dyspnoea-fatigue index and a decrease of frequency and complexity of ventricular premature complexes; there was also a significant decrease in mortality (Zeng XH, Am J Cardiol. 2003).

L-carnitine

- In patients with cardiovascular disease risk factors, L-carnitine lowered total and LDL-cholesterol, lipoprotein(a), blood glucose, HbA1c and insulin resistance and raised HDL-cholesterol (Asadi M, Clin Nutr. 2020).
- In patients with metabolic syndrome, a meta-analysis found that L-carnitine lowered systolic blood pressure and waist circumference and at doses >1g/day also lowered blood glucose and triglycerides and increased HDL-cholesterol (Choi M, Nutrients. 2020).
- A meta-analysis also showed that L-carnitine lowered CRP (Sahebkar A. J Med Biochem. 2015).
- A meta-analysis of heart failure trials showed that L-carnitine was associated with improvement in overall efficacy, left ventricular ejection fraction, strike volume, cardiac output and E/A, as well as decreased levels of BNP, NT-proBNP, LVEDD and LVESV (Song X, Biomed Res Int. 2017).
- A meta-analysis of patients with acute myocardial infarction found that L-carnitine was associated with a significant reduction in all-cause mortality, ventricular arrhythmias and development of angina (DiNicolantonio JJ, Mayo Clin Proc. 2013).
- A meta-analysis of patients with dilated cardiomyopathy showed that L-carnitine was associated with improvement in overall efficacy, left ventricular ejection fraction and cardiac output, with significantly decreased left ventricular end-diastolic dimension, brain natriuretic peptide and transforming growth factor-beta). (Weng Y, Biomed Res Int. 2021)

Coenzyme Q10

- A meta-analysis showed that CoQ10 lowers total and LDL cholesterol in diabetic patients and improves endothelial health (Dludla PV, Endocrinol Diabetes Metab. 2020). In patients with prior myocardial infarction, 120mg/day for 1 year, total cardiac events and cardiac deaths were significantly lower, HDL-cholesterol was increased and total and LDL cholesterol and lipid peroxides decreased, even in those also taking statins (Singh RB, Mol Cell Biochem. 2003).
- A meta-analysis found that CoQ10 reduced elevated lipoprotein(a) (Sahebkar A, Pharmacol Res. 2016).
- A meta-analysis of 14 RCTs showed that CoQ10 decreased mortality and improved exercise capacity (Lei L, BMC Cardiovasc Disord, 2017).
- Trials showed that in patients with chronic heart failure 300mg/day CoQ10 reduced major adverse cardiovascular events, all-cause mortality, cardiovascular mortality and hospitalisation (Mortensen AL, Cardiol J. 2019), while 400mg/day for 3 months improved peripheral endothelial function in heart failure patients with reduced ejection fraction (Kawashima C, Am J Cardiovasc Drugs. 2020). 60mg/day for 3 months administered to heart transplant candidates led to a significant improvement in functional status, clinical symptoms, and quality of life (Berman M, Clin Cardiol, 2004). In heart failure patients, 2 mg/kg/day for 1 year found that the number of patients who required hospitalisation for worsening heart failure was significantly smaller in the coenzyme Q10 treated group than in the control group and episodes of pulmonary oedema or cardiac asthma were reduced (Morisco C, Clin Investig, 1993).
- In patients with ischaemic cardiomyopathy, dilated cardiomyopathy, primary diastolic dysfunction, hypertension, mitral valve prolapse and valvular heart disease CoQ10 administration improved 58 per cent by one New York Heart Association (NYHA) class, 28% by two classes and 1.2% by three classes, with a statistically significant improvement in echocardiographic myocardial function. Overall medication requirements dropped considerably: 43% stopped between one and three drugs. (Langsjoen H, Mol Aspects Med. 1994)
- CoQ10 improved diastolic function in children with dilated cardiomyopathy (Kocharian A, Cardiol Young, 2009).
- In elderly patients undergoing aortic valve replacement, 400mg/day starting 7 days prior to surgery counteracted the post-operative plasma CoQ10 decline and oxidation and curbed the post-operative increase in troponin ; it also prevented the adverse outcomes associated with defective left ventricular ejection fraction recovery (Orlando P, Aging, 2020).
- In a group of elderly subjects low in selenium and CoQ10, supplementation with 200 µg/day selenium and 200 mg/day CoQ10 prevented an increase in D-dimer and reduced the risk of cardiovascular mortality (Alehagen U, Nutrients. 2021).

