

The effect of nutrition on blood pressure

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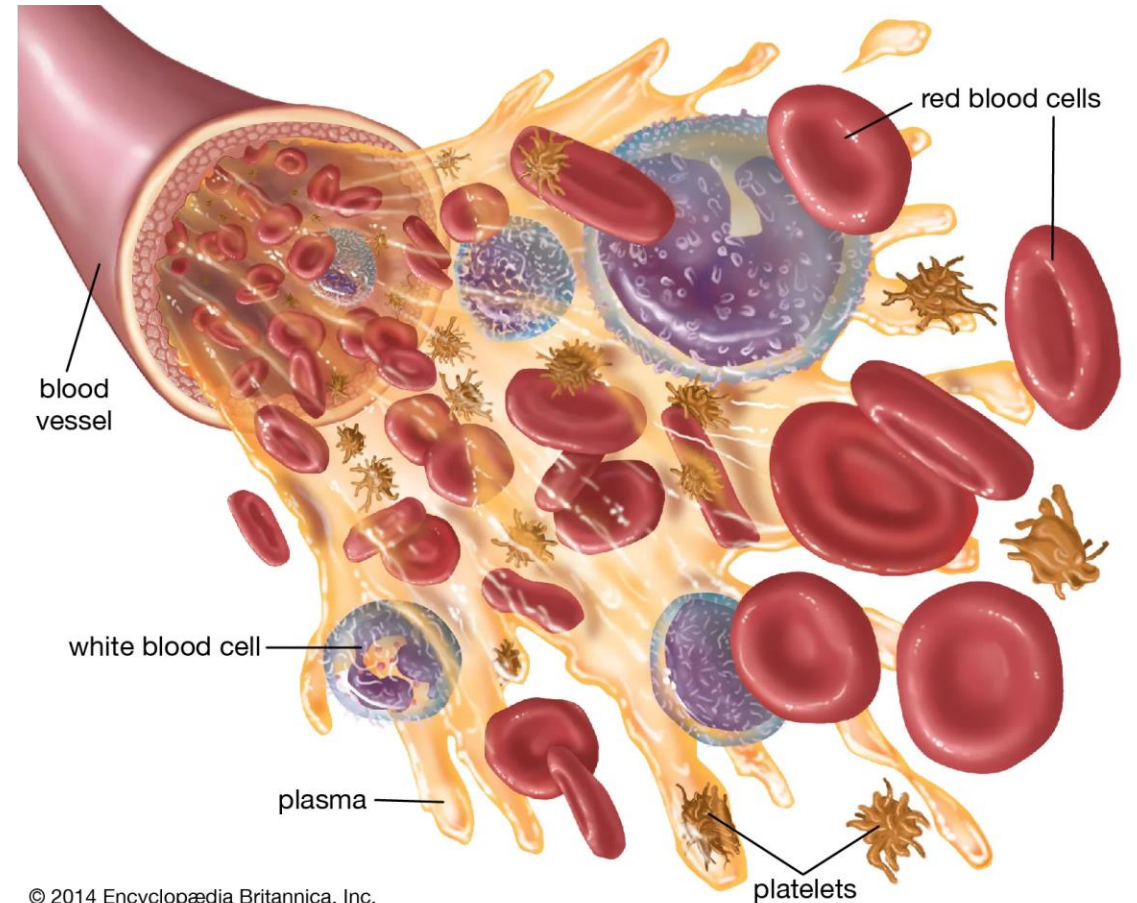
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Blood

Blood is classified as a connective tissue and consists of two main components:

- Plasma, which is a clear extracellular fluid, and is a mixture of proteins, enzymes, nutrients, wastes, hormones and gases.
- Formed elements, which are made up of the blood cells and platelets
- The formed elements are so named because they are enclosed in a plasma membrane and have a definite structure and shape. All formed elements are cells except for the platelets, which are tiny fragments of bone marrow cells.

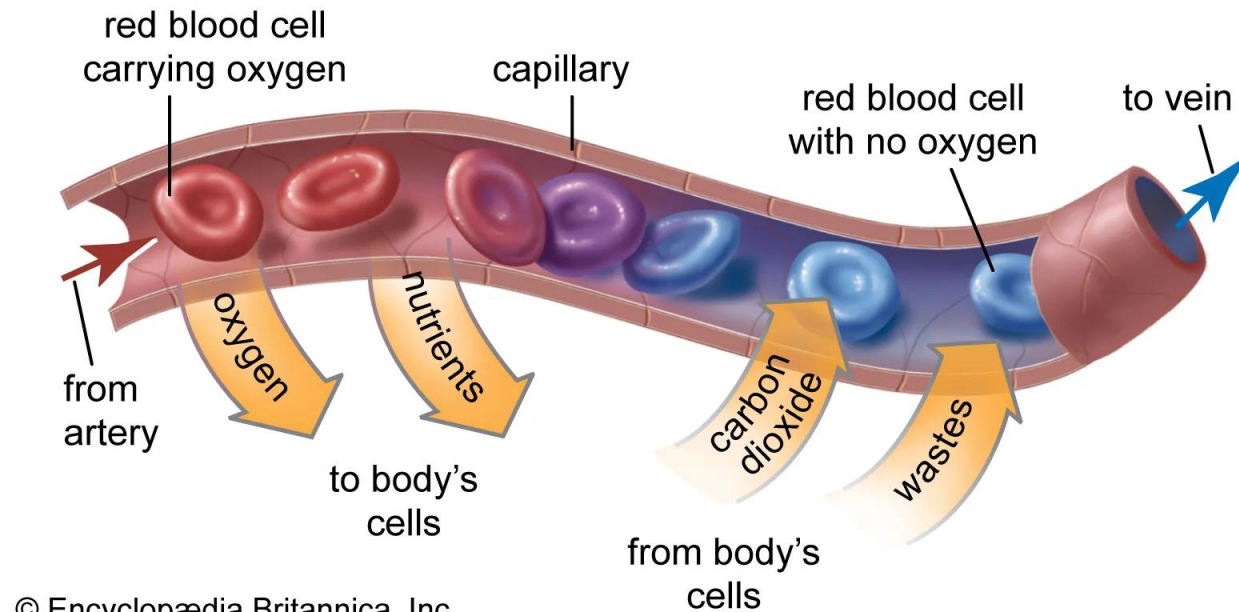


Blood function

Blood has three main functions: transport, protection and regulation.

Blood transports the following substances:

- Gases, namely oxygen (O₂) and carbon dioxide (CO₂), between the lungs and rest of the body
- Nutrients from the digestive tract and storage sites to the rest of the body
- Waste products to be detoxified or removed by the liver and kidneys
- Hormones from the glands in which they are produced to their target cells
- Heat to the skin to help regulate body temperature

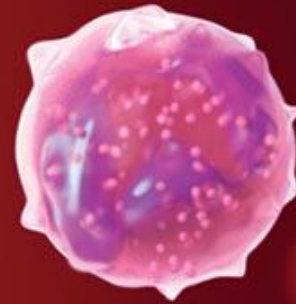


Blood function

Protection

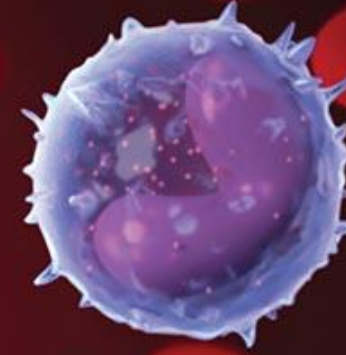
Blood has several roles in inflammation:

- Leukocytes, or white blood cells, destroy invading microorganisms and cancer cells
- Antibodies and other proteins destroy pathogenic substances
- Platelet factors initiate blood clotting and help minimise blood loss



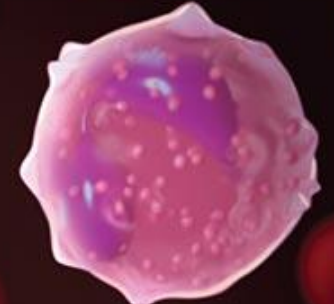
Neutrophils

Kill bacteria, fungi and foreign debris



Monocytes

Clean up damaged cells



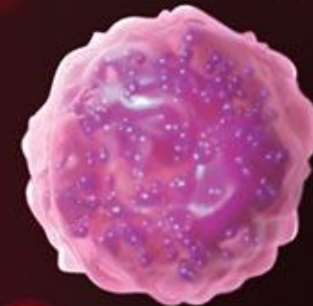
Eosinophils

Kill parasites, cancer cells and involved in allergic response



Lymphocytes

Help fight viruses and make antibodies



Basophils

Involved in allergic response

Blood function

Regulation

Blood helps regulate:

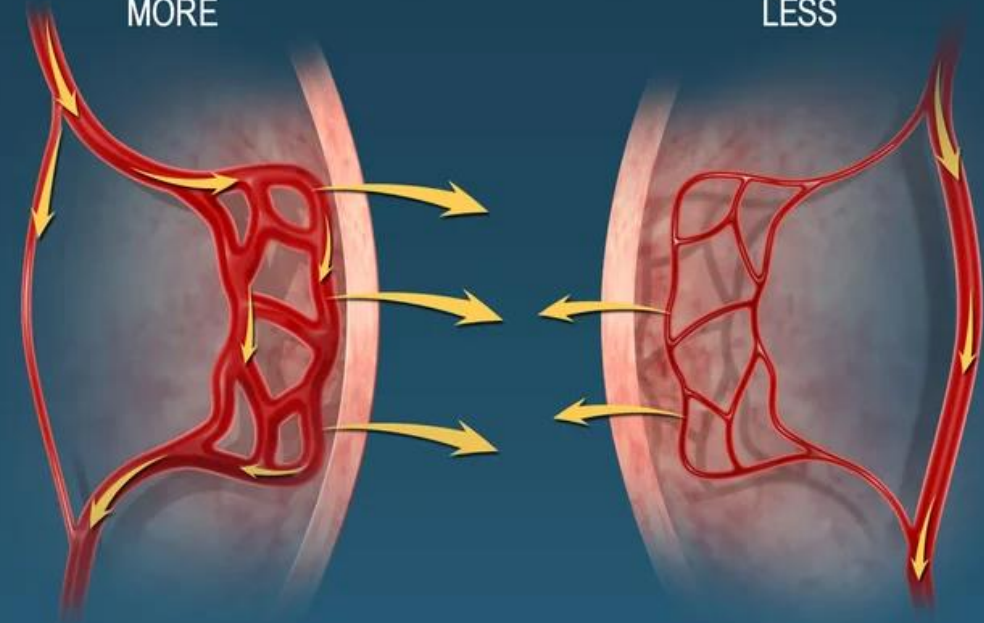
- pH by interacting with acids and bases
- Water balance by transferring water to and from tissues
- Maintenance of body temperature

HOW BLOOD REGULATES BODY TEMPERATURE

HEAT LOSS
ACROSS EPIDERMIS

MORE

LESS

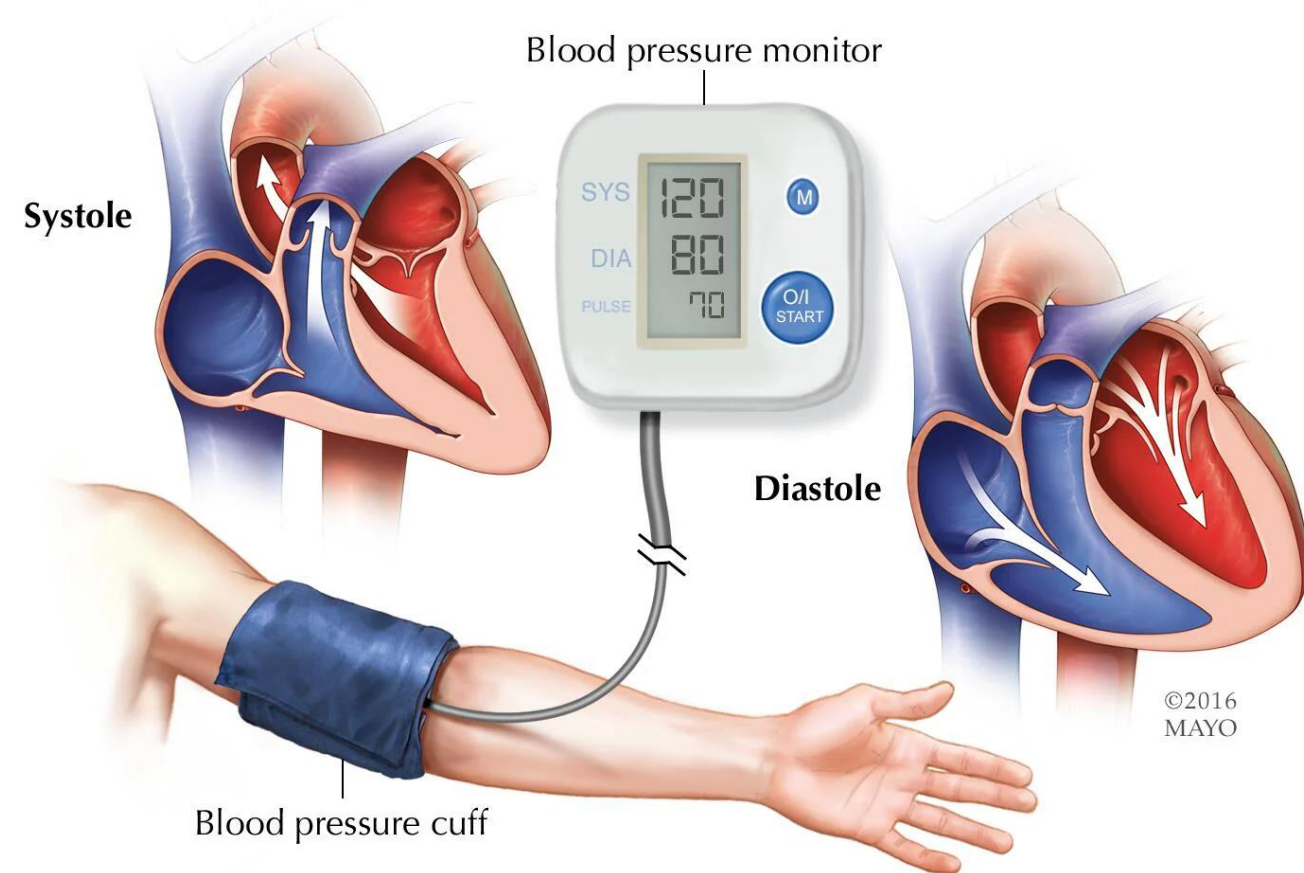


BLOOD VESSEL DILATES
(VASODILATION)

