nuzest®

Technical Bulletin

GOOD GREEN VITALITY

ISSUE: July 2019

CONTENTS

DISCLAIMER

The information contained in this document has been prepared independently as a guide to Healthcare practitioners (HCPs) considering Good Green Vitality as a recommended supplement to clients and/or patients. It draws upon existing scientific research on the human biosystem, on nutritional supplementation in general and on specific forms of vitamins, minerals and other nutrients contained in the product.

This document is not a guide to or an endorsement of Good Green Vitality, or of any supplement or individual ingredient, for use as a prevention or cure for any illness or disease.

The opinions and conclusions expressed in this document are those of the authors, reached after analysis of available scientific research papers and personal experience in clinical practice. HCPs should not rely solely on the opinions expressed or information contained in this document but are encouraged to conduct independent research to reach their own conclusions.

It is further emphasised that Nuzest Good Green Vitality has been formulated as a general food supplement to a normal diet. It has not been formulated for therapeutic purposes and does not claim to prevent or cure any disease. It is simply a comprehensive blend of nutrients designed to help fill the gaps of missing or depleted nutrients as a support formula for general health and wellbeing.

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Founder Holistic Performance Nutrition

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Cliff Harvey is an author, clinician, and active researcher examining clinical applications of ketogenic and lower-carbohydrate diets and mind-body therapies. Since 1998 he has been applying a “Carb-Appropriate” nutritional approach in his practice, blending the best of traditional and non-traditional nutritional science to help athletes perform better and to help those with chronic illness to recover health.

He is the author of several best-selling books and is a contributor to magazines and media worldwide. Cliff is also a strength athlete holding several world records and is a two times IAWA Weightlifting World Champion.

SCIENTISTS HAVE DEBATED THAT LONG-TERM HEALTH IS SUPPORTED BY DAILY SUPPLEMENTATION OF A MULTI-VITAMIN.

Many people struggle to consume a sufficient diversity of foods on a consistent basis to deliver the required nutrients for optimal health. Additionally, the trend towards the simplification of diets,[3] crop breeding practices that have increasingly bred phytonutrients out of plants over the last 10,000 years,[4] food processing[5] and high temperature cooking methods[6] can all contribute to a loss of nutrients.

Studies have also shown that nutrient requirements may increase according to sustained levels of psycho-emotional stress,[7] prolonged and intense exercise,[8] and exposure to environmental toxins,[9] these factors being associated with many contemporary lifestyles.

National Nutrition Survey's undertaken in the UK have shown that large minorities are not reaching their dietary targets for Reference Nutrient Intakes (RNIs).[10-12] In the case of the elderly, inadequate intake of vitamin D, magnesium, Vitamin K and copper have been of particular concern.

In a major UK survey of dietary habits of 4-18 year olds,[13] it has been shown that the most commonly consumed foods are white bread, savoury snacks, chips, biscuits, potatoes and chocolate confectionery.

Additionally, it was found that boys eat, by weight, nearly four times as many biscuits than leafy green vegetables, while girls eat, by weight, more than four times as much sweets and chocolate than leafy green vegetables.

The same survey also revealed that 91% of girls aged 4-6 years failed to reach the RNI for zinc (6.5mg - a key mineral required for the immune system); while 97% of girls aged 15-18 years did not reach the RNI for magnesium, 73% did not reach the RNI for zinc, and 53% did not reach the RNI (200µg) for folic acid, despite recent studies that demonstrate that intakes well over 400µg are likely to be required to minimise risk of neural tube defects.[14]

It should also be recognised that the RNI for a given vitamin or mineral is lower than the Nutrient Reference Value (NRV) (formerly commonly known as the Recommended Daily Allowance [RDA]).

These amounts have been determined to deliver to the target population the minimum amounts required to prevent gross deficiencies and related diseases, not the optimum amounts required to take into account biochemical and genetic individuality,[15] as well as variable needs.

Accordingly, estimates such as Suggested Optimum Nutrient Allowances (SONAs) have been proposed,[16,17] these being considerably greater, and achieved through the diet alone by a much smaller proportion of the population. SONAs, however, do not take into account the diversity of plant-based and other nutrients required for optimal function and chronic disease prevention.[18]

Food (dietary) supplements often provide single, isolated nutrients, vitamins, minerals or limited combinations, these being provided in forms that are often not typical of those found in a food matrix. There is increasing evidence that nutrients in the precise forms, and even ratios, found in foods as well as with the numerous synergistic cofactors and other components are more beneficial than the isolated or limited combinations of industrially produced analogues.[19,20]

WHY SUPPLEMENT?

There are also some studies that have shown that particular synthetic nutrients, specifically synthetic beta-carotene,[21] synthetic vitamin E[22] and synthetic folic acid,[22] may present health concerns if consumed at higher dosages over long periods in some people. None of these synthetic forms are contained in Good Green Vitality (GGV).

GGV is a unique product worldwide, formulated specifically to meet the nutritional requirements typical of modern lifestyles. Accordingly, the product contains 77 functional ingredients, plant foods and extracts, in turn including a vast and diverse array of natural chemistries that help modulate a host of different metabolic processes. Such diversity of plant-based and other nutrients is extremely challenging, if not impossible, to achieve in a normal diet, especially on a consistent basis.

'Why supplement?' references available upon request.

PURPOSE/FUNCTION

Supporting all 11 body systems, Nuzest Good Green Vitality is comprehensive foundational nutrition at its very best. From energy production, cognitive function and the immune system to bone and gut health, Nuzest is able to support all in their quest to optimal health and vitality.

Designed as a daily supplement to help fill key nutritional gaps, Good Green Vitality is nutritional insurance rather than a replacement to a healthy balanced diet.

We always encourage food first as a main nutrition source, filling your plate at each meal with colours, fibre, carbohydrates, protein and fat. For anyone, it is the ultimate nutritional back-up if taken daily; supporting optimal health and performance.

Good Green Vitality is the ideal supplement for health practitioners to prescribe to clients for foundational health to help provide better outcomes for specific treatments. A blend of over 75 ingredients produce a powerful synergistic effect of nutritional benefits. Each ingredient is specifically chosen for the benefits it provides to the 11 body systems, boosting overall vitality, immunity and enhanced daily functioning.

Built on a foundation of nutrient-rich superfoods including microalgae, mushrooms, vegetables and high polyphenol fruit and berry extracts, Good Green Vitality provides the all-important armoury of phytonutrients, and trace and ultra-trace minerals necessary for proper absorption and utilisation of the vitamins, minerals and other isolated nutrients used to fortify the formula.

Enzymes, soluble fibre and macrobiotics support digestion and the microbiome, immune and inflammatory modulation, while herbs support detoxification and adaptogens for adrenal support. Other valuable ingredients such as co-enzyme Q10, beta glucans, resveratrol, phospholipids, *Panax ginseng* and more help to support performance, energy production, and cognition.