Lipoic acid

- A systematic review and a meta-analysis found that α-lipoic acid improved endothelial function through increasing the bioavailability of endothelium-derived nitric oxide and decreasing oxidative stress and inflammation (Hajizadeh-Sharafabad F, Crit Rev Food Sci Nutr. 2020; Jalilpiran Y, Phytother Res. 2020).
- α-lipoic acid improved brachial artery flow-mediated dilatation in young people (Tromba L, Nutrients. 2019).
- α-lipoic acid improved subclinical left ventricular dysfunction in asymptomatic patients with T1D, preventing diabetic cardiomyopathy, and decreased lipid oxidation, inflammation and troponin-I levels, (Hegazy SK, Rev Diabet Stud. 2013).
- In patients with takotsubo cardiomyopathy, 600mg/day α-lipoic acid improved adrenergic cardiac innervation and the defect size (Marfella R, J Cardiol. 2016).

Magnesium

- A systematic review showed that hypomagnesaemia was an independent risk factor for cardiovascular mortality, including sudden cardiac death (Voultsos P, Cardiol Rev. 2021), while a meta-analysis found an inverse linear relationship between dietary intake and risk of cardiovascular disease and coronary heart disease (Zhao L, J Cardiovasc Pharmacol. 2019).
- In patients with essential hypertension, 300mg/day significantly decreased systolic and diastolic blood pressure, systemic vascular resistance index and left cardiac work index (Banjanin N, Nutrients. 2018).
- A meta-analysis found that in patients with T2D, supplementation improved blood glucose, LDL and HDL cholesterol, triglycerides and systolic blood pressure (Verma H, J Hum Nutr Diet. 2017).
- In heart failure patients, magnesium orotate (6000 mg for 1 month, 3000 mg for 11 months) significantly improved survival rate, clinical symptoms and quality of life (Stepura OB, Int J Cardiol. 2009). 300mg/day also improved heart rate variability (Almoznino-Sarafian D, Nutr Metab Cardiovasc Dis. 2009).
- In patients with coronary artery disease, magnesium improved exercise tolerance and left ventricular function during rest and exercise (Pokan R,. Br J Sports Med. 2006).
- A meta-analysis found that magnesium supplementation following coronary artery bypass graft reduced post-operative atrial fibrillation (Chaudhary R, J Atr Fibrillation. 2019).
- Oral magnesium sulphate decreased ventricular and supraventricular arrhythmias in acute coronary syndrome (Salaminia S, BMC Cardiovasc Disord. 2018).

Melatonin

- A meta-analysis found that melatonin improved LDL cholesterol and triglycerides (Loloei S, Diabetes Metab Syndr. 2019).
- In patients with T2D and coronary heart disease, melatonin 10mg/day for 12 weeks lowered lipid peroxidation, inflammation, blood glucose, insulin, HOMA, total/HDL cholesterol and systolic and diastolic blood pressure (Raygan F, Clin Nutr. 2019).
- A meta-analysis showed that melatonin reduced systolic and diastolic blood pressure (Hadi A, Horm Metab Res. 2019). In particular, in elderly patients, 1.5mg/day for 3 weeks reduced systolic and diastolic blood pressure, particularly between 3:00 and 8:00 in the morning, i.e. at the time of the highest risk of cardiovascular events (Gubin DG, Curr Aging Sci. 2016).
- In healthy young men, melatonin reduces blood coagulation (Wirtz PH, J Pineal Res. 2008).
- 3mg/day reduced tachycardia in postural tachycardia syndrome (Green EA, Cardiovasc Ther. 2014).
- A meta-analysis found that melatonin-treated patients following revascularisation had higher left ventricular ejection fraction and lower levels of troponin, suggesting that melatonin is a cardioprotective agent (Domínguez-Rodríguez A, Front Cardiovasc Med. 2021).