BLOOD VESSEL CONSTRICTS
(VASOCONSTRICTION)

Blood pressure

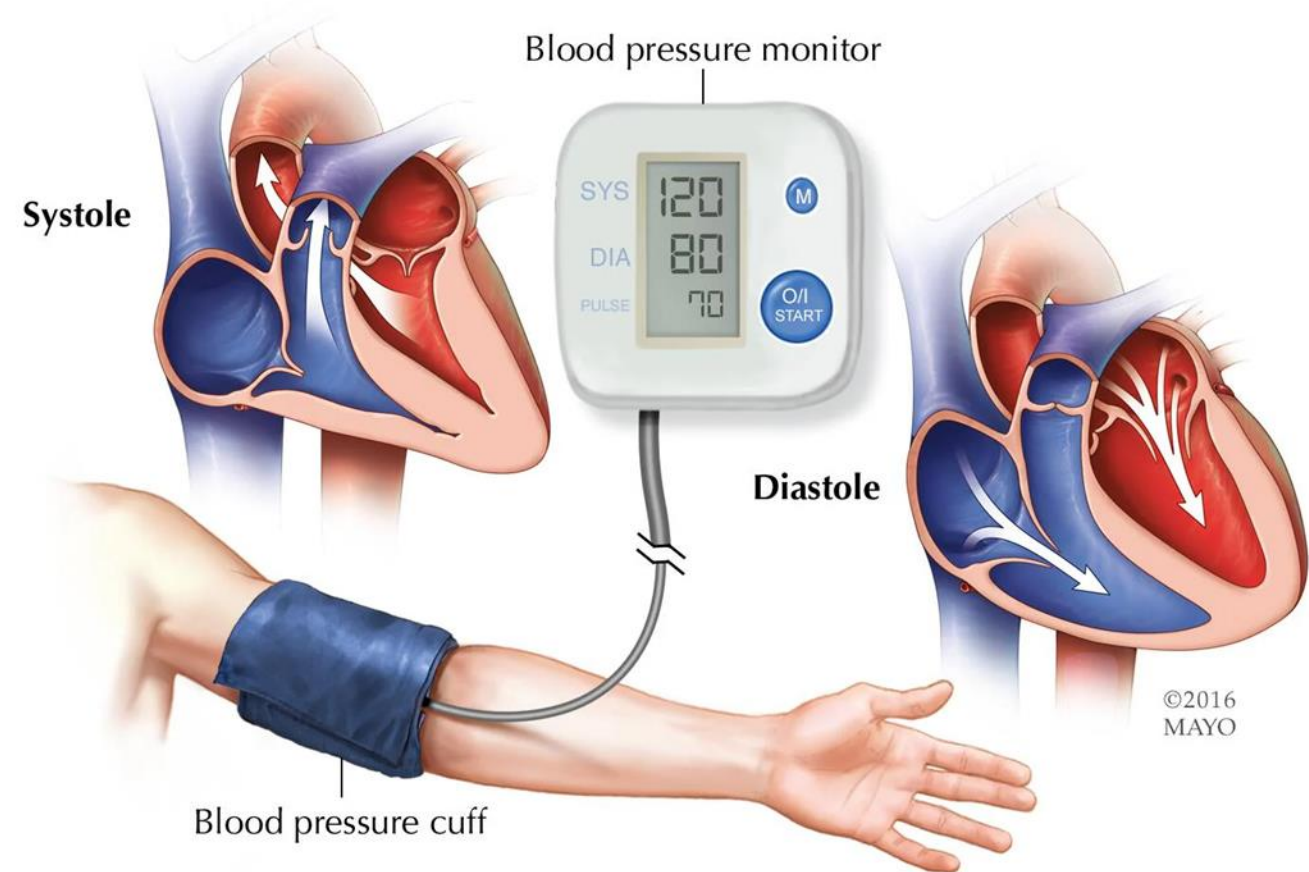
- Blood pressure is the measurement of the pressure or force of blood inside the arteries.
- Each time the heart beats, it pumps blood into arteries that carry blood throughout the body. This happens 60 to 100 times a minute, 24 hours a day.
- Heart rate is the number of times your heart beats in one minute.
- An increase in heart rate doesn't mean blood pressure is going up, too.



Blood pressure reading

Blood pressure readings have two measurements:

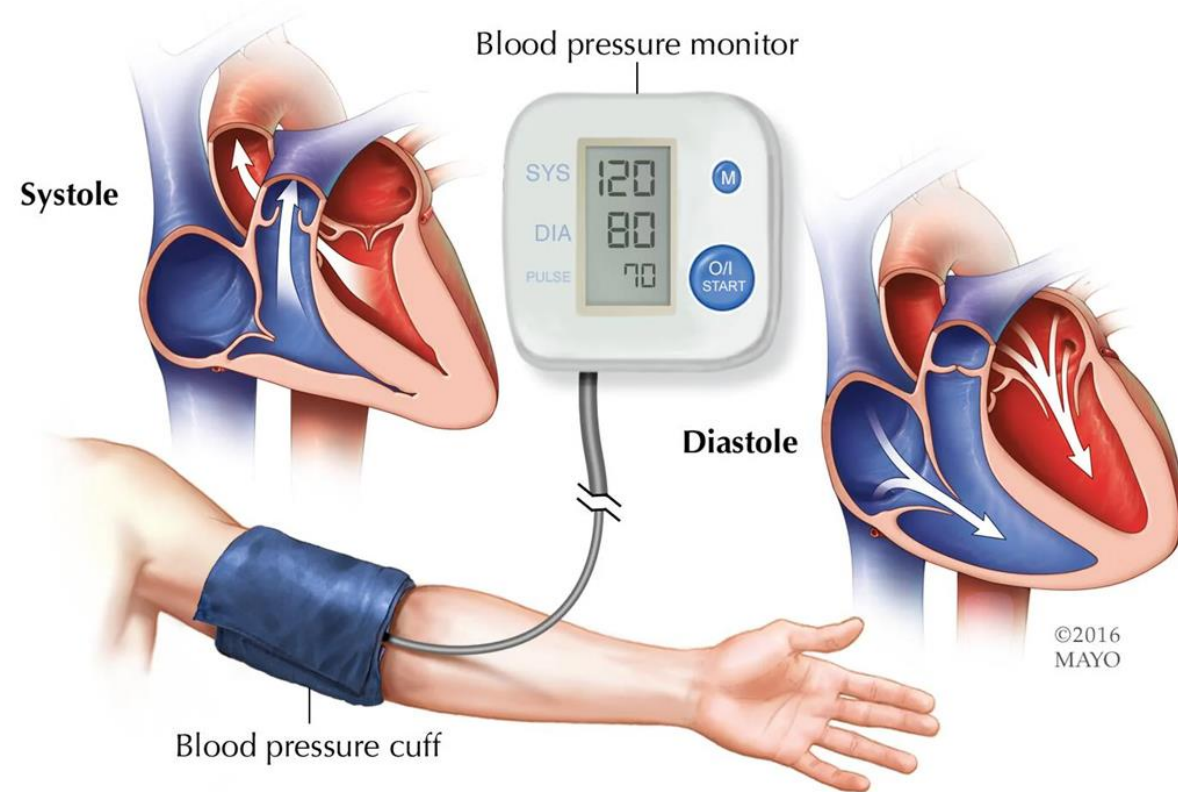
- Systolic blood pressure (the top/first number): This is the pressure in the arteries when the heart is beating and sending blood into the arteries.
- Diastolic blood pressure (the bottom/second number): This is the pressure in the arteries when the heart is at rest between heartbeats.



High blood pressure reading

As a general guide:

- High blood pressure is considered to be from 140/90mmHg or more if the reading was taken at a pharmacy, GP surgery or clinic (or an average of 135/85mmHg if it was taken at home)
- If over the age of 80, high blood pressure is considered to be from 150/90mmHg or more if the reading was taken at a pharmacy, GP surgery or clinic (or an average of 145/85mmHg if it was taken at home)
- Ideal blood pressure is usually considered to be between 90/60mmHg and 120/80mmHg, while the target for people over the age of 80 years old is below 150/90mmHg (or 145/85mmHg if it was taken at home)
- Blood pressure readings from 121/81mmHg to 139/89mmHg could mean risk of developing high blood pressure.
- Everyone's blood pressure will be slightly different. What's considered low or high for you may be normal for someone else. NHS



Blood pressure

- Blood pressure doesn't always stay the same. Blood pressure normally rises and falls throughout the day.
- It changes based on what a person is doing. When exercising or excited, blood pressure goes up. When resting, blood pressure is lower.

Blood pressure can also change because of:

- Age
- Medications
- Changes in position



High blood pressure causes

If you have high blood pressure from unknown causes, it's called essential or primary hypertension.

High blood pressure is a major risk factor for cardiovascular disease and is responsible for more than half of all strokes and heart attacks .

High blood pressure can cause:

- Transient ischaemic attack (TIA).
- Stroke.
- Heart attack.
- Enlarged heart.
- Heart failure.
- Peripheral artery disease.
- Aneurysms.
- Kidney disease.
- Broken blood vessels in the eyes.
- Vascular dementia

Blood Pressure



Hypertensive crisis

During a hypertensive crisis, you may experience:

- Shortness of breath.
- Chest pain.
- Difficulty with being able to see or talk.
- Pain in the back.
- Weakness or numbness.

Blood Pressure



Secondary hypertension

- High blood pressure may be the result of another health condition (secondary hypertension).
- It can be caused by conditions that affect the kidneys, arteries, heart or endocrine system.
- Secondary hypertension can also occur during pregnancy.
- Hyperparathyroidism. The parathyroid glands control levels of calcium and phosphorus in the body. If the glands release too much parathyroid hormone, the amount of calcium in the blood rises — which triggers a rise in blood pressure.

Blood Pressure



Secondary hypertension

- Diabetes complications (diabetic nephropathy). Diabetes can damage the kidneys' filtering system, which can lead to high blood pressure.
- Polycystic kidney disease-cysts in the kidneys interfere with kidney function and can raise blood pressure.
- Glomerular disease. Kidneys remove waste and sodium using tiny filters called glomeruli. In glomerular disease, these filters become swollen. This may raise blood pressure.
- Renovascular hypertension. This type of high blood pressure is caused by narrowing (stenosis) of one or both arteries leading to the kidneys.
- Renovascular hypertension is often caused by the same type of fatty plaques that can damage the coronary arteries (atherosclerosis) or a separate condition in which the muscle and fibrous tissues of the renal artery wall thicken and harden into rings (fibromuscular dysplasia).

Blood Pressure



Health conditions that can cause high blood pressure include:

- Long-term kidney infections
- Glomerulonephritis – damage to the tiny filters inside the kidneys
- Hormone problems – for example, changes in blood supply to the kidneys, hormone imbalances which can happen with problems such as an underactive thyroid or excess cortisol, overactive thyroid, Cushing's syndrome, acromegaly, increased levels of the hormone aldosterone (hyperaldosteronism), and phaeochromocytoma (a small vascular tumour of the adrenal medulla, causing irregular secretion of adrenalin and noradrenaline leading to attacks of raised blood pressure, palpitations, and headache).
- Lupus
- Scleroderma – a condition that causes thickened skin, and sometimes problems with organs and blood vessels

Blood Pressure



Secondary hypertension-symptoms

- High blood pressure that doesn't respond to blood pressure medications (resistant hypertension)
- Very high blood pressure — systolic blood pressure over 180 millimeters of mercury (mm Hg) or diastolic blood pressure over 120 millimeters of mercury (mm Hg)
- High blood pressure that no longer responds to medication that previously controlled the blood pressure
- Sudden-onset high blood pressure before age 30 or after age 55
- No family history of high blood pressure
- No obesity