The levels, forms and ratios of vitamins, minerals and other supportive nutrients have been determined and optimised through a thorough evaluation of available scientific reviews and supporting scientific evidence.

Specific forms of vitamins and minerals have been selected based on maximum bioavailability; efficacy being the driving force behind the formulation.
No vitamin, mineral or other nutrient has a specific single function. They all work in support of each other in a range of functions within the human ecosystem. Some of those nutrients are produced by the body's own chemistry while others need to be introduced directly through the food chain.

Food provides essential ingredients for the body's laboratory/information system and, like any chemical formula, if an element is missing or out of balance it can have dire consequences. In the case of the human body it can lead to long term chronic health issues and an impairment to optimal function. This indeed is the rationale behind supplementation; provision of missing nutrients and boosting of those that are deficient.

We know through clinical evidence that most people are deficient to some degree of the main essential nutrients needed for optimal function. This may be a result of lifestyle demands, poor dietary choices, low quality food, soil depletion or a person's own biological inefficiency due to various genetic, age or health-related reasons. Research for optimal health is ever evolving and extensive research is always at the forefront of Nuzest development.

The following diagrams aim to show which nutrients added to Good Green Vitality support each of the 11 body systems.

THE ELEVEN BODY SYSTEMS

The levels of most vitamins are significantly higher than national daily reference values while most minerals, except iron (by design) are at either the daily reference value or make a reasonable contribution to daily nutritional needs.

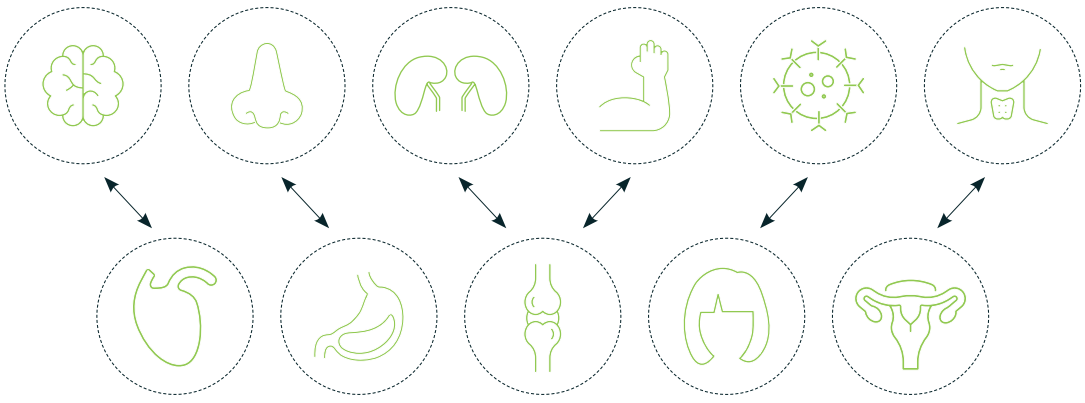
Nutrient Reference Values (NRV) and Recommended Daily or Dietary Intakes (RDI/RI) established by regulatory authorities globally are designed to show the minimum levels of nutrients required to prevent disease or malfunction. Even then, they are a general guide and not specific to individual needs.

While NRVs have been established to provide recommended dietary intakes of vitamins and minerals based on age and gender, in food labelling they are not age or gender specific. In any case, they do not take account of genetics, physical attributes such as size and weight, medical conditions, environmental factors or ethnic backgrounds.

Optimal supplementation, or "personalised" nutrition, for therapeutic or even general health requires a variety of tests such as stool, blood and genetic analysis and the advice and supervision of appropriately qualified health practitioners.

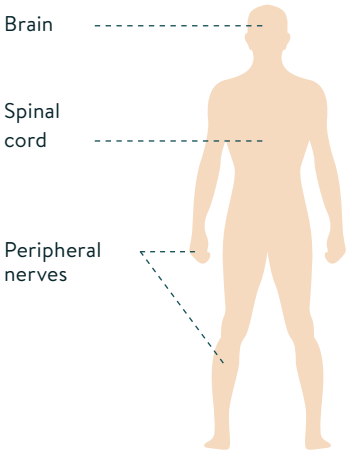
In an effort to produce foundational nutritional support for everybody, Good Green Vitality uses levels of nutrients based on a combination of the regulatory guidelines, safety considerations, efficacy and evidence of widespread serious deficiency in the general population.

Researched levels of each carefully selected vitamin have been formulated into the Good Green Vitality recipe. These meet and exceed the daily recommended suggestions to ensure that the consumer is getting a sufficient amount of natural and easily absorbed nutrients.