Omega 3 fatty acids

- There was a marked depletion of omega-3 fatty acids in patients hospitalised for decompensated heart failure (Berliner D, Prostaglandins Leukot Essent Fatty Acids. 2019).
- A meta-analysis showed that supplementation of omega-3 fats was associated with lower risk of myocardial infarction and coronary heart disease events and mortality (Bernasconi AA, Mayo Clin Proc. 2021). A further meta-analysis showed that the effect appeared to be dose dependent: 2g/day was associated with reduced cardiac death, while 3g/day was also associated with sudden death and stroke (Rizos EC, Heart. 2021).
- A meta-analysis found that omega-3 intake (food or supplements) was associated with a significant coronary heart disease (CHD) risk reduction among higher-risk populations and reduced risk of any CHD event (Alexander DD, Mayo Clin Proc. 2017).
- A meta-analysis showed that omega-3 supplementation reduced heart rate, that appeared to be due to DHA, not EPA (Hidayat K, Eur J Clin Nutr. 2018).
- Two meta-analyses found that omega-3 supplementation reduced cardiac and all-cause mortality provided the dose is >1g/day (Wen YT, Nutr Metab Cardiovasc Dis. 2014; Maki KC, J Clin Lipidol. 2017).
- In patients with advanced chronic heart failure, 4g/day reduced monocyte-platelet aggregates, T-selectin, monocytic tissue factor and inflammation (Moertl D, Thromb Haemost. 2011).
- In ischaemic heart failure patients, 2g/day for 8 weeks improved left ventricle ejection fraction, global longitudinal strain, the E/e' ratio, ST2 levels, flow mediated dilatation and hsCRP levels (Oikonomou E, Clin Nutr. 2019). 1g/day in heart failure patients was associated with lower brain natriuretic peptide (BMP) levels and improved left diastolic function (Chrysohoou C, Vascul Pharmacol. 2016).
- In cardiac surgery patients, a meta-analysis showed that omega-3 supplementation reduced hospital length of stay and incidence of postoperative atrial fibrillation (Langlois PL, Clin Nutr. 2017).

D-Ribose

- In heart failure patients, D-ribose enhanced atrial contribution to left ventricular filling, a smaller left atrial dimension and a shortened E wave by echocardiography, as well as a significant improvement of the patient's quality of life (Omran H, Eur J Heart Failure, 2003).
- Advanced heart failure patients given 5g/day for 8 weeks showed significant improvement in ventilatory parameters, along with a 44% Weber class improvement and the ventilatory exercise status (MacCarter D, Int J Cardiol, 2009).
- In heart failure patients, supplemental D-ribose demonstrated a significant improvement in diastolic compliance with comparable measurements pertaining to left atrial function. It also induced a significant improvement in quality of life and physical function activity scoring. (Illien S, J Mol Cell Cardiol. 2001) Similar results were seen in heart failure patients with preserved systolic function and diastolic dysfunction given 5g/day for 6 weeks (Bayram M, Ther Adv Cardiovasc Dis. 2015).
- Daily doses of D-ribose enabled patients with stable severe coronary artery disease to increase their ‘ischaemic threshold’, reflected in their ability to exercise longer with fewer symptoms or potential electrocardiographic changes (Pliml W, Lancet. 1992).
- Supplementation with creatine, D-ribose, vitamin B1 and vitamin B6, in addition to standard therapy and a physical exercise program, improved exercise tolerance in cardiovascular disease patients (Derosa G, Nutrients, 2019).