Blood Pressure



Risk of high blood pressure

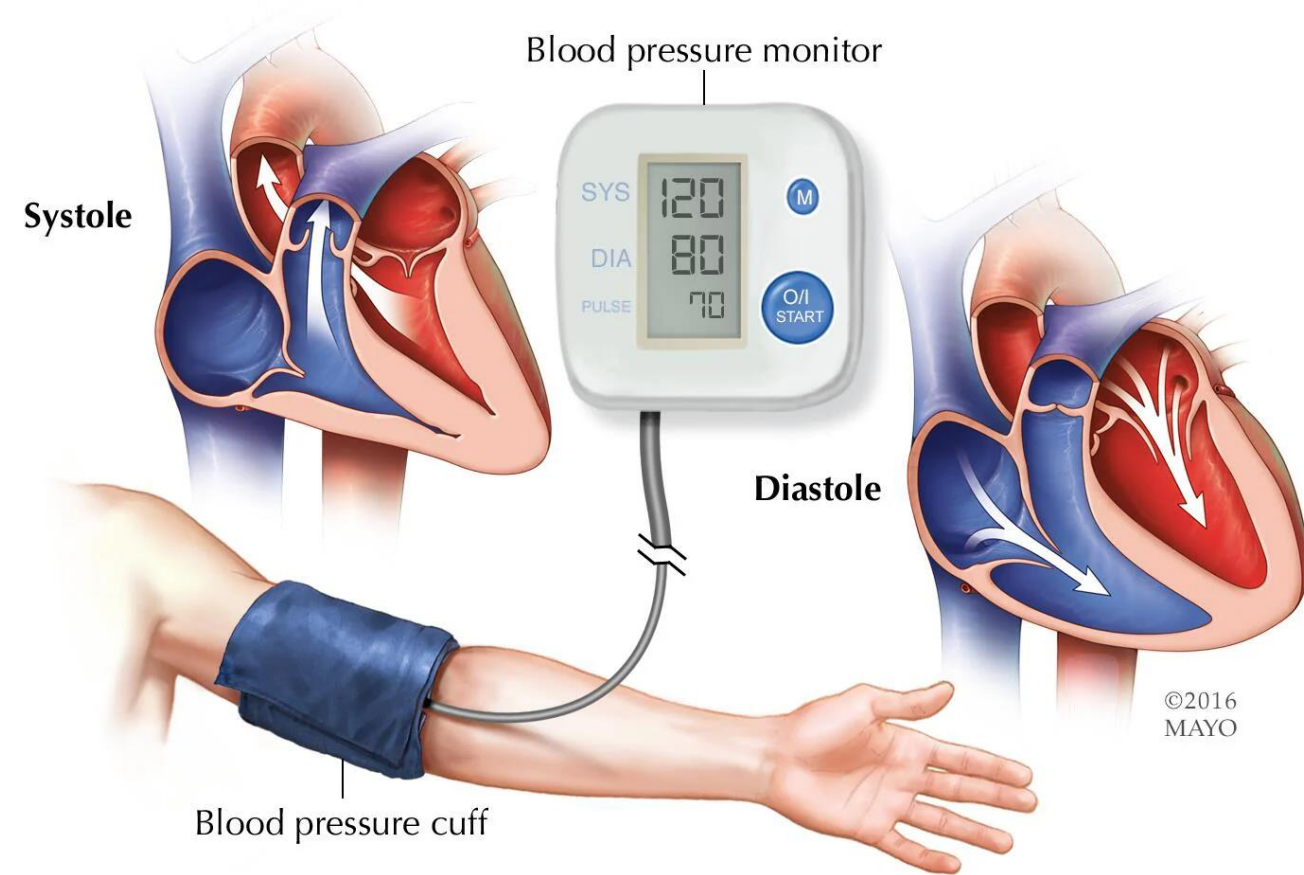
Risk of high blood pressure is higher:

- A family history of high blood pressure, cardiovascular disease or insulin resistance/diabetes.
- Have high cholesterol.
- Use oral contraceptives.
- Diabetes.
- Overweight
- Eat too much salt and do not eat enough fruit and vegetables/poor diet
- Not enough exercise
- Drink too much alcohol or coffee (or other caffeine-based drinks)
- Smoke
- Have a lot of stress
- Sleep apnoea
- Over 65
- Are of black African or black Caribbean descent
- Live in a deprived area



Blood pressure

- In the UK, high blood pressure is the third biggest risk factor for all disease after smoking and poor diet.
- Around one in three adults in the UK has high blood pressure. In England, 31% of men and 26% of women have high blood pressure.
- Half of people with high blood pressure are not diagnosed or receiving treatment. In England alone, there are more than five million people that are undiagnosed.
- High blood pressure rarely has any symptoms which is why it is called the 'silent killer'. The only way to know you have the condition is to get your blood pressure measured.
- High blood pressure costs the NHS over £2.1 billion every year



Ageing changes in blood

Blood pressure tends to rise with age. Up to five out of every hundred (5%) 16–24-year-olds in England have high blood pressure, but by the age of 65-74, more than half (58%) have it. This could be because the effects of an unhealthy lifestyle can build up over time, for example gaining weight and exercising less.

The increase in blood pressure with age is mostly associated with structural changes in the arteries and especially with large artery stiffness.

Ageing changes-

- Rise in fibrinogen
- Rise in blood viscosity
- Rise in plasma viscosity
- Increased red blood cell rigidity
- Increased formation of fibrin degradation products
- Earlier activation of the coagulation system

High blood pressure

- One in 4 adults worldwide suffers from high blood pressure, and this ratio is expected to increase to 29% by 2025.
- The prevalence of hypertension is 37.3% in developed countries and 22.9% in developing countries.
- Among the population with hypertension, more than 90% have essential hypertension, which makes this type of hypertension without a secondary cause a major global chronic non-communicable disease.
- Although the pathogenesis of essential hypertension is not entirely clear, recent studies have indicated that oxidative stress and vascular endothelial cell injury might be important factors.

Blood pressure

Nitric oxide is a naturally produced vasodilator that controls and regulates vascular tone and therefore controls and regulates blood pressure.

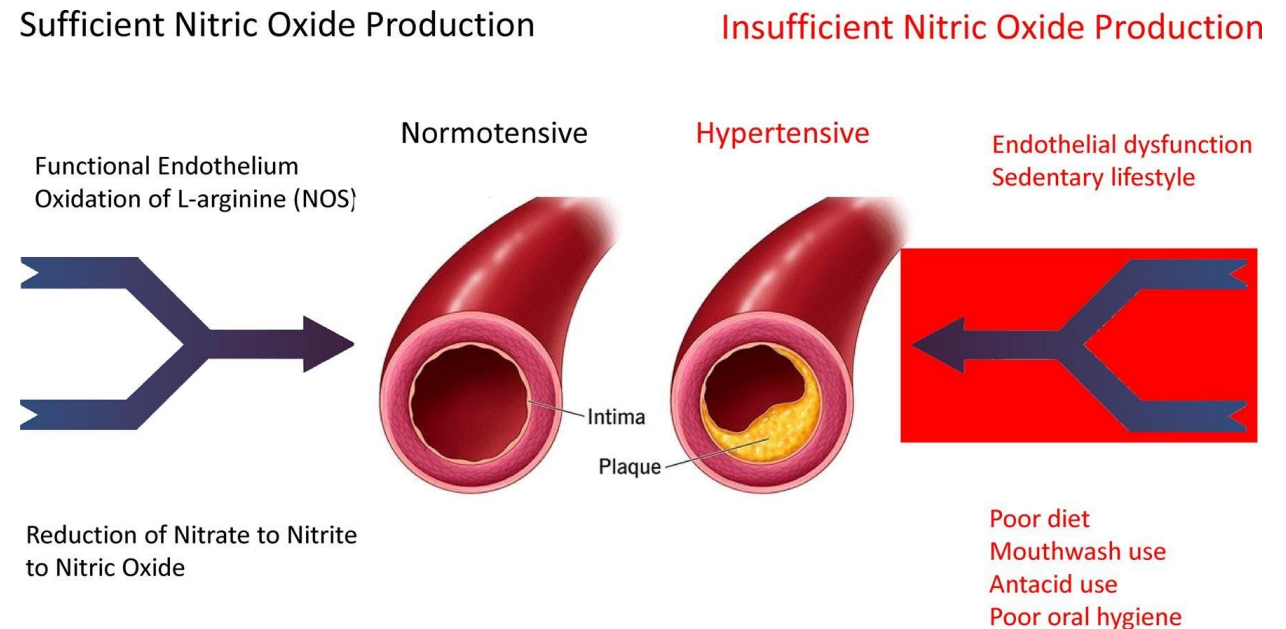
It relaxes the inner muscles of blood vessels, causing the vessels to widen. In this way, nitric oxide increases blood flow and lowers blood pressure

Research over the past 40 years reveals that loss of nitric oxide production is the earliest event in the development of hypertension.

Nitrate is a compound found in beetroot and dark leafy greens like spinach.

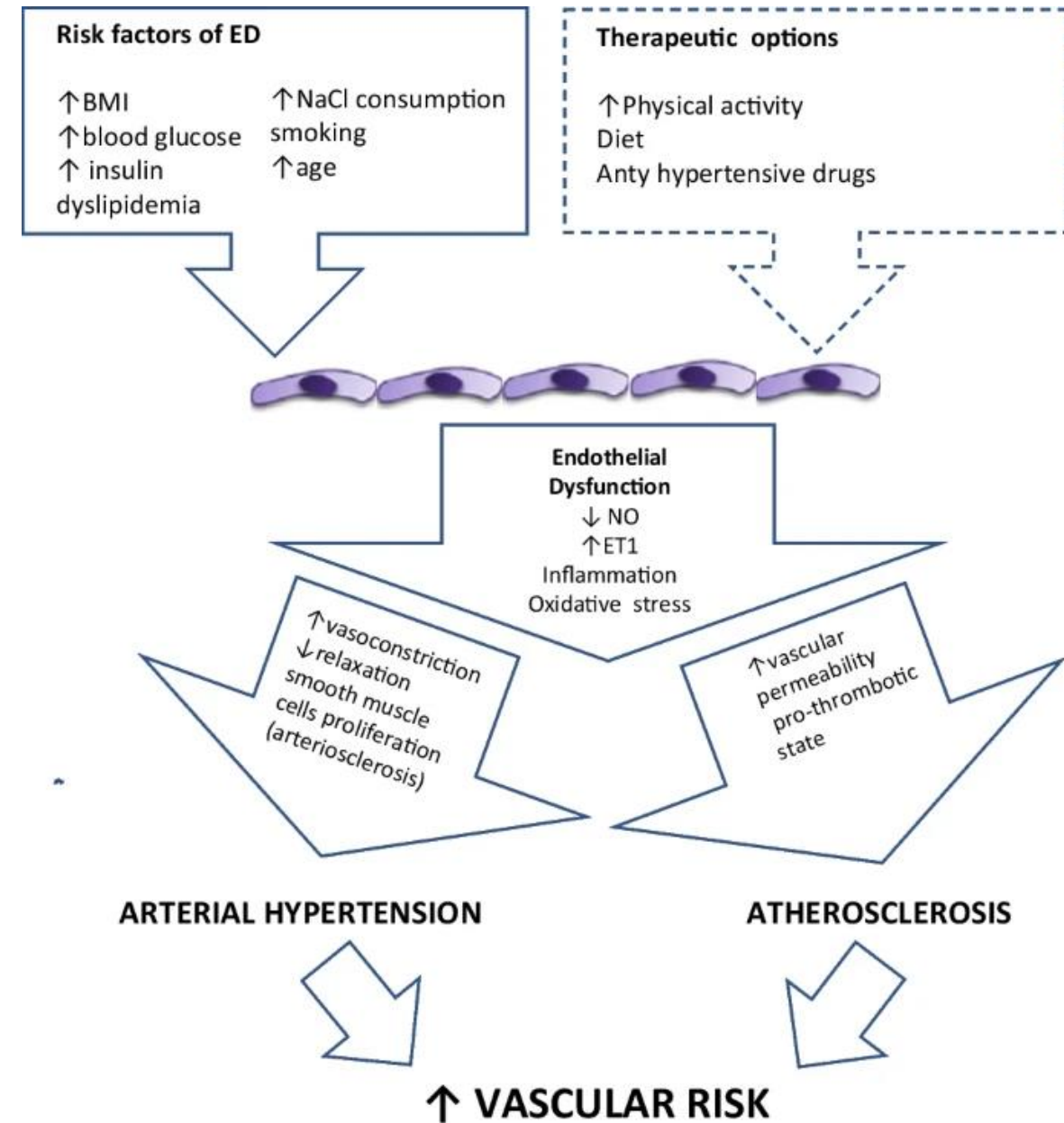
Vegetables and fruits contain several compounds, such as nitrate and flavonoids, that may help keep blood pressure under control by increasing nitric oxide levels.

Also, L-arginine through your diet in foods such as nuts, fish, red meat, soy, whole grains, beans and dairy products.