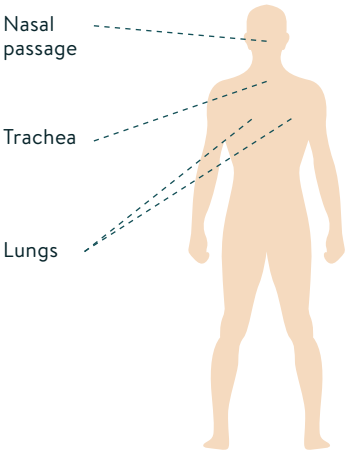


11 Body Systems

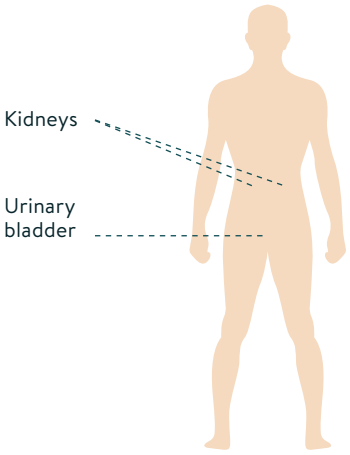
Nervous System



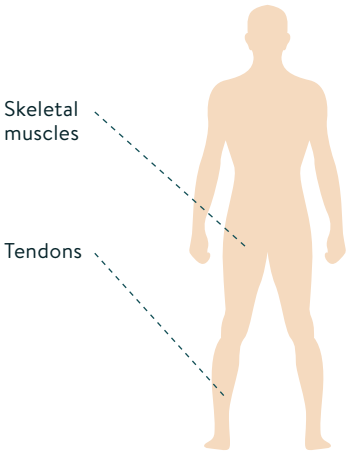
Respiratory System



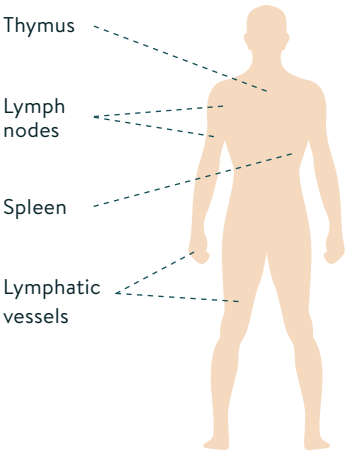
Excretory System



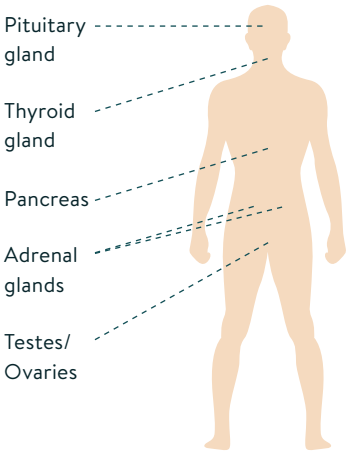
Muscular System



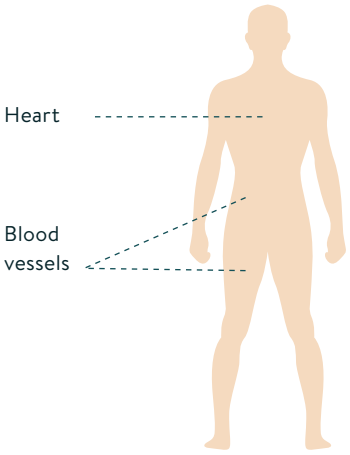
Immune System



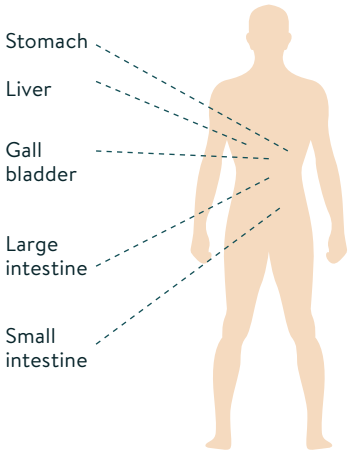
Endocrine System



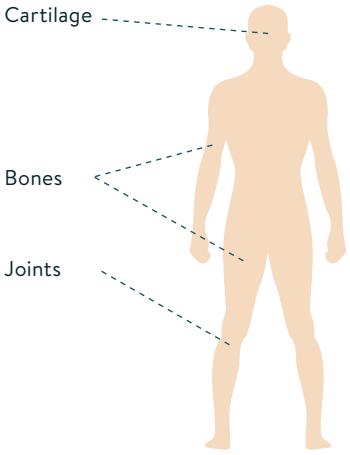
Circulatory System



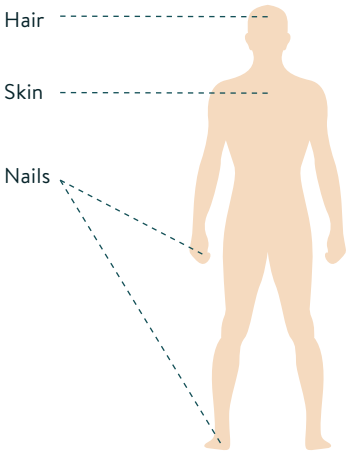
Digestive System



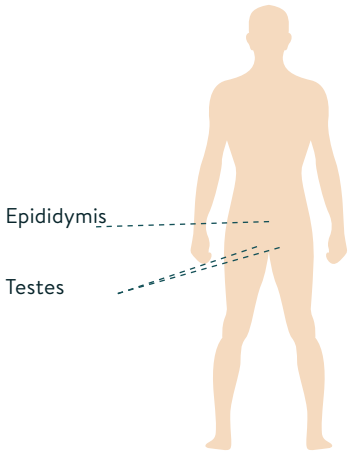
Skeletal System



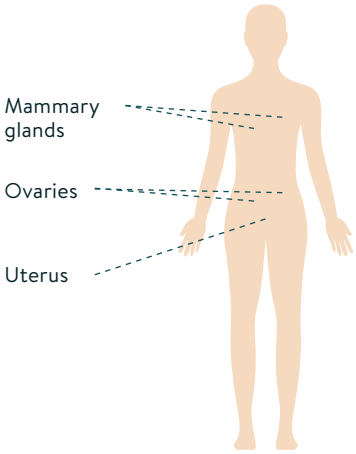
Integumentary System



Reproductive System



Reproductive System



System, Function, Ingredient

Body system	Key organs and tissue	Functions	Ingredients in Good Green Vitality that support this system
Circulatory	Heart, arteries, veins, arterioles, capillaries, venules	• Delivers oxygen and nutrients to cells throughout the body and takes wastes away • Functions as a 'cooling system' for the body by increasing or reducing blood flow to the skin and extremities	• Vitamin B1, B2, B3, B5, B6, B9, B12, C, E, K • Calcium • Copper • Magnesium • Potassium • Zinc • Protein • L-ascorbic acid • Bioflavonoid • Grapeseed • Green tea • Cacao • Rosemary • Beta glucans • Co-enzyme Q10 • Black pepper • Aloe vera • Globe artichoke • Psyllium husk • Milk thistle • Hawthorn • Fruit and berry blend • Vegetable blend • Spirulina • Probiotics • Dietary enzymes
Digestive and excretory	Mouth, oesophagus, stomach, small and large intestine	• Absorbs nutrients from the gastrointestinal tract and removes waste (mostly solid) oesophagus, stomach and intestines. • Eliminates waste from the body.	• Zinc • Bioflavonoid • Black pepper • Aloe vera • Psyllium husk • Milk thistle • Dandelion

Digestive and excretory	Mouth, oesophagus, stomach, small and large intestine	• Absorbs nutrients from the gastrointestinal tract and removes waste (mostly solid) oesophagus, stomach and intestines. • Eliminates waste from the body.	• Ginger • Liquorice • Barley leaf • Wheatgrass • Spirulina • Probiotics • Slippery elm
Endocrine	Pineal gland, pituitary gland, pancreas, ovaries, testes, thyroid gland, parathyroid gland, hypothalamus and adrenal glands	• Influences the function of other cells and through chemical messengers (hormones)	• Vitamin A, B6, B9, D, E, K • Chromium • Kelp • Magnesium • Manganese • Selenium • Zinc • Red marine algae • L-ascorbic acid • L-selenomethionine • Green tea • Rosehip • Rosemary • Turmeric • Shiitake mushroom • Beta glucans • Co-enzyme Q10 • Black pepper • Aloe vera • Psyllium husk • Milk thistle • Ginger • Liquorice • Kelp • Chlorella • Spirulina • Probiotics