Taurine

- A meta-analysis found that in patients with liver dysregulation, up to 6g/day decreased systolic blood pressure, diastolic blood pressure, total cholesterol and triglycerides (Guan L, Eur J Pharmacol. 2020).
- In young overweight/obese subjects, 3g/day for 7 weeks decreased triglycerides and the atherogenic index (Zhang M, Amino Acids. 2004).
- In heart failure patients with ejection fraction <50%, 1500mg/day for 2 weeks following exercise showed a significant decrease in the values of Q-T segments and a significant increase in the values of P-R segments, with higher values of T wave and Q-T segment, indicating improved cardiac function and functional capacity (Ahmadian M, J Diet Suppl. 2017). In a similar study, exercise time, metabolic equivalents and exercise distance increased significantly (Beyranvand MR, J Cardiol. 2011).
- In young males with T1D, 2 weeks of supplementation returned arterial stiffness (augmentation index) and brachial artery reactivity (flow-mediated dilatation) to those of healthy controls (Moloney MA, Diab Vasc Dis Res. 2010).

Vitamin D

- A meta-analysis showed that supplementation could lower systolic and diastolic blood pressure, parathyroid hormone levels, total and LDL cholesterol and triglycerides and raise HDL cholesterol (Mirhosseini N, Front Cardiovasc Med. 2018). This was partially confirmed in a later meta-analysis which found that supplementation improved diastolic blood pressure and parathyroid hormone levels (Bahrami LS, Sci Rep. 2020).
- A meta-analysis showed that in heart failure patients, supplementation decreased left ventricular end-diastolic dimension and increased left ventricular ejection fraction; this was more effective at a dose of >4000 IU/day (Zhao JD, BMJ Open. 2018). A later meta-analysis confirmed that vitamin D can enhance left ventricular ejection fraction in heart failure (Naghedi A, Rev Port Cardiol. 2021).
- In patients with heart failure and left ventricular systolic dysfunction with baseline vitamin D levels <50 nmol/l, 4000IU/day for 1 year improved cardiac function and reversed LV remodelling (Witte KK, J Am Coll Cardiol. 2016).
- In African Americans with vitamin D levels <50nmol/L, supplementation dose-dependently lowered carotid-femoral and carotid-radial pulse wave velocity (Raed A, PLoS One. 2017).

Curcumin

- A meta-analysis showed that curcumin lowered triglycerides while raising HDL cholesterol; the effect was not found to be dependent on the duration of supplementation (Simental-Mendía LE, Crit Rev Food Sci Nutr. 2019). Since then, in young obese males, 500mg/day for 12 weeks lowered homocysteine and raised HDL cholesterol (Campbell MS, Nutrition. 2019). In subjects with hypercholesterolaemia, 200mg/day significantly lowered total and LDL-cholesterol and the total:HDL-cholesterol ratio (Ferguson JJA, Metabolism. 2018).
- A meta-analysis showed that curcumin lowered CRP levels in trials exceeding 4 weeks (Sahebkar A. Phytother Res. 2014).
- In patients undergoing coronary angioplasty, 500mg/day for 8 weeks lowered total and LDL cholesterol, triglycerides, lipid peroxides and inflammatory markers and improved total antioxidant capacity (Helli B, Endocr Metab Immune Disord Drug Targets. 2021).
- A meta-analysis showed that curcumin could increase flow-mediated dilatation (Hallajzadeh J, Phytother Res. 2019).
- In patients with metabolic syndrome, 500mg/day for 12 weeks improved arterial stiffness (pulse wave velocity) and weight (Alidadi M, Adv Exp Med Biol. 2021).

Grape seed extract

- A meta-analysis showed that grape seed extract lowered systolic blood pressure and heart rate but did not affect lipids (Feringa HH, J Am Diet Assoc. 2011).
- Since then a study showed that in obese/overweight subjects, 300mg/day for 12 weeks raised HDL cholesterol and reduced total and LDL cholesterol, triglycerides, visceral adiposity index and atherogenic index of plasma (Yousefi R, Phytother Res. 2021). 200mg/day for 8 weeks also decreased oxidised LDL (Razavi SM, J Med Food. 2013).
- In prehypertensive older men, 300mg/day lowered the blood pressure response to exercise and improved peripheral vasoconstriction, flow-mediated dilatation, oxygen delivery and cardiac stroke volume and output (Otsuki T, Front Physiol. 2019). 300mg/day also improved ambulatory blood pressure in subjects with systolic blood pressure between 120 and 159mmHg (Ras RT, Br J Nutr. 2013).