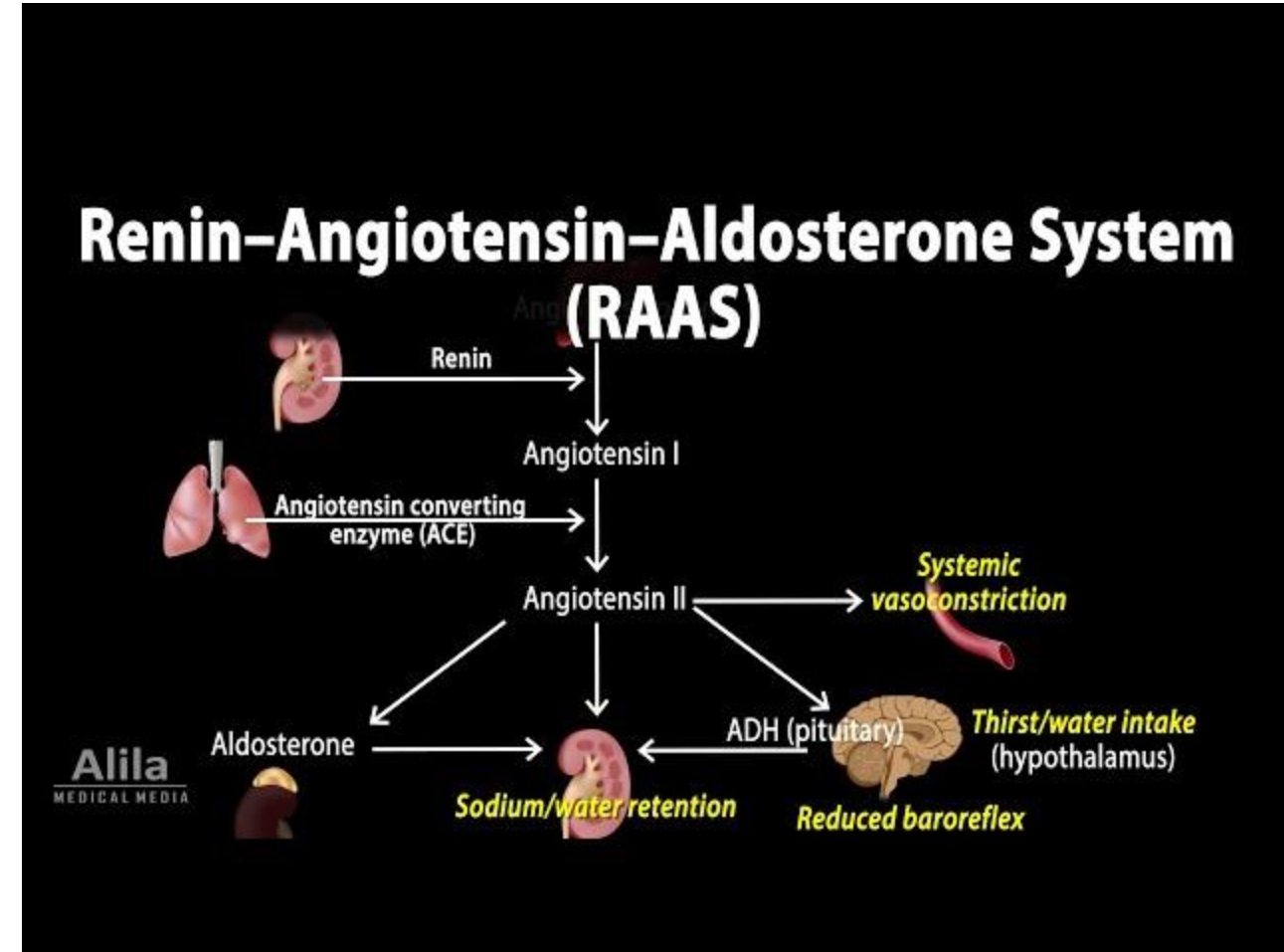
Endothelial dysfunction

- The endothelium lines the interior of the entire vascular system in the body and acts as a physical barrier between blood and tissues. Substances and mediators produced by the endothelium exhibit antithrombotic and anti-inflammatory properties. Oxidative stress and inflammation are conditions that damage the endothelium and shift endothelial function from vasoprotective to vasoconstrictive, prothrombotic, and pro-apoptotic functions.
- A dysfunctional endothelium contributes to the development of hypertension and further cardiovascular complications.
- Reduced nitric oxide (NO) bioavailability plays an essential role in the pathophysiology of ED-associated hypertension.
- Endothelial cell dysfunction, a characteristic of essential hypertension, is caused by damage to these cells and the release of large amounts of superoxide anions.
- It is closely related to the development of vascular disease and has been found to promote hypertension and cardiovascular and cerebrovascular diseases.
- There is some evidence suggesting that the Mediterranean diet characterised by high consumption of vegetables, fish, olive oil and moderate wine consumption may have a positive effect on endothelial function.



RAAS

- The renin-angiotensin-aldosterone system (RAAS) is a critical regulator of blood volume, electrolyte balance, and systemic vascular resistance. While the baroreceptor reflex responds short term to decreased arterial pressure, the RAAS is responsible for acute and chronic alterations.
- The classical understanding of RAAS is that it comprises three significant compounds: renin, angiotensin II, and aldosterone.
- These three compounds elevate arterial pressure in response to decreased renal blood pressure, salt delivery to the distal convoluted tubule, and beta-agonism.
- RAAS is implicated in the pathogenesis of primary hypertension. This has been proven by using medications that block the RAAS at different steps.
- Overactivation of the RAAS is implicated in the development of secondary hypertension due to primary hyperaldosteronism.
- Angiotensin II is also implicated in many pathophysiological states and is known to induce oxidative stress, vascular smooth muscle contraction, endothelial dysfunction, fibrosis, and hypertrophic, anti-apoptotic, and pro-mitogenic effects. Angiotensin II has been implicated in the pathogenesis of hypertension, atherosclerotic disease, heart failure, and kidney disease through these effects.



RAAS and Flaxseed SDG lignans

- Renin–angiotensin–aldosterone system (RAAS) plays an important role in hypertension.
- Angiotensin-II stimulate the generation of superoxide anion radical (Griendling et al., 1994, Rajagopalan et al., 1996), which contribute to decreased nitric oxide (NO) bioavailability and impaired endothelium-dependent vasorelaxation (Gryglewski et al., 1986).
- Synthetic ACE inhibitors therapy is commonly used today to treat hypertension.
- Flax lignan concentrate reduced blood pressure by reduction of renal angiotensin-II level, inhibition of plasma endothelin-1 production, induction of the nitric oxide, nitric oxide synthase and in vivo antioxidant defence system.

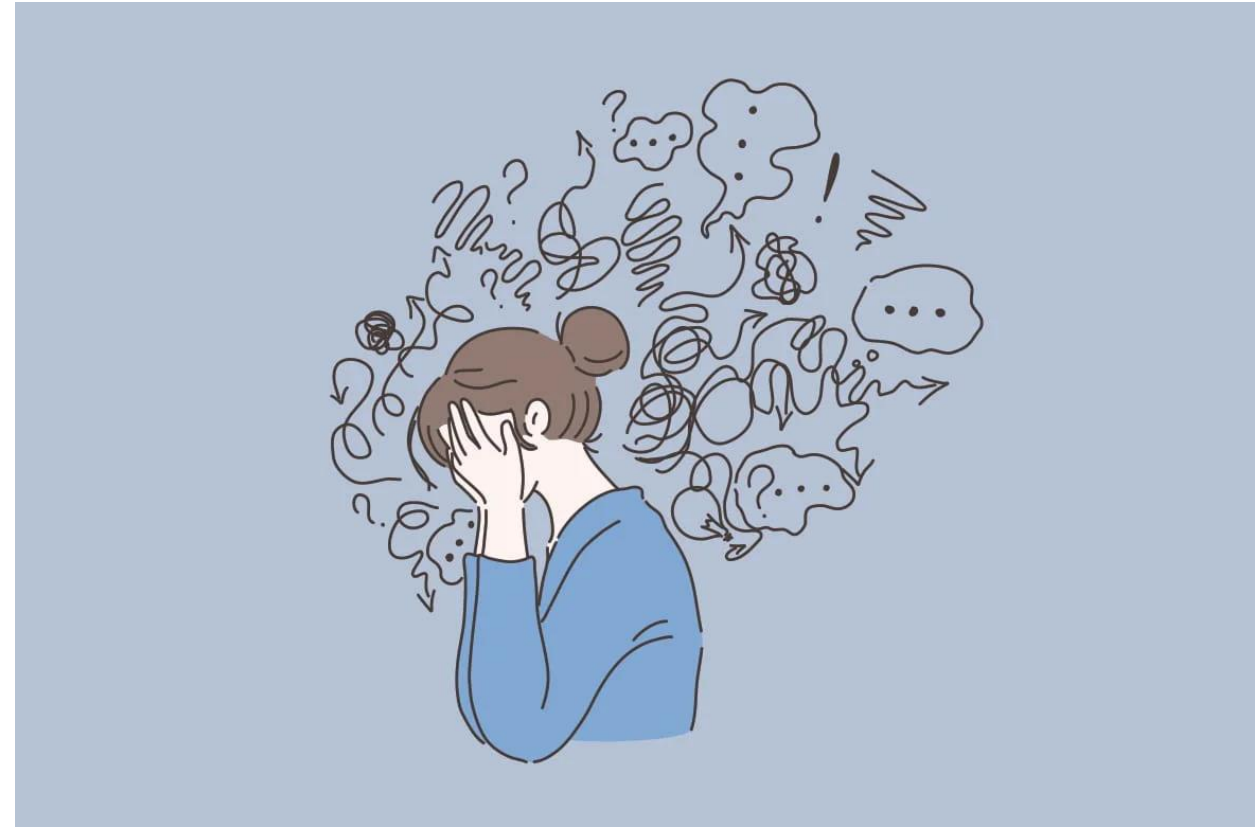


Flaxseed Lignans

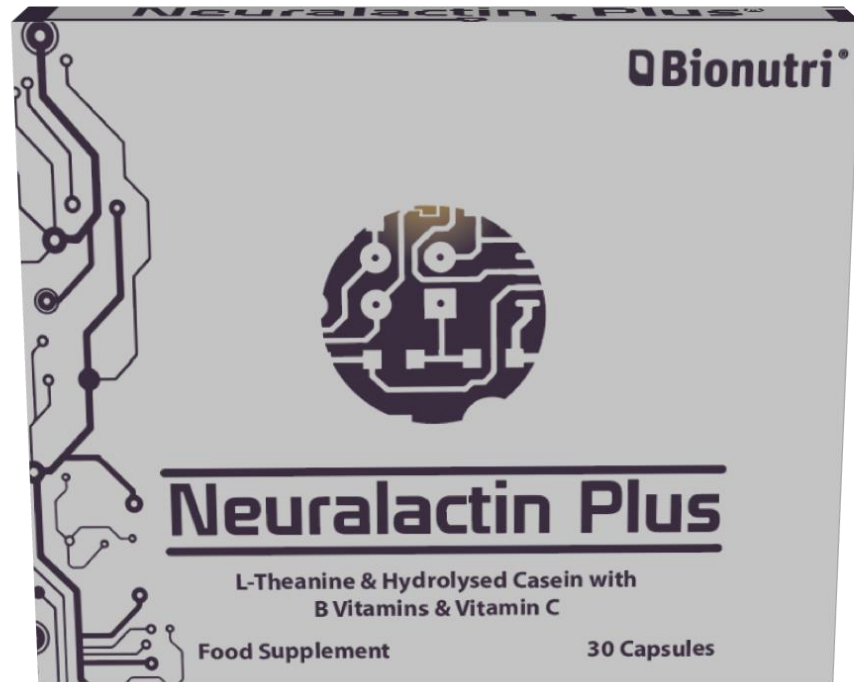


Stress

- Several studies have indicated a role for catecholamine (e.g., adrenaline and nor-adrenaline) over-activity as a causative factor in the generation of hypertension in combination with obesity.
- Reducing overall stress can directly impact hypertension.
- Yoga.
- Conscious breathing (lying down in hypertension in a relaxed state)
- Acupuncture
- Meditation
- Regular and heavy intake of any alcohol can increase blood pressure dramatically
- A relaxation therapy using inhalation of essential oils to prevent the progression of hypertension is recommended using lavender, ylang-ylang, marjoram, and neroli. Helps salivary cortisol levels and BP levels.



Stress support



Blood pressure-salt and fructose

- Oxidative stress due to increased generation of reactive oxygen species could result from enhanced expression of NADPH-oxidase and super oxide dismutase in response to high sodium levels.
- These states are magnified in metabolic syndrome and are linked with sodium retention and salt sensitivity.
- Further, elevated levels of inflammatory mediators may play an important role in the pathogenesis of hypertension in metabolic syndrome, in part, through the induction of renal and vascular inflammation and injury.
- Increased dietary fructose (and by inference sucrose) exerts two distinct effects on salt homeostasis: it enhances salt absorption in the small intestine and reduces salt excretion in the kidney.
- Long-term fructose consumption causes insulin resistance and increased circulating levels of insulin.
- Excessive fructose and salt intake can contribute to the development of multiple determinants of metabolic syndrome, including insulin resistance, low grade inflammation, renin angiotensin aldosterone system activation, elevated serum uric acid, and obesity. Coupled with the fructose-stimulated salt absorption in the small intestine and kidney tubules, these alterations will lead to a state of salt overload and eventual hypertension.



Bloated, thirsty, poor sleep

Blood pressure in the UK

- While high blood pressure becomes more common worldwide, some countries have seen a fall in the proportion of adults with high blood pressure in recent years. The UK now has some of the lowest rates, along with Canada, Australia and parts of Europe.
- This is likely to be due to the salt reduction work that has been ongoing in the UK since the early 2000s, alongside better diets which include more fruit and vegetables, as well as better healthcare, whereby raised blood pressure can be detected early and treated with blood pressure-lowering drugs.



Common blood pressure medicines

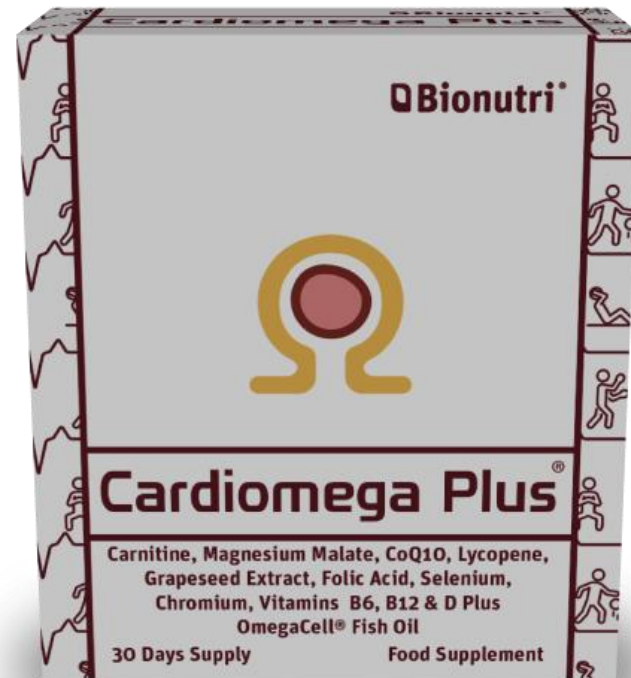
- ACE inhibitors – such as enalapril, lisinopril, perindopril and ramipril
- Angiotensin-2 receptor blockers (ARBs) – such as candesartan, irbesartan, losartan, valsartan and olmesartan
- Calcium channel blockers – such as amlodipine, felodipine and nifedipine or diltiazem and verapamil
- Diuretics – such as indapamide and bendroflumethiazide
- Beta blockers – such as atenolol and bisoprolol
- Alpha blockers – such as doxazosin
- Other diuretics – such as amiloride and spironolactone
- The medicine recommended for will depend on things like how high blood pressure is, age and ethnicity.