Body system	Key organs and tissue	Functions	Ingredients in Good Green Vitality that support this system
Integumentary	Skin, hair, nails, sweat and other exocrine glands	• A physical barrier to help prevent infection, allow an appropriate internal environment, and includes connective tissue to stabilise and protect the body	• Vitamin B7, C, D • Beta glucans • Dietary enzymes • Gotu kola • Protein • Rose hip • Slippery elm
Immune	White blood cells	• Defends the body against pathogens (like bacteria, viruses, and other microbes that can harm the body)	• Vitamin A, B2, B7, B9, B12, C, D, E, K • Copper • Manganese • Selenium • Zinc • Barley leaf • Bioflavonoid • Black pepper • Chlorella • Dandelion • Dietary enzymes • Fruit & berry blend • Ginger • Globe artichoke • Grapeseed • Green tea • Hawthorn • Kelp • Liquorice • Milk thistle • Probiotics • Rose hip • Rosemary leaf extract • Shiitake mushroom • Turmeric • Ashwagandha • Vegetable blend • Wheatgrass

Body system	Key organs and tissue	Functions	Ingredients in Good Green Vitality that support this system
Muscular		• Moves the body	• Vitamin B1, D • Magnesium • Potassium • Zinc • Protein • Green tea • Shiitake Mushroom
Nervous	Brain, spinal cord, central and peripheral nervous system	• Collects, processes, and transmits information from the senses, via nerves and the brain, to the body	• Vitamin A, B1, B2, B3, B12, E • Copper • Magnesium • Potassium • Zinc • Bioflavonoid • Green tea • Gotu kola • Rhodiola • Ashwagandha • Shiitake mushroom • Co-enzyme Q10 • Fruit and berry blend • Vegetable blend
Renal and urinary	Kidneys, ureters	• Removes waste, excess acids and bases, or liquids via the filtration of the kidneys and excreted in urine	• Dandelion • Beetroot
Reproductive	Penis, vagina	• Production of offspring	• Vitamin B6 • Grapeseed • Ashwagandha • Ginger

Body system	Key organs and tissue	Functions	Ingredients in Good Green Vitality that support this system
Respiratory	Nose, nasal cavity and sinuses, pharynx, larynx trachea, lungs: bronchi, bronchioles and the alveoli	• Extracts oxygen from air to take into the body and removes carbon dioxide. Also, an excretory channel to get rid of excess acid	• Bioflavonoid • Fruit and berry blend • Vegetable blend
Skeletal	The bones of the skeleton	• Maintains the structure of the body to allow movement and function and protects vital organs like the heart and brain	• Vitamin D • Vitamin K • Calcium • Copper • Magnesium • Potassium • Protein • Red algae

STRESS
ASHWAGANDHA
LICORICE
RHODIOLA

ENERGY
VITAMIN B12, GINSENG
FOLATE

DIGESTION
PROBIOTICS
ENZYMES
FIBRE

DETOXIFICATION
MILK THISTLE
SPIRULINA
WHEATGRASS

IMMUNITY
ZINC
VITAMIN C
MUSHROOMS

ANTI-AGEING
RESVERATROL
COQ10, GREEN TEA

75+
PREMIUM INGREDIENTS

NUTRITION FACTS & INGREDIENTS

VITAMINS & MINERALS	PER SERVE	%RDI^
Vit A	800mcg RE	100%
Vit B1	4mg	348%
Vit B2	4mg	308%
Vit B3	20mg	53%
Vit B5	10mg	80%
Vit B6	8mg	552%
Biotin (Vit B7)	300µg	1091%
Vit B9 (L-5-MTHF)	400mcg	100%
Vit B12 (Methylcobalamin)	100mcg	4167%
Vit C	300mg	706%
Vit D (from Lichen)	20mcg	200%
Vit E (Mixed tocopherols)	15mg TE	176%
Vit K1	50mcg	80%
Vit K2 (Menaquinone-7)	30mcg	48%
Chromium	40µg	133%
Copper	0.6mg	43%
Iodine	150mcg	111%
Magnesium	100mg	27%
Manganese	2mg	50%
Potassium	300mg	10%
Selenium	70mcg	108%
Zinc	19mg	100%

GREEN & MARINE SUPERFOODS	PER SERVE
Spirulina (organic)	800mg
Red marine algae	485mg
Barley leaf (organic)	250mg
Wheatgrass (organic)	250mg
Chlorella (organic)	200mg
Kelp whole plant (5:1)*	190mg
Dunaliella salina	8mg
BERRIES, FRUIT & VEGGIES	**PER SERVE**
Apple	1g
Blackcurrant (200:1)*	350mg
Broccoli sprout	200mg
Beetroot	200mg
Acerola cherry (4:1)*	200mg
Bilberry (100:1)*	200mg
Spinach	150mg
Papaya	100mg
Carrot	100mg
Goji berry (4:1)*	50mg
IMMUNE SUPPORTS & ANTIOXIDANTS	**PER SERVE**
Flaxseed	600mg
Citric acid	250mg
Citrus bioflavonoids	250mg

NUTRITION FACTS & INGREDIENTS

IMMUNE SUPPORTS & ANTIOXIDANTS	PER SERVE
Grape seed (120:1)*	250mg
Green tea leaf (10:1)*	200mg
Rosehip fruit (4:1)*	200mg
Panax ginseng root (10:1)*	100mg
Cacao bean polyphenol extracts	100mg
Rosemary leaf (10:1)*	100mg
Turmeric rhizome (4:1)*	100mg
Gotu kola aerial parts (10:1)*	100mg
R,S alpha-lipoic acid	70mg
Shiitake mushroom	60mg
Resveratrol	55mg
1,3/1,6 beta-glucans	25mg

DIGESTION, DETOX & LIVER SUPPORT	PER SERVE
Aloe vera leaf (200:1)*	1g
Globe artichoke leaf (15:1)*	500mg
Psyllium husk	200mg
Milk thistle seed (70:1)*	100mg
Ginger	80mg
Licorice root	70mg
Bromelain (2000GDU/g)	60mg
Dandelion whole plant (4:1)*	50mg
Slippery elm bark	30mg

PREBIOTICS & PROBIOTICS	PER SERVE
Apple pectin (prebiotic)	250mg
Lactobacillus acidophilus	5B CFU
R,S alpha-lipoic acid	70mg

NEURAL, ENERGY & ADRENAL SUPPORT	PER SERVE
Pea protein isolate	740mg
Sunflower lecithin	500mg
Rhodiola root (15:1)*	100mg
Ashwagandha root (5:1)*	80mg
Astragalus root (4:1)*	80mg
Hawthorn fruit (10:1)*	50mg
Co-enzyme Q10	20mg

FLAVOUR	
Natural vanilla and pineapple flavours	

Per 10g Serve | All weights are averages
^%RDI for adults aged 18yrs and above
*Extracts are listed as equivalent values