Quercetin

- A meta-analysis found that quercetin lowered systolic and diastolic blood pressure and, in trials lasting at least 8 weeks, HDL cholesterol was increased and triglycerides lowered (Huang H, Nutr Rev. 2020).
- In overweight/obese high risk subjects, 150mg/day for 6 weeks decreased oxidised LDL-cholesterol levels (Egert S, Br J Nutr. 2009).
- Doses of both 150mg/day and 300mg/day inhibited platelet cell signalling and thrombus formation (Hubbard GP, J Thromb Haemost. 2004).
- In post-myocardial infarction patients, 500mg/day for 8 weeks increased total antioxidant capacity (Dehghani F, Phytother Res. 2021).
- In patients with essential hypertension and gout, quercetin lowered echocardiographic E/e' and left ventricular mass index and also had a cumulative antihypertensive effect (Kondratiuk VE, Wiad Lek. 2018).
- In patients with coronary heart disease given 120mg/day for 2 months, echocardiographic deceleration time and premature ventricular contractions decreased and the total time and number of episodes of ST segment depression declined (Chekalina NI, Wiad Lek. 2017).
- A meta-analysis showed that in rodents, quercetin improved left ventricular dysfunction in both pressure-overload and ischaemia/reperfusion-injury models (Siti HN, Cardiovasc Drugs Ther. 2020).

Resveratrol

- A meta-analysis showed that in patients with T2D, resveratrol lowered blood glucose, insulin and systolic blood pressure (Nyambuya TM, Molecules. 2020).
- A systematic review found that resveratrol reduced blood pressure in pre-hypertensive and hypertensive patients (Mashhadi FD, Curr Drug Discov Technol. 2020)
- In subjects with dyslipidaemia, 100mg/day for 2 months induced a reduction in total cholesterol and triglycerides (Simental-Mendía LE, Nutrition. 2019). In patients with T2D and coronary hear disease, 500mg/day for 4 weeks reduced fasting glucose, insulin resistance and lipid peroxidation and increased HDL-cholesterol and total antioxidant capacity (Hoseini A, Food Funct, 2019).
- In heart failure patients, 100mg/day for 3 months reduced red blood cell aggregation (Gal R, Cardiovasc Ther, 2020).
- In patients with coronary heart disease, 100mg/day for 2 months improved left ventricular diastolic function, deceleration time and ST depression and the number of premature atrial and ventricular contractions was significantly reduced (Chekalina NI. Wiad Lek. 2017).
- However, one study found that doses of 1000mg/day for 90 days induced increased levels of soluble vascular cell adhesion molecule-1 (sVCAM-1) and total plasminogen activator inhibitor (tPAI-1) (Mankowski RT, Exp Gerontol. 2020). Another found that 250mg/day for 8 weeks blunted the positive effects of exercise training on cardiovascular health in elderly men (Gliemann L, J Physiol, 2013).
- A meta-analysis of rodent studies showed that pretreatment with resveratrol significantly reduced the infarct size after myocardial ischaemia/reperfusion injury (Mao ZJ, Oxid Med Cell Longev. 2019).

Genistein

- A meta-analysis showed that for study duration of at least 6 months, genistein can significantly decrease systolic and diastolic blood pressure in subjects with metabolic syndrome (Hemati N, Food Res Int, 2020).
- In postmenopausal women with metabolic syndrome, 54mg/day for 1 year reduced fasting glucose, fasting insulin, insulin resistance, total and LDL-cholesterol, triglycerides, systolic and diastolic blood pressure, visfatin and homocysteine and increased HDL-cholesterol and adiponectin was also reduced in genistein recipients (Squadrito F, J Clin Endocrinol Metab. 2013).
- 54mg/day for 1 year also significantly improved left ventricular ejection fraction and left atrial area fractional change (De Gregorio C, Nutrients, 2017), while 54mg/day for 6 months improved brachial artery flow-mediated vasodilatation and decreased total cholesterol, triglycerides, homocysteine and visfatin, while adiponectin levels were increased. (Irace C, Eur J Clin Invest, 2013).