Medicines that can increase blood pressure

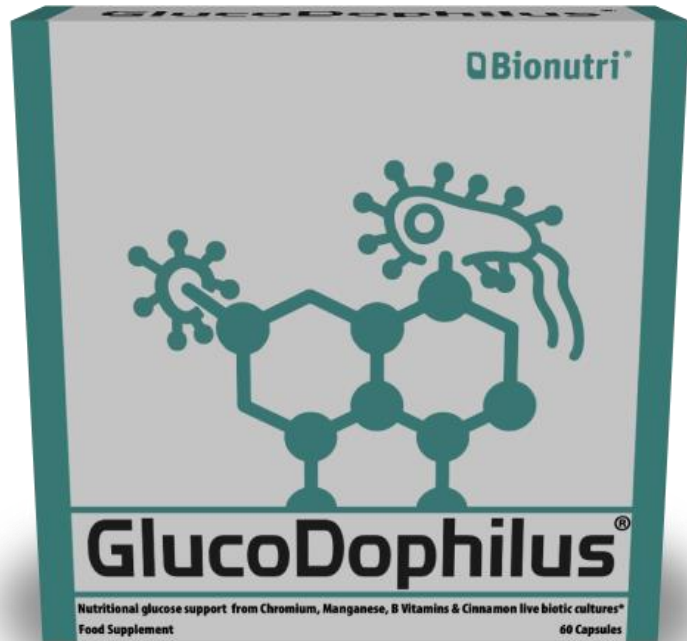
Medicines that can increase blood pressure include:

- The contraceptive pill
- Steroids
- Non-steroidal anti-inflammatory drugs (NSAIDs) – such as ibuprofen, aspirin and naproxen
- Some pharmacy cough and cold remedies
- Some herbal remedies – particularly those containing licorice
- Some recreational drugs – such as cocaine and amphetamines
- Some selective serotonin-noradrenaline reuptake inhibitor (SSNRI) antidepressants – such as venlafaxine

Cardiovascular and mitochondrial health



Blood glucose and liver support



Kidney health



Alpha Lipoic Acid

- Alpha-lipoic acid (ALA), which is synthesised by the liver and present in both animal and vegetable sources, is a potent mitochondrial antioxidant, functions through multiple pathways to support anti-inflammatory and antithrombotic processes, while also increasing vasodilation through nitric oxide mediation, leading to an improvement in endothelial function and a subsequent decrease in BP.
- Caution in people with low blood sugar

Best food sources of ALPHA LIPOIC ACID



Tomatoes



Spinach



Potatoes



Organ Meat



Broccoli



Beets

THIOL

Foods with high concentrations of thiol can also be incorporated into diet to promote the body's natural ability to produce ALA. Examples of foods high in thiols are:



Vitamin C

- Markers of inflammation and endothelial activation are significantly associated with blood pressure variability, although strong evidence has been found that anti-inflammatory and antioxidant therapies protect target organs from the effect of blood pressure variability.
- These findings corroborate the results of a study in that antioxidant adjuvant therapy with Vit C can reduce blood pressure variability in patients with essential hypertension, thereby protecting the target organs.



Vitamin C

- Vitamin C is an essential vitamin involved in human metabolism, it possesses the ability to remove superoxide anions and prevent the formation of peroxynitrite as well as improve vascular endothelial function.
- According to a review by Taddei et al in 1998, Vit C might improve endothelial-dependent vasodilation in patients with essential hypertension and reverse the nitric oxide synthase inhibitor NG-monomethyl-L-arginine.
- Vitamin C may act as a diuretic, removing excess fluid from the body. This may help lower the pressure within blood vessels.
- A meta-analysis found that Vit C supplementation may play an important role in reducing blood pressure in patients with essential hypertension.
- Vit C supplementation can significantly reduce SBP and DBP in patients with essential hypertension.



Vitamin C

- As smokers have higher metabolic losses and lower plasma levels of vitamin C than non-smokers (turnover is 40% higher), the reference value for vitamin C intake is set to 135 mg/day for female smokers and 155 mg/day for male smokers.
- Dihydropyridine calcium channel blockers (e.g., nifedipine, nifedipine) may inhibit vitamin C uptake by intestinal cells
- Aspirin can impair vitamin C status if taken frequently
- There is some evidence that vitamin C interacts with anticoagulant medications like warfarin (Coumadin). Large doses of vitamin C may block the action of warfarin and thus lower its effectiveness. Individuals on anticoagulants should limit their vitamin C intake to <math><1\text{ g/day}</math> and have their prothrombin time monitored following anticoagulant therapy.



Vitamin C

- Ascorbate is a major metabolite in plants. Bionutri uses ascorbate form (non-acidic), ease in stomach
- Eighty to ninety-five per cent of the vitamin C found in foods is absorbed.
- Absorption of vitamin C is greater when several individual doses of vitamin C, in quantities less than one gram, are taken throughout the day rather than one megadose.
- Food constituents work synergistically with nutrients in the presence of several enzymes, co-enzymes, co-factors and trace minerals. Multiple biochemical interactions take place, and the nutritional and biochemical role of vitamin C is enhanced by the associated activity of associated food factors.
- These include polyphenols, antioxidants, flavanols and tannins contained in fruits such as Pomegranate, Plum and Blueberry



Magnesium

The combination of increased intake of magnesium and potassium coupled with reduced sodium intake is more effective in reducing BP than single mineral intake and is often as effective as one antihypertensive drug in treating hypertension.

Reducing intracellular sodium and calcium while increasing intracellular magnesium and potassium improves BP response.

Magnesium also increases the effectiveness of all antihypertensive drug classes.

Various genetic defects in magnesium transport are associated with hypertension and possibly with cardiovascular disease.

Oral magnesium acts as a natural calcium channel blocker, increases nitric oxide, improves endothelial dysfunction, and induces direct and indirect vasodilation.



Potassium

- Foods that are rich in potassium are important in managing high blood pressure, because potassium lessens the effects of sodium. The more potassium eaten; the more sodium lost through urine.
- Potassium also helps to ease tension in blood vessel walls, which helps further lower blood pressure. Excess fluid puts extra pressure against blood vessels walls, raising blood pressure.
- Increasing potassium through diet is recommended in adults with blood pressure above 120/80 mm Hg who are otherwise healthy.
- Potassium can be harmful in kidney disease, any condition that affects how the body handles potassium or those who take certain medications. The decision of whether to take excess potassium should be discussed with the doctor.



Potassium-rich foods

Chicken (average roasted meat, 174g)
574mg

Banana (one) 330mg

Avocado (half) 360mg

Broccoli (raw, 80g) 317mg

Spinach (80g) 545mg

Cooked salmon (154g piece) 634mg

Potato (one medium portion, boiled, 175g)
639mg

Skimmed milk (1/3pint/195g) 316mg

BHF



Potassium in leafy greens

Leafy greens, which are high in potassium, include:

Romaine lettuce

Kale

Turnip greens

Collard greens

Spinach

Beet greens

Swiss chard



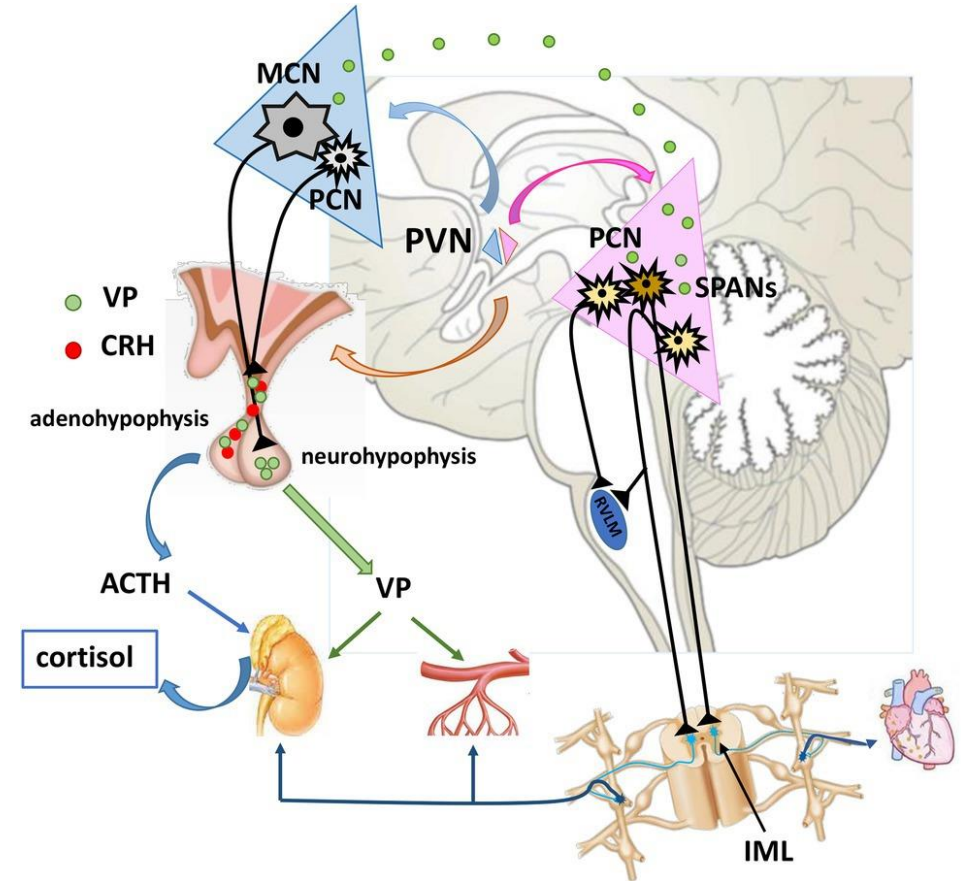
Luteolin

- Luteolin, is a citrus flavonoid found in many plants including chamomile, dandelion and milk thistle and has multiple biological effects in maintaining normal cell health. Vegetables and fruits such as celery, parsley, broccoli, onion leaves, carrots, peppers, cabbages, apple skins are luteolin rich.
- Luteolin is blood-brain barrier permeable for central nervous system diseases and is neuroprotective.
- Protects or enhances endogenous antioxidants such as glutathione-S-transferase (GST), glutathione reductase (GR), superoxide dismutase (SOD) and catalase (CAT)
- Luteolin suppresses LPS or bacteria-induced inflammation
- Suppresses cytokines and their signal transduction pathways (TNF- α , IL-6, IL-1 β , and IL-17)



Luteolin

- Luteolin is a small molecule that is soluble in fats (lipophilic), it can cross the blood brain barrier.
- The PVN (The Paraventricular Nucleus of the Hypothalamus in Control of Blood Pressure and Blood Pressure Variability) has been shown to modulate blood pressure, and there is evidence that by reducing inflammation in the PVN, luteolin enhances this brain structure's ability to regulate blood pressure. In this way, luteolin can alleviate hypertension, along with its underlying contributors like high adrenal hormone levels.
- In the PVN, luteolin attenuated sympathoexcitation and lowered hypertension by dampening oxidative stress and inflammatory components and restoring neurotransmitter balance. This seems possible via the amelioration of the PI3K/AKT signaling pathway and that of NF- κ B.



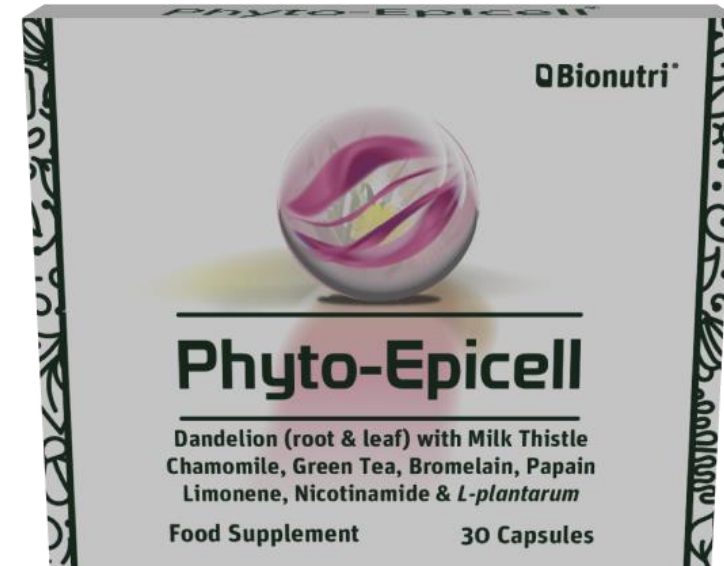
Apigenin

- Apigenin is a flavonoid with antioxidant, anti-inflammatory, and anti-apoptotic activity. The potential effects of apigenin on cardiometabolic diseases were investigated in vivo and in vitro. It is widely distributed in vegetables and fruits, such as celery, parsley, oranges and garlic, and is also found in herbs such as chamomile.
- Hypertension plays a central role in cardiometabolic diseases, which is prevalent in almost 80% of people with metabolic syndrome. Recent studies reported that apigenin improves hypertension via attenuation of oxidative stress and recovery of mitochondrial dysfunction.
- Apigenin has also been reported to diminish the complications induced by hypertension, such as renal damage and fibrosis due to abnormal collagen accumulation in kidneys.
- Current evidence suggests that apigenin decreases blood pressure mainly via improved NO bioactivity and oxidative stress, regulation of apoptosis-related mitochondrial genes and promotion of vasodilation in vascular endothelium.



Luteolin and Apigenin

- Nutritional compounds found in Dandelion Leaf and Dandelion Root, Milk Thistle and Chamomile are natural dietary sources of Luteolin and Apigenin.



Dandelion leaves and root

- Aremu et al. (2019) noted increased antioxidant activity and reduced lipid peroxidation in the heart, liver, kidney, and brain of tested rats.
- The authors suggest that the phenolic compounds present in the extracts may also regulate nitric oxide synthase (NOS) levels and activity by affecting kinase signalling pathways and intracellular Ca^{2+} associated with NOS phosphorylation and NO production.
- In addition, phenolic compounds can also affect the inhibition of endothelin-1 (vasoconstrictor) and endothelial NADPH oxidase.
- Based on the findings in this study, TOL possessed better in vitro antioxidant properties than TOR owing to its higher phenolic and flavonoid content; better radical scavenging activity and antioxidant capacity; and that the observed antioxidant property translated into the tissue antioxidant status.