VITAMINS

Vitamin A

Form:
Retinyl palmitate and mixed natural carotenoids (including beta-carotene) from *Dunalliela salina*
Key body systems:
Immune, nervous (vision), endocrine

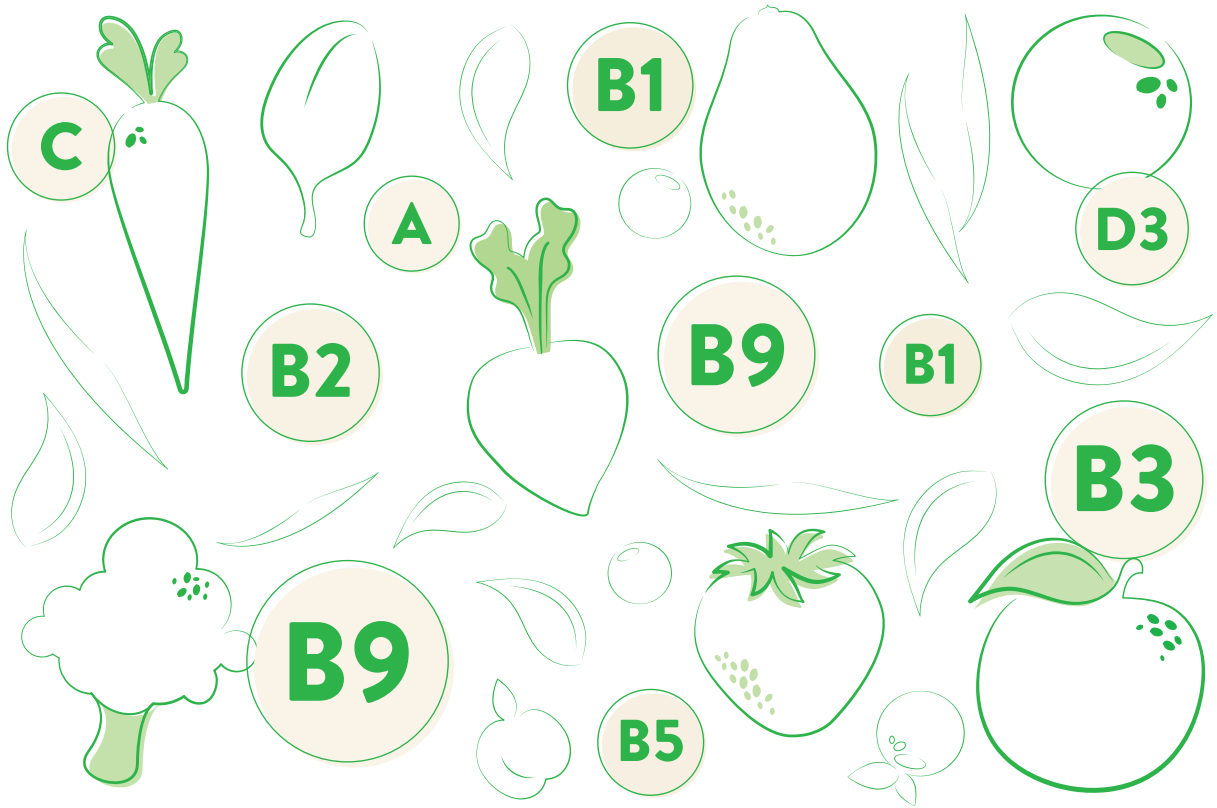
Vitamin A is a group of essential, fat-soluble vitamins including retinol, retinal, retinoic acid, and provitamin A carotenoids (most notably beta-carotene) which can be converted to 'active' vitamin A.

Vitamin A is important for growth and development, immunity, and for vision, especially low-light and colour vision. Vitamin A also functions via retinoic acid which is a hormone-like growth factor for epithelial and other cells.

Key benefits of vitamin A supplementation:

- Improved immunity and resistance to infection
- Improved vision
- Reduced risk of anaemia

Vitamin A deficiency is the leading cause of preventable vision problems and blindness in children, along with severe impacts on immunity.[1] Vitamin A supplementation is associated with large reductions in illness, mortality, and vision problems in children and it has been recommended that any children at risk of deficiency should be given a vitamin A supplement.[2] Additionally, vitamin A



supplementation during pregnancy improves immunity to illness and reduces the incidence of gestational night blindness.[3] A systematic review and analysis using a Chinese cohort has demonstrated that the incidence of actual and sub-clinical vitamin A deficiency increases with age and is more common in rural and under-developed areas.[4]

Vitamin A supplementation has been demonstrated to reduce anaemia by ~26% and raise haemoglobin levels, compared to those not supplementing, and improves iron status in pregnant and lactating women. It has been concluded that vitamin A supplementation reduces the risk of anaemia, by improving haemoglobin and ferritin levels in individuals with low vitamin A levels.[5]

Why retinyl palmitate

While this form is usually found in foods of animal origin, it can also be produced in a vegan (non-animal) form, which is included in this product. Retinyl palmitate is an ester of vitamin A that is immediately converted to the active, bioavailable storage form of vitamin A—retinol, in the small intestine. Unlike vegetable derived carotenoids like beta-carotene, retinyl palmitate does not need to undergo additional processing and conversion to active vitamin A in the body. This conversion process to usable vitamin A from carotenoids can differ by a factor of nine-fold.[6] And whole food sources of beta-carotene may be required in amounts around four times higher than taking a pre-formed vitamin A supplement.[7,8]

Higher body-fat levels may also negatively affect beta-carotene conversion[6]. However, excessive doses of pre-formed vitamin A can be toxic, whereas carotenoids will not be converted to vitamin A in excessive amounts. For these reasons, pre-formed vitamin A is included in this product along with mixed carotenoids that have additional benefits to health and can help to provide sufficiency of vitamin A.

Vitamin B1 – Thiamine

Form:
Thiamine hydrochloride
Key body systems:
Circulatory, muscular, nervous

Thiamine (or thiamin) was the first B-vitamin to be discovered and the first vitamin to be isolated, hence its classification as 'B1'. Food sources include whole grains, legumes, meats and fish. However, processing of grains removes much of the thiamine content. Vitamin B1 deficiency known as 'beri-beri' was a common illness in developing countries but is not commonly seen in developed nations despite around 20% of people potentially not meeting their B1 requirements from diet alone.[9] The major role of thiamine in the body is as a component of co-enzymes that enable us to use amino acids (from protein) and carbohydrates for energy.

Key benefits of thiamine supplementation:

- Improved cardiovascular health
- Possible reduced risk of obesity and diabetes
- Improved energy provision

Thiamine deficiency is prevalent in heart failure patients and supplementation with this vitamin improves cardiac function, weight maintenance, and signs and symptoms of heart failure.[10-12] Thiamine deficiency could be part of the complex aetiology (causation) of heart disease and supplementation might reduce the risk of future cardiovascular events.[14]

There is also evidence that thiamine deficiency might be associated with obesity, possibly also involving the interaction of thiamine and magnesium in the formation of the enzyme thiamine diphosphate, an integral part on the liberation of energy from glucose. Up to 47% of patients with obesity entering bariatric surgery are deficient in thiamine.[14]

Why supplement with thiamine?

A sub-clinical deficiency may exist for a large proportion of the population and supplementing with thiamine, along with the other B vitamins, magnesium, and other essential and secondary nutrients is prudent to ensure nutritional status, improve health and reduce future health-risk. Thiamine hydrochloride as a bioavailable and safe form for supplementation.

Vitamin B2 – Riboflavin

Form:
Riboflavin
Key body systems:
Immune, circulatory, nervous

Riboflavin, or vitamin B2, is a B-vitamin found in high amounts in eggs, green vegetables, milk and other dairy products, meat, mushrooms, and almonds. It is essential to preserve proper energy provision (cellular respiration) and sufficient amounts, often via supplementation, are used to prevent and treat migraines. Riboflavin is also considered to play a role in the prevention of anaemia, hyperglycaemia, hypertension, diabetes mellitus, neurological disorders, and oxidative stress directly or indirectly.[15,16]

Key benefits of riboflavin supplementation:

- Reduced oxidative stress
- Reduction in blood pressure (in genetically predisposed people)
- Benefits for neural health and MS
- Reduced duration, frequency, and severity of migraines

In addition to its other actions, riboflavin is a relatively under-recognised anti-oxidant that can help reduce oxidative stress to the body.[17] It is extensively used and has demonstrated significant evidence for the treatment of migraines without significant adverse effects.[18]
Cardiovascular disease patients with the MTHFR 677TT genotype and high blood pressure might experience significant reductions in blood pressure with riboflavin supplementation.[19]

Riboflavin deficiency results in neurological abnormalities and demyelination. Possibly due to its role as an antioxidant and promotion of brain-derived neurotrophic factor (BDNF), riboflavin is also showing positive benefits for symptoms of multiple sclerosis (MS).[20]

Riboflavin supplementation has also been shown to reduce the frequency and duration of migraines, [21] and at a dose of >200mg per day is effective for reducing both the frequency and severity of migraines in children.[21]

Why riboflavin

Riboflavin is included to support the provision of energy and, in supportive (non-therapeutic) dosage, to support the neural and cardiovascular functions of the body, and antioxidant pathways in association with the other health-supporting ingredients included in the formula.

Vitamin B3 – Niacin

Form:
Nicotinamide, nicotinic acid
Key body systems:
Circulatory, nervous

Niacin, also known as Vitamin B3, is a water-soluble vitamin that has a wide range of functions in the body, including a role in converting carbohydrates into glucose, metabolising fats and proteins, and nervous system function.

Key benefits of niacin supplementation:

- May help prevent cardiovascular disease and associated events
- Improves blood lipids
- May reduce migraines and tension-type headaches
- May improve psychotic symptoms in those with a niacin-respondent subset of schizophrenia

Research suggests that niacin supplementation reduces cardiovascular disease events[22,23] via its HDL-elevating, antioxidant and anti-inflammatory properties.[24] Niacin has been shown to significantly improve lipid abnormalities in people with type 2

diabetes mellitus, but requires monitoring of glucose levels if used for long-term treatment.[25] Niacin supplementation (in particular, IV and oral nicotinic acid) may help reduce migraine and tension-type headaches.[26] Niacin deficiency has been shown to be a contributor in the development of some niacin-respondent subsets of schizophrenia and niacin supplementation may be beneficial to these cases. [27]

Why nicotinamide and nicotinic acid?

High doses of niacin can cause flushing, nausea, and fainting,[26] so, a supportive and moderate dose is included in this formula. Nicotinic acid and nicotinamide are both well-absorbed and tolerated.

Vitamin B5 – Pantothenic acid

Form:
Calcium d-pantothenate
Key body systems:
Overall support

Vitamin B5 or pantothenic acid is a water-soluble vitamin of the B-complex. It is an essential nutrient required to help metabolise proteins, carbohydrates, and fats. The name derives from the Greek '*pantos*' (meaning everywhere) as small amounts are found in almost all foods. Higher amounts are found in wholegrains, eggs, liver and dried mushrooms.

Key benefits of vitamin B5 supplementation:

- Supports B-complex nutrient sufficiency as part
- Provides support for energy production

Vitamin B5 is essential to produce co-enzyme A (COA). CoA is required in approximately 4% of all known enzymes as a cofactor, mostly used in the liberation of energy from the food we eat.

Why include vitamin B5

Because of the relative ubiquity of vitamin B5 in food, deficiency is extremely rare and there is little evidence that high amounts from supplements offer any meaningful benefit to people eating a healthy diet. However, as part of the B-complex, pantothenic acid is important to produce energy in the body and a small amount is included in this formula, from bio-available calcium d-pantothenate, to help preserve nutrient sufficiency.

Vitamin B6 – Pyridoxines

Form:
Pyridoxine hydrochloride

Key body systems:
Circulatory, endocrine, reproductive
Vitamin B6 refers to a group of related chemicals that are all interconvertible and are essential for the liberation of energy from amino acids, carbohydrates and fats. Forms include pyridoxine, pyridoxine 5'-phosphate (P5P), pyridoxal, pyridoxal 5'-phosphate (PLP, pyridoxamine, and pyridoxamine 5'-phosphate (PMP).

Key benefits of vitamin B6 supplementation:

- Reduced risk of cardiovascular disease
- Possible improvements in mood and cognition
- Possible improvements in peri-menstrual symptoms
- Support for overall health and energy production

While there are purported benefits to mood and cognition from supplementation with B6, along with possible reductions in premenstrual symptoms, these effects have not been demonstrated conclusively with isolated supplementation, or combination B-vitamin supplementation. There does however, appear to be a dose-dependent relationship between increased B6 intake and reduced cardiovascular risk.[28]

There might be a significant proportion of people (~20%) who do not habitually consume enough B6 in their diets,[9] and due to the critical role of this vitamin, in concert with the other B vitamins, supplementation is recommended.

Why pyridoxine hydrochloride

The various forms of B6 are highly interconvertible. Pyridoxine hydrochloride is easily absorbed and offers a high yield of conversion to active forms of vitamin B6 (like PLP) in the body.