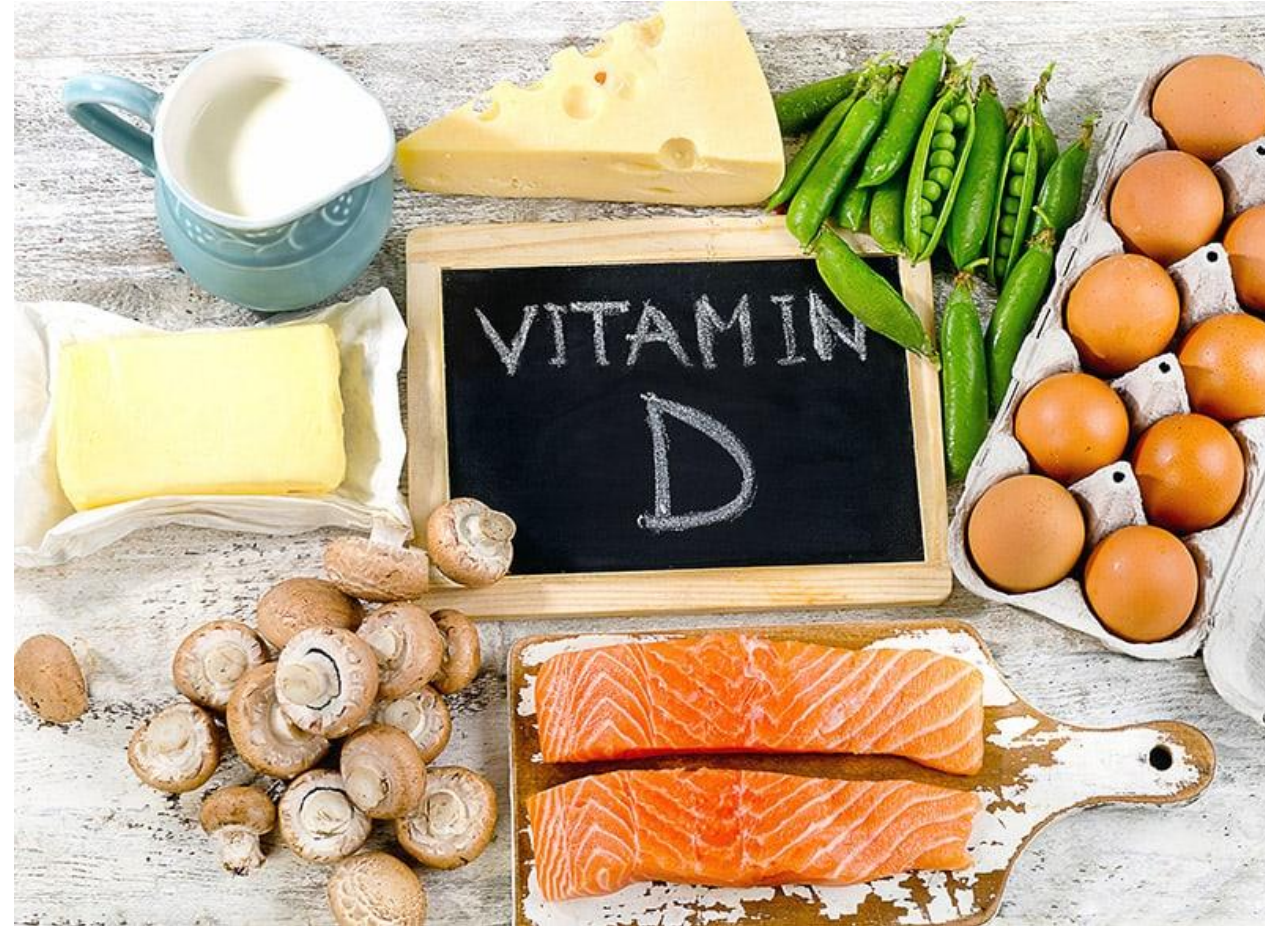
Sodium rich foods

- Frozen meals
- Pickles
- Salty snacks
- White bread
- Tomato juice and sauces
- Processed meat
- Pizza
- Processed and hard cheeses
- Soy sauce
- Salad dressings



Vitamin D

- According to a review article from 2013, vitamin D deficiency may raise the risk of hypertension.
- It's possible that taking vitamin D supplements might help lower blood pressure by interacting with a variety of systems in the body.



Garlic

- A review of 12 studies in over 550 people with high blood pressure found that taking garlic reduced systolic and diastolic blood pressure by an average of 8.3 mm Hg and 5.5 mm Hg, respectively. This reduction was similar to the effects of blood pressure medications.
- Allicin is the main active compound in garlic, considered the contributing factor in garlic's ability to lower blood pressure. Allicin can prevent angiotensin production, a hormone responsible for raising blood pressure by contracting the blood vessels.
- Some B vitamins are important co-factors in the mechanisms of action through which sulphur components in garlic are transformed into H₂S, serving as signalling molecules for smooth muscle cell relaxation and vasodilation, leading to a reduction in blood pressure.
- Aged garlic was found to improve arterial stiffness.



Thyme

- In the journal of Oxidative Medicine and Cellular Longevity, researchers explained that polyphenol-rich foods had an inverse effect on conditions like hypertension.
- This informed their decision to investigate the anti-hypertensive effects of thyme.
- Reactive oxygen species play an important role in the development of hypertension.
- Thyme is rich in polyphenolic compounds.
- Thyme also contains high concentrations of vitamins A, C, E and K, as well as minerals such as calcium, potassium, iron and phosphorus.



Thyme

- Rosmarinic acid - one of the key compounds in thyme - may help reduce systolic blood pressure by inhibiting enzymes.
- Rosmarinic acid has been shown to improve blood vessel (endothelial) and blood cell health via its antioxidant and anti-inflammatory properties.
- A study showed that Rosmarinic acid can improve blood cell health by reducing the rupture of red blood cells (known as haemolysis) via inhibition of C3-Convertase.



Garlic with Thyme and Rosemary



Cinnamon

- A review of 9 studies including 641 participants showed that taking cinnamon reduced systolic and diastolic blood pressure by an average of 6.2 mm Hg and 3.9 mm Hg, respectively. This effect was stronger when people took cinnamon consistently over 12 weeks.



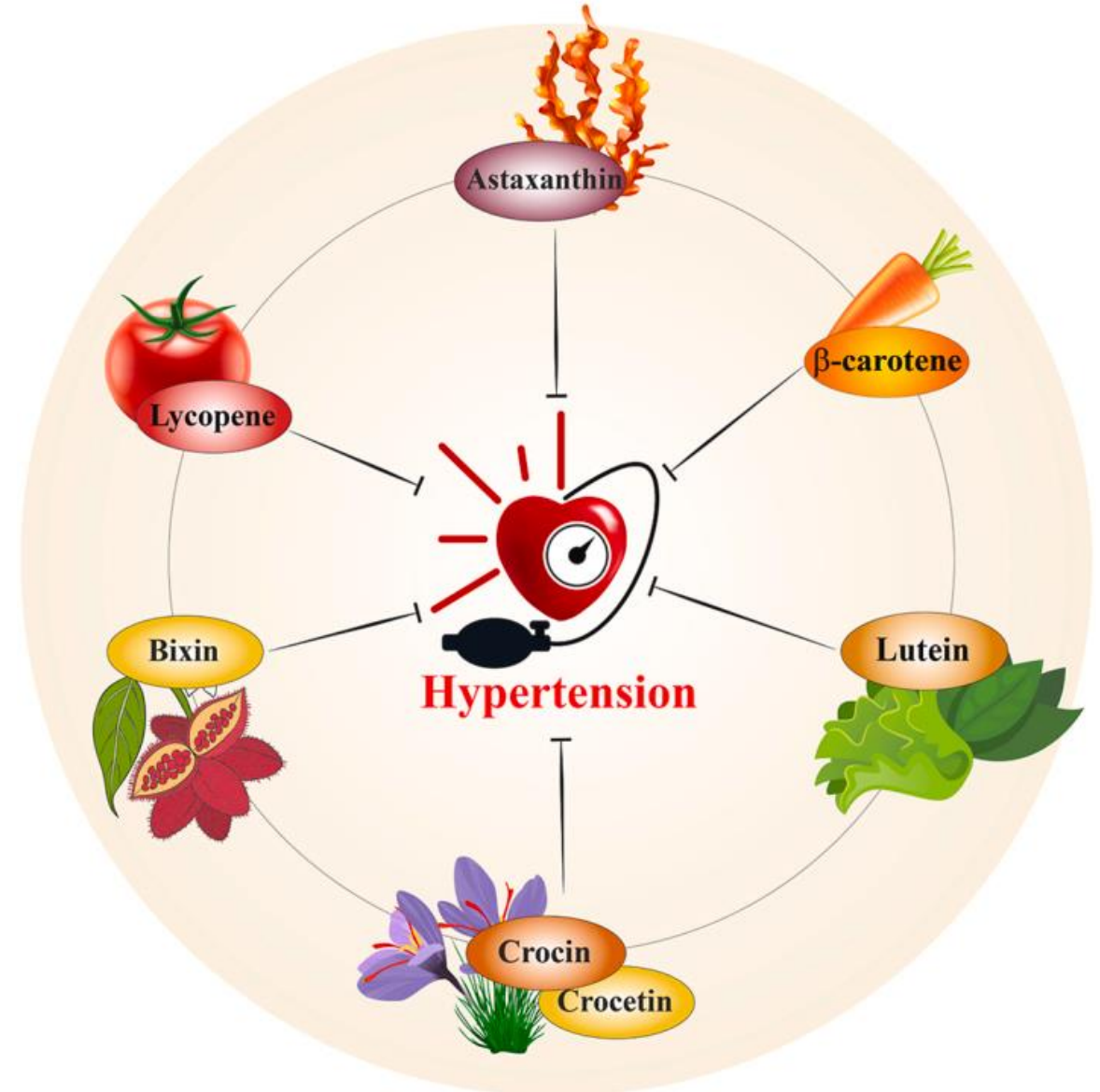
Beetroot juice/other drinks

- Beetroot juice (BRJ) is rich in nitrate (NO_3) and has the potential to reduce blood pressure (BP).
- NO_3 is a precursor to produce nitric oxide (NO) and increases its concentrations in the bloodstream, optimising endothelial function (e.g., vasodilation)
- Carrot, pomegranate and celery juice
- Green tea rich in polyphenols

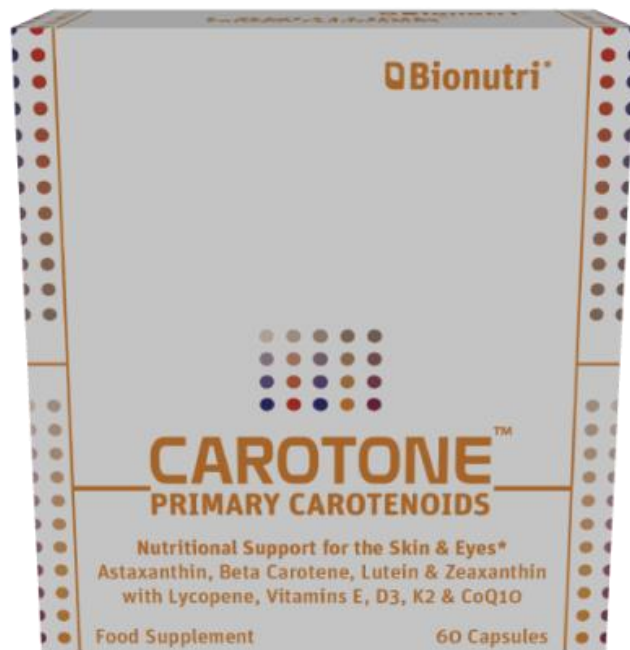


Carotenoids

- Suppressing reactive oxygen species (ROS) production, inhibiting angiotensin-II, endothelin-1, and oxidised low-density lipoprotein; and nitric oxide enhancement are some of the mechanisms by which they lower blood pressure.
- They also have several additional benefits for the cardiovascular system, including antioxidative, anti-inflammatory, anti-atherogenic, and antiplatelet effects. They improve endothelial function and metabolic profile.



Carotenoids



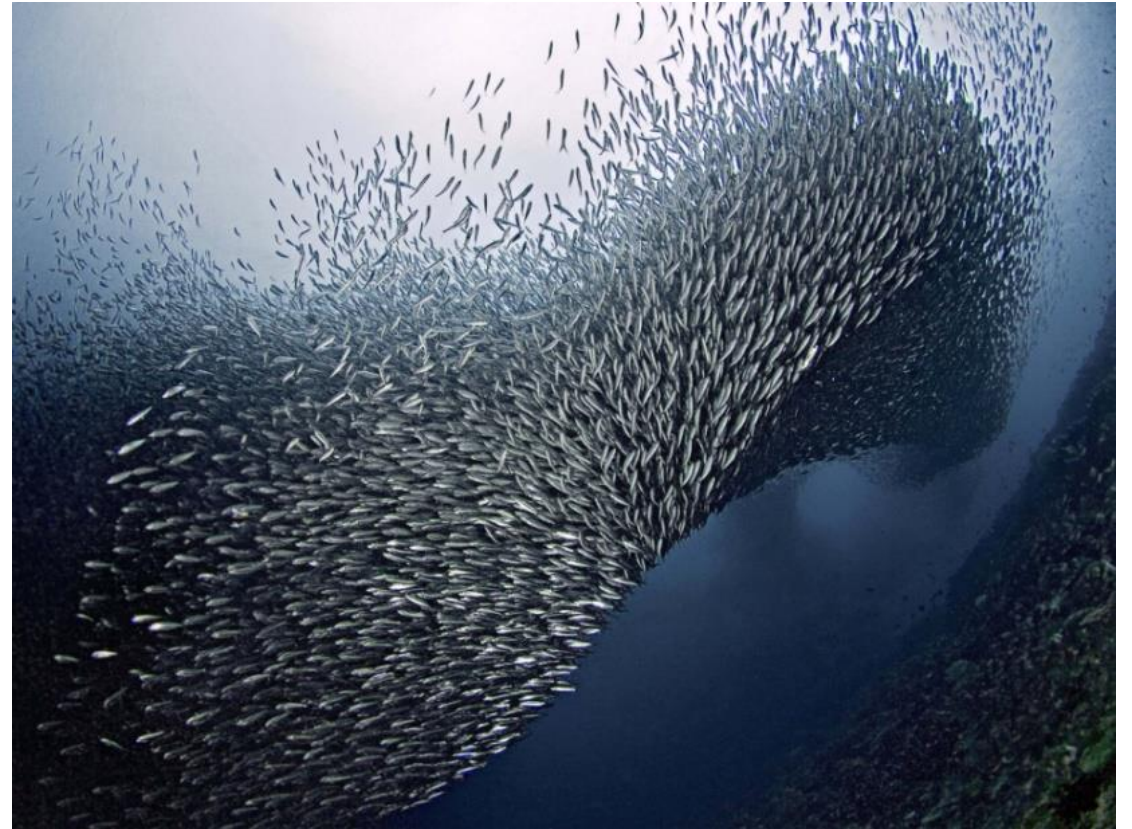
Sweet Basil

- Sweet basil is high in eugenol. Research has linked this plant-based antioxidant to many health benefits, including lowered blood pressure.
- Studies suggest that eugenol may help reduce blood pressure by acting as a natural calcium channel blocker which prevents the movement of calcium into the heart and arterial cells, allowing the blood vessels to relax.
- Animal studies have shown that sweet basil extracts helped relax blood vessels and thin the blood, which in turn helped reduce blood pressure.



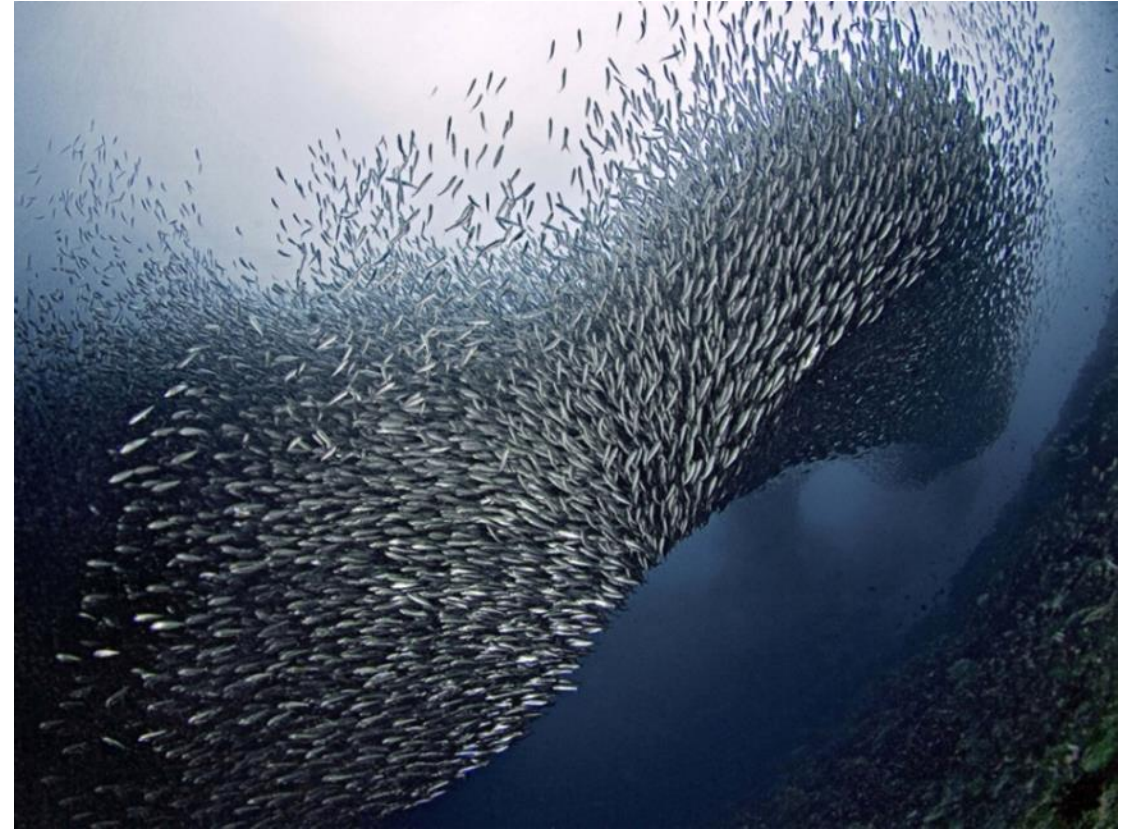
DHA and blood pressure

- DHA influences the beta-adrenergic system to a greater extent than EPA an important mechanism involved in the hypotensive and antiarrhythmic action of DHA
- Additionally, DHA stimulates release of ATP increasing vasodilation by stimulating nitric oxide (NO)
- A combination of this and the decrease in noradrenaline levels has a blood pressure lowering effect



DHA-HR and BP

- A meta-analysis including thirty randomized controlled trials showed that prolonged fish oil intake may reduce heart rate, especially in populations with a high baseline heart rate.
- In dyslipidaemic males and postmenopausal women, this decrease appears to be mediated by DHA rather than EPA.
- Research has demonstrated that intakes of DHA/EPA as low as 700 mgs daily are capable of showing clinically meaningful blood pressure reductions.



DHA and blood viscosity/pressure

Evidence indicates that DHA increases red blood cell membrane fluidity, thereby increasing the deformability of the blood cells so that they can move through capillaries more easily and thereby lower blood viscosity and blood pressure. DHA may also reduce blood pressure by lowering cortisol

Docosahexaenoic Acid Inhibits Bloods Viscosity in Stroke- Prone Spontaneously Hypertensive Rats Shinichi Kimura, et.al.

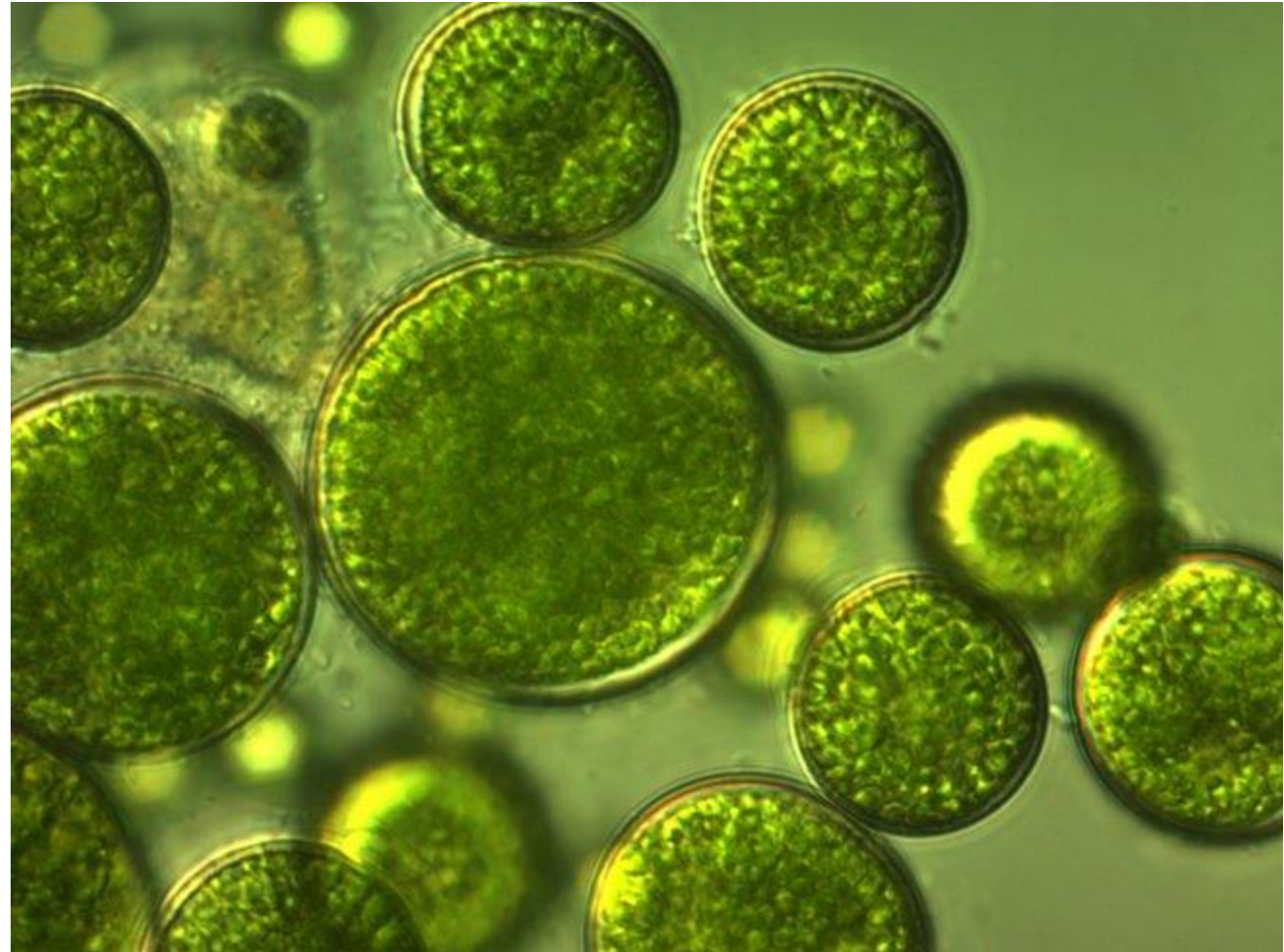
RESEARCH COMMUNICATIONS IN MOLECULAR PATHOLOGY AND PHARMACOLOGY 100(3):351-361 (1998)

Docosahexaenoic acid is an antihypertensive nutrient that lipid metabolism, eicosanoid production, platelet aggregation and affects aldosterone production in SHR Marguerite M. Engler, et.al.

PROCEEDING OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE 201:32-38 (1999)



Vegan DHA



Rosehip

- High in vitamin C, carotenoids, EFA's and tretinoin
- Helps the passage of fluids between cells through osmosis
- Antioxidant
- Helps in tissue injury
- Glycosides regulate inflammatory effects and antinociceptive activities including actions on arachidonic acid metabolism and inhibition of cyclooxygenases. Attenuates inflammatory responses in different cellular systems and reduces catabolic processes.
- Nourishes the skin (collagen and elastin)



CoQ10

- CoQ10 is an antioxidant
- It has been found to slightly improve hypertension but mainly reduces systolic not diastolic readings.
- This over a period of time



Polyphenol bio transformation

- Polyphenols, which usually remain inactive in diet are bio transformed to active compounds after removal of the sugar moiety by the gut microbiota, among other factors.
- Structural specificity of polyphenol and individual richness of microbiota determines the level of biotransformation that occur in the intestine.
- The final active products are absorbed by the portal vein and travel to other tissues and organs, providing antimicrobial and other metabolic action.

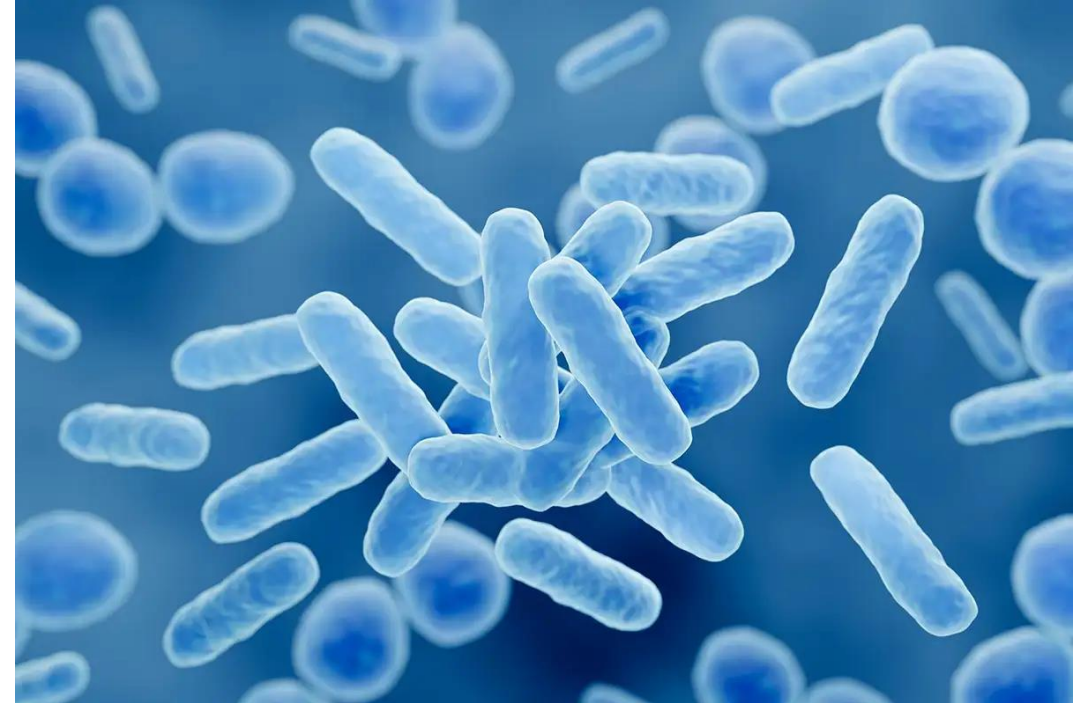


Polyphenolic compounds	Classes involved	Foods containing polyphenols	Gut bacteria
Flavanols	Kaempferol[51], Quercetin[53], Myricetin[52]	Onions, capers, apples, broccoli, grapes and plums	Bacteroides distasonis, Bacteroides uniformis, Enterococcus casseliflavus and Eubacterium ramulus
Flavanones	Hesperetin, Naringenin[54]	Citrus fruits and tomatoes	Clostridium sps, E. ramulus
Flavan-3-ols	Catechin[55], Epicatechin[56], Gallocatechin[57,58]	Green tea, cocoa, kola, banana, pomegranate	Bifidobacterium infantis and Clostridium coccides
Anthocyanidins	Cyanidin[59], Pelagonidin, Malvidin[60]	Bilberries and all red, blue and purple fruits (especially berries)	Lactobacillus plantarum, L. casei, L.acidophilus and Bifidobacterium longum
Isoflavones	Daidzein[61,62], Genistein[63], Formononetin[64]	Soy, beans, lentils, chickpea (Fabaceae family)	Lactobacillus and Bifidobacterium
Flavones	Luteolin[65], Apigenin[66]	Cereals, parsley, thyme, celery and citrus fruits	C.orbiscinden, Enterococcus avium
Tannins	Gallo tannins, Ellagitannins[67]	Raspberries, cranberries, strawberries, walnuts, grapes and pomegranate	Butyrivibrio sps
Lignans	Secoisolariciresinol, metaresinol, pinoresinol, larciresinol, isolarciresinol, syringiresinol[68]	Flax seeds, cereals, strawberries, and apricots	Species of Bacteroides, Clostridium, Peptostreptococcus and Eubacterium
Chlorogenic acids	Caffeic acid, ferulic acid[69]	Peach, plums and coffee	E.coli, Bifidobacterium sps and L.gasseri

Types of dietary polyphenols present in various foods and the types of microorganisms responsible for the degradation (World J Gastroenterol. 2015 Aug 7; 21(29): 8787–8803. Role of the normal gut microbiota Sai Manasa Jandhyala et al.)