Vitamin B7 – Biotin

Form:
Biotin
Key body systems:
Integumentary, immune
Biotin, or vitamin B7, is a water-soluble vitamin and a cofactor for five carboxylases that catalyse steps in the metabolism of fatty acids, glucose and amino acids. Biotin also plays a role in histone modification, gene regulation, and cell signaling.[29,30]

Key benefits of biotin supplementation:

- Helps modulate gene expression
- Aids metabolism of fats, carbohydrate, and protein
- Improves the health of hair, skin, and nails

Research suggests that biotin supplementation can reduce brittleness and improve the health of nails. [31] Biotin supplementation has also reduced triglyceride concentrations and improved lipid profiles in diabetic patients,[32] and in combination with chromium supplementation has improved glucose control in trial participants with diabetes.[33]

Why biotin?

Biotin is an important water-soluble vitamin that needs to be supplied to the body regularly. It is important for blood glucose regulation, gene expression, metabolism, and plays a particular role in the health of hair, skin and nails.

Vitamin B9 – Folate

Form:
Calcium L-5 methyl-tetrahydrofolate (L-5MTHF)
Key body systems:
Circulatory, immune, endocrine

Folate is a B-vitamin (B9) necessary for the production and maintenance of new cells, DNA synthesis and RNA synthesis through methylation, and for preventing changes to DNA. It is especially important during periods of frequent cell division and growth, such as infancy and pregnancy.

Key benefits of folate supplementation:

- Reduced homocysteine levels
- Improved pregnancy outcomes
- Reduced inflammation
- Significant benefit of the natural form vs synthetic

Folic acid/folate supplementation helps to reduce homocysteine (a cardiovascular risk marker) and might help improve glucose control in those with diabetes.[34,35] Folate added to the diet (through fortification or supplementation) reduces the risk of neural tube defects in babies.[36] There is also some indicative evidence that folate supplementation could reduce the risk of preeclampsia (high blood pressure and organ damage during pregnancy).[37] There has been a suggestion that folate supplementation could reduce inflammation. A systematic review and meta-analysis including 10 randomised, controlled trials, suggested that folate can significantly reduce C-reactive protein, a key marker of systemic inflammation.[38]

Why L-5-MTHF?

It is important to use an active methylated form of folate; L-5-methyltetrahydrafolate (L-5-MTHF) in preference to the cheaper synthetic form often simply labelled 'folic acid'. Many people cannot effectively convert other synthetic forms of folic acid to active folate in the body. The common synthetic form of folic acid (pteroylmonoglutamate) found in most supplements leads to high levels of unmetabolised folic acid in the blood.[39,40] This can interfere with the function of active folate,[41,42] negatively affecting immunity.[43] Although it has been suggested that L-5-MTHF is less easily absorbed than synthetic folic acid, a recent systematic review has suggested that there is little difference between absorption rates of different forms of folic acid or folate, with one study reporting a significant difference showing greater bioavailability of the L-5-MTHF form.[44]

Vitamin B12

Form:
Methylcobalamin
Key body systems:
Immune, circulatory, nervous

Vitamin B12, or cobalamin, is a water-soluble vitamin that plays an essential role in folate metabolism and in the synthesis of succinyl-CoA, a citric acid intermediate. In addition, it is required, as methylcobalamin, for the function of the folate-

dependent enzyme methionine synthase, which is required for the synthesis of the amino acid methionine from homocysteine. Vitamin B12 plays a key role in red blood cell production, brain health and DNA synthesis. Intestinal malabsorption is generally the cause of vitamin B12 deficiency, as absorption of vitamin B12 from food requires stomach acid to free vitamin B12 from food.

Key benefits of B12 supplementation

- Reduced chronic pain
- Possible antioxidant properties
- Normalises serum vitamin B12 levels and alleviates symptoms related to vitamin B12 deficiency
- Important for vegans and vegetarians to supplement with this vitamin

Vitamin B12 plays an important role in the preservation of the myelin sheath around neurons and for the synthesis of neurotransmitters. Research has shown that vitamin B12 administration significantly reduces pain and improves quality of life in patients with postherpetic neuralgia, a complication of herpes zoster.[45] Oral vitamin B12 supplementation has been shown to normalise serum vitamin B12 levels and address the clinical manifestations related to vitamin B12 deficiency and is a cost-effective, more comfortable alternative to intramuscular vitamin B12.[46,47] Vitamin B12 may also possess antioxidant properties.[48] Anaemia is usually the first sign of a B12 deficiency, but not always as high intakes of folates can mask B12 deficiency for some time. Of note is that the neural (brain and central nervous system) damage induced by a B12 deficiency is not reduced by folate and so it is imperative for vegans to take a B12 supplement.

Early in the 20th century doctors coined the term "pernicious anaemia" for the form of anaemia that did not respond to iron supplementation. Pernicious anaemia occurs when the body doesn't produce intrinsic factor in the stomach, necessary for the absorption of B12. In 1948, vitamin B12 was identified as the cure for pernicious anaemia and a reliable form of B12 for supplementation was sought.

Why methylcobalamin?

The common form added to supplements cyanocobalamin is a synthetic form not found in foods in nature. The metabolism of cyanocobalamin leaves behind a cyanide residue that the body must then excrete. This is unlikely to cause problems for most people as the amount of cyanide left is extremely small. However, those with pre-existing kidney problems may have trouble excreting even these small amounts and a methylcobalamin form is preferred.[49] Expert advice is to use a non-cyanide form of B12 for general safety.[50]

Methylcobalamin is a natural alternative to synthetic vitamin B12. Vitamin B12 regulates, together with L-5-MTHF (folate), the remethylation of homocysteine to L-methionine and the subsequent formation of S-adenosylmethionine (SAMe). SAMe is essential to most biological methylation reactions including the methylation of myelin, neurotransmitters, and phospholipids (e.g. phosphatidylcholine). Methylcobalamin, having a methyl group, is able to act as a methyl donor for these reactions,[51] whereas the synthetic forms need to themselves be methylated in order to do this. This step may be limited in some people and even in healthy people taxes methylation pathways unnecessarily. Methylcobalamin is also absorbed more effectively than synthetic B12 (cyanocobalamin).[52]

Vitamin C

Form:
L-ascorbic acid
Key body systems:
Immune, circulatory, integumentary

Vitamin C, or ascorbic acid, is a water-soluble essential vitamin that serves as both an antioxidant and pro-oxidant. This vitamin plays an instrumental role in the development and maintenance of tissues, bone formation, wound healing, immune function, and a number of metabolic functions.[53] Humans are unable to synthesise vitamin C, so ingestion from either an exogenous supplement or diet is necessary. Deficiency of vitamin C can lead to scurvy, anaemia, infections, bleeding gums, muscular degeneration, poor wound healing, and a number of other conditions.[53]

Key benefits of vitamin C supplementation:

- Antioxidant effects
- Connective tissue and joint health and repair
- Improved cardiovascular health and reduced blood pressure

- Improved immunity
- Reduction in severity of colds

Research suggests that vitamin C supplementation can support healthy connective and bone tissue (via collagen formation). Vitamin C's antioxidant roles are many, and it has been shown to prevent free radical damage, reduce asthmatic symptoms, and supplementation may be protective against stroke,[54] heart attacks, neurodegenerative decline and related disorders.[55]

Vitamin C might also be of benefit for the prevention of certain cancers of the lung, breast, and bladder,[59-59] and has been shown to enhance the immune system and protect the body from a number of diseases by stimulating the activity of antibodies.[58]

Increased vitamin C intake, vitamin C supplementation and higher concentrations of vitamin C are associated with lower blood pressure.[60] Vitamin C supplementation has been shown to significantly reduce serum uric acid, and may play a role in reducing hyperuricaemia and help to prevent gout.[61] Vitamin C dosages of greater than 500mg/day have been associated with beneficial effects on endothelial function, particularly in those with cardio-metabolic disorders.[62]

Research shows that vitamin C can help to reduce symptoms of colds and shorten their duration,[63] and might even help to prevent the occurrence of colds in athletes and others prone to higher levels of stress when taken regularly.[64,65]

Why L-ascorbic acid?

Vitamin C is ascorbic acid. This is the bio-identical form of vitamin C and when combined with citrus bioflavonoids and other secondary antioxidants in the formula, provides a natural antioxidant complex.

Vitamin D

Form:

Cholecalciferol (Vitamin D3) from lichen

Key body systems:

Skeletal, integumentary, immune, endocrine, muscular

Vitamin D is a group of fat-soluble steroid-like compounds important for calcium absorption and bone mineralisation, mood, immune function and modulating immunity amongst other functions. The major source of vitamin D is endogenous (within the body) production in the skin as a result of exposure to the UV rays in sunlight. However, due to geographic and seasonal variation in sun exposure and genetic differences in vitamin D production in response to sunlight, supplementation and food derived sources have been considered important for preserving health.

Key benefits of Vitamin D supplementation

- Reduced depression
- Possible improvements in respiratory function
- Increased muscle strength
- Reduced incidence of immune disorders
- Improved bone and systemic health

Vitamin D supplementation might help to reduce depression in those with significant depression.[66] Vitamin D might also reduce exacerbations of asthma in children.[68] In two reviews of the available research, vitamin D at between 600 and 5000iu per day was found to improve muscular strength.[68,69] Vitamin D supplementation is showing promise for follicular development and menstrual regulation in women with polycystic ovary syndrome.[70] It is also showing promise for inhibiting relapse in rheumatoid arthritis and systemic lupus erythematosus (SLE).[71] Vitamin D supplementation during pregnancy is significantly associated with improved birth weights and reduced neonatal and foetal mortality.[72]

Obesity reduces vitamin D absorption in a linear fashion and so, those with higher bodyweights might benefit even more from supplementation.[73]

Why cholecalciferol from lichen?

Vitamin D3 (cholecalciferol) is the natural form found in and created by animals (including humans) compared to the fungi-derived vitamin D2 (ergocalciferol). There is epidemiological evidence that vitamin D3 promotes better health outcomes than D2. Vitamin D3 supplements have typically been extracted from the lanolin of sheep wool and are therefore not vegan. In this formula we have included natural vitamin D3, bioidentical to that within the

human body, sourced from lichen to ensure that the product can be used by vegans.

Vitamin E

Form:
d-alpha tocopherol acetate and mixed natural tocopherols and tocotrienols
Key body systems:
Circulatory, immune, endocrine, nervous

The vitamin E group includes eight fat-soluble vitamins; alpha-, beta-, gamma-, and delta-tocopherols and tocotrienols. Vitamin E deficiency, typically caused by malabsorption generally, or problems with fat absorption, can result in nervous system problems. Vitamin E is a key antioxidant and is thought to play an important role in gene expression. Sources include most dietary fats, including oils, nuts and seeds, and the fat of meat, fish, eggs and dairy.

Key benefits of vitamin E supplementation:

- Supports cardiovascular health
- Improved blood sugar control in those with metabolic disorder
- Anti-inflammatory and analgesic properties

Populations who consume larger amounts of vitamin E in food have been linked to reduced rates of cardiovascular and other disease and in vitro research has demonstrated the antioxidant and anti-ageing properties of vitamin E. However, studies using supplementation of vitamin E have yielded mixed or even negative results, possibly due to the conflicting forms used (i.e. the various forms of tocopherols and tocotrienols) or lack of combination with other essential nutrients creating an 'imbalanced' nutritive effect,[74-76] and possibly due, in part to statistical methods used.[77] Pooled data from randomised controlled trials also shows a significant, positive effect of vitamin E supplementation on endothelial function (the thin membrane that lines the inside of blood vessels which can become damaged and is a contributor to heart disease). This effect is greatest for those with lower levels of vitamin E.[78] Supplementation with vitamin E also significantly reduces (WMD = −3.4 mmHg, 95% CI = −6.7 to −0.11, $P < 0.001$) systolic blood pressure (with no significant effect on either diastolic or mean arterial pressure).[79]
While no overall effect of vitamin E supplements improving blood-sugar control has been observed, better glucose control (reductions in HbA1c) has been demonstrated in those with severely elevated blood glucose (HbA1c ≥ 64),[80] and on balance, it appears that there is reduced hospitalisation and cardiovascular mortality for those people with diabetes taking vitamin E supplements.[81]

Vitamin E supplementation might be useful as an adjunctive to reduce head and neck cancers,[82] to reduce the reduce risk of asthma in children when taken during pregnancy,[83] and to relieve osteoarthritis,[84] possibly due to its anti-inflammatory and immunomodulatory effects.[85]

Vitamin E supplementation can also significantly reduce severity and duration of premenstrual pain.[86]

Why d-alpha tocopherol and mixed natural tocopherols and -trienols?

While alpha-tocopherol has been considered the 'active' vitamin E and is very important for health, all of the vitamin E family have benefits to human function. For example, alpha- and gamma-tocopherols provide contrasting and complementary actions for immune and inflammatory modulation.[87] Gamma has also been shown to be a more effective free-radical scavenger and excessive amounts of alpha-tocopherol might inhibit these effects.[88] For the balance of our innate immune, inflammatory and antioxidant pathways, we have included a mixed vitamin E blend.

Vitamin K

Form:
K1 (phylloquinone) and K2 MK-7 (menaquinone-7)
Key body systems:
Immune, endocrine, circulatory, skeletal

Vitamin K is a fat-soluble vitamin that plays a role in clot formation, bone metabolism, modulation of inflammation and immunity