Probiotics

- Experimental and clinical reports have demonstrated that improvement of the gut microbiota through probiotic supplementation might positively help in reducing BP in the hypertensive conditions (Ettinger et al., 2014; Jose and Raj, 2015; Mell et al., 2015).
- Supplementation of the diet with *L. plantarum* for 6 weeks in a population of smokers of both genders resulted in reduced systolic BP, improvement of metabolic alterations and attenuated generation of reactive oxygen species (Naruszewicz et al., 2002).



Polyphenols

- The beneficial effects of polyphenol supplementation have been demonstrated in the large PREDIMED (Prevention with Mediterranean Diet) cohort.
- In this study, the consumption of a Mediterranean diet—supplemented with extra-virgin olive oil or nuts—resulted in reduced incidence of cardiovascular events (myocardial infarction, stroke, or death from cardiovascular causes) (Estruch et al., 2013).
- Within the PREDIMED cohort, a sub-study on 1139 high-risk participants was performed in which two different polyphenol-rich diets (based on supplementation with extra-virgin olive oil or nuts) were randomly assigned.
- The increase in polyphenol intake—which was unequivocally identified as increased total urinary polyphenol excretion—was associated with decreased inflammatory biomarkers and a decrease of systolic and diastolic BP (Medina-Remón et al., 2016).



Polyphenols

- In the Polish population of the non-interventional HAPIEE cohort (Health, Alcohol and Psychosocial factors In Eastern Europe), elevated dietary intake of polyphenols was associated with lower body mass index (BMI), waist circumference (WC), BP and triglycerides, further suggesting that high polyphenols intake is inversely associated to metabolic syndrome and its clinical manifestations (Grosso et al., 2016).
- To ascertain whether olive oil polyphenols alleviate arterial hypertension (AH) independently from the lipid component of olive oil, which is rich in monounsaturated fatty acids (MUFA), a double-blind, crossover dietary-intervention study was performed in which mildly hypertensive women received polyphenol-rich olive oil (approximately 30 mg/day) in a first dietary period, and polyphenol-free olive oil in a second dietary period.
- Interestingly, only polyphenol-rich olive oil decreased BP and improved endothelial function, underscoring the specific role of polyphenols within the olive oil (Moreno-Luna et al., 2012).
- In addition, in a randomized, double blind, controlled, crossover trial, the hypotensive and lipid-lowering capacity have also been demonstrated for olive leaf extract (Lockyer et al., 2015, 2016).



DASH(Dietary Approaches to Stop Hypertension) Diet

Fruits

Vegetables

Whole grains

Low-fat dairy products

Skinless poultry and fish

Nuts and legumes

Non-tropical vegetable oils

Water

Limit:

Saturated and trans fats (red meats)

Alcoholic beverages

Sodium

Fatty meats

Items with added sugar such as sugar-sweetened beverages

Follow the DASH diet to potentially lower your blood pressure



Licorice-Glycyrrhizinic Acid

- Bionutri Mastic Gum Plus contains Licorice Root powdered extract (*Glycyrrhiza glabra* roots). This is not deglycyrrhizinated and therefore does contain Glycyrrhizinic Acid.
- Each capsule contains approximately 8mg of Glycyrrhizinic Acid, so if you were to take Mastic Gum Plus at our Recommended Daily Intake of 3 capsules per day you would be consuming around 24mg Glycyrrhizinic Acid daily. You should not exceed the Recommended Daily Intake.
- 24mg Glycyrrhizinic Acid daily is well below the level of precaution in respect of an adverse effect for people with high blood pressure, which the World Health Organisation recommends to be 100mg daily for the general population.
- If you are taking medication for blood pressure, you should check with either your doctor or your dispensing pharmacist before taking any Food Supplement.



Low blood pressure-causes

- Pregnancy.
- Heart and heart valve conditions.
- Hormone-related diseases (endocrine disorders).
- Dehydration.
- Blood loss.
- Severe infection (septicaemia).
- Severe allergic reaction (anaphylaxis).
- Shock/trauma
- Anaemia (lack of B12 and folate)
- Lack of nutrients in the diet. (sodium)
- Diabetes
- Heart problems such as arrhythmias (irregular heartbeat)
- Medicines to treat high blood pressure, depression, or Parkinson's



Low blood pressure

- Low blood pressure is blood pressure that is lower than 90/60 mm Hg. Some people have low blood pressure all the time, and it is normal for them.



Lifestyle for low blood pressure

- Eat Small Meals more frequently to keep blood pressure regulated.
- Avoid overconsumption of caffeine, artificial sugar and sweeteners.
- Consume food that naturally contains salt such as carrots, spinach, celery, beets, and artichokes.
- Avoid vigorous exercise. The best type of exercise is yoga, stretching, tai chi, all of which stimulate blood pressure. Resistance training can also be very beneficial since it improves circulation.
- Good hydration helps keep blood volume high which further keeps blood pressure up.
- Try taking warm (not hot) or preferably cold showers for mild cases of low blood pressure. Consider switching between cold and hot water during a shower.



Lifestyle for low blood pressure

- Make sure to stand up slowly from lying positions. If you stand up too rapidly, it causes the feeling of dizziness or even faint. This happens because the heart fails to pump enough blood due to the quick change of position. If you are lying down, first sit up for some seconds and then gradually stand up.
- Some drugs that people take for anxiety and depression and some painkillers can cause hypotension.
- Try wearing compression stockings because they can prevent pooling blood in the legs. Wearing them while sitting or standing can ensure faster circulation of blood back to the heart and lungs.
- Try not to lift heavy objects
- Don't stand in one place for a long time
- Avoid long exposure to hot water



Ginseng

- The basis of ginseng's prowess is its' many active constituent ginsenosides.
- Ginseng has extensive pharmacological activities and specific mechanisms of action.
- Ginsenosides can inhibit ROS production, stimulate NO production, increase blood circulation, ameliorate vasomotor tone, and adjust lipid profile.
- Additionally, many studies indicate that ginsenosides have a multitude of activities in both physiological and/or pathologic conditions concerning with CVD.

J Ginseng Res. 2012 Jan; 36(1): 16–26.

Cardiovascular Diseases and Panax ginseng: A Review on Molecular Mechanisms and Medical Applications

Jong-Hoon Kim*



Ginseng

- The vasomotor center (VMC) is a portion of the medulla oblongata. Together with the cardiovascular centre and respiratory centre, it regulates blood pressure.
- The endothelium contributes to the control of vascular smooth muscle tone by production and release of NO, which accounts for the biological activity of the endothelium derived relaxing factor.
- Ginseng and ginsenosides ameliorate vasomotor function.
- The blood pressure lowering activity of P. ginseng is due to promotion of vascular endothelial cell-derived nitric oxide (NO) secretion.



Ginseng

- While ginseng can elevate blood pressure, this generally occurs with low blood pressure, which helps restore blood pressure to normal; ginseng also lowers high blood pressure.
- The vasodilation action of P. ginseng improves blood circulation.
- Korean red ginseng has an antihypertensive effect, which appears to be related to lower rather than higher doses of ginsenosides.
- Collective observations indicate that ginseng normalises blood pressure and improves blood circulation.



Rosemary Oil-inhalation

- The increase achieved in blood pressure values after inhalation of Rosemary essential oil is clinically significant. The results obtained from this prospective clinical trial prove the effectiveness of statistical methodology as a new approach to explain the antihypotensive effect of rosemary essential oil and its relationship with the improvement in patients' quality of life.

(Camphor stimulates the respiratory system and promotes blood circulation)



Aquasol-unique instant pure herb teas

- We source the best quality organic herbs around the world, fair trading with skilled farmers who maintain the complexity and full integrity of the herb.
- Superfine grade, smaller granules
- Whole herb is consumed-zero waste
- Liquids, hot and cold, food or yogurts

aquasol



Aquasol-unique instant pure herb teas

- More bioactive and bioavailable after testing-higher than normal herbal powder
- Better than standardised herbs which may concentrate part of the herb making it more potent and not all of it so not concentrated materials without the wider part
- Aquasol overcomes this by through grinding has a much greater surface area, normally herbs may be 11-25 microns when ours are many times greater-250 microns

aquasol



About Bionutri

- Nutrients constitute much of the vital energy in the foods we eat and equally, the more diverse and dynamic our diet the greater our potential for health. So, the capacity for Nutrition Practice to exert health benefits is indeed profound.
- However, the modern Practitioner is routinely confronted by clients in an inflammatory, congested state with a lifestyle that does not sufficiently nourish them. To overcome these barriers the Practitioner can intervene with individual or combination supplements.
- That being said, bioavailability and biological activity of nutrient combinations is dependent upon a number of factors; simply bombarding a stressed or weakened system can be either over-stimulating or just ineffective.
- Biosynthesis is the process through which basic nutrients and substrates are enzymatically activated into becoming much more than simply the sum of their parts. It is this process that forms Bionutri's core focus.



About Bionutri

- A name synonymous with nourishment, not overstimulation.
- Born out of a vision to simplify the work of nutritional and naturopathic practitioners.
- Specific and straightforward innovative solutions for daily supplementation geared to support the fundamental metabolic systems of the human body.
- Unique combinations of plants and nutrients with probiotics to enhance their biological activity and bioavailability nourishing the specific systems of the body with well constituted nutrition and phyto-nutrition, whilst supporting gut health for optimal activity and bioavailability.
- We do not look to by-pass nutritional pathways or megadose with single nutrients or enzymes.
- Cutting edge manufacturing processes allow us to activate and stabilise vital nutrition within their most complex groupings.



About Bionutri

Dosing

- Dosing is an important factor when either formulating or considering taking a supplement, Bionutri maintains a nutritional mandate:
- Our products are food supplements not functional medicines.
- We believe our role is to provide the best nutrition at a level that remains nutritional.
- We do not look to by-pass nutritional pathways or megadose with single nutrients or enzymes
- A new Bionutri product can be years in the making. From a draft formulation to a finished product is a meticulous process, involving multiple stages of research and development, analysis and testing.



About Bionutri

- Products designed for specific straightforward solutions for daily supplementation
- Range is compact and comprehensive
- We draw on 25 years of experience in food supplement manufacture to create a system approach that simplifies your prescribing task
- Eases client management
- Improves compliance
- Cost effective



About Bionutri

- Bionutri endorses a good manufacturing ethos.
- We maintain a conscientious but wholly pragmatic approach to our work.
- Above all, Bionutri is led by a scientific approach not an idealistic one.
- We formulate and manufacture our products to provide biological advantage, not adhering to fads that come and go within the health food industry.
- We have access to some of the most advanced biotechnology in a GMP registered probiotic manufacturing facility.



About Bionutri



Blister packing--our triplex foil sachets ensure the integrity of our products from the first to the last.

We have a specific policy in place to blister pack products containing volatile oils, probiotics, lipid nutrients or aromatic herbs

Practitioner Support

- Website for your clients to browse www.bionutri.co.uk and a password protected practitioner page where you have access to catalogue pages and webinar listings for online registration (for webinars contact adel@bionutri.co.uk).
- CPD opportunities to join the hundreds of healthcare professionals that visit our free weekly 11-12 Wednesday webinar. A wide range of topics covered plus interactive Q and A. Extensive back catalogue of recorded CPD webinars available. Sign up at www.bionutri.co.uk/practitioner-signup-form
- We are also on Facebook/Bionutri for practitioners/Instagram and LinkedIn (Bionutri)
- Professional Product catalogue
- Technical Support by Zoom/phone or email-Sue McGarrigle ND (suem@bionutri.co.uk), Edward Joy Herbalist (ed@bionutri.co.uk), Rosie Rayner ND rosie@bionutri.co.uk
- Product training-one to one or small groups by telephone or Zoom/Teams.
- Kinesiology samples
- Samples for sensitive clients



Product sources

Practitioner/Patient

Bionutri Ltd

The Natural Dispensary

Ireland-Maria Cadogan at NT

Supplies-

www.ntsupsuppliesireland.com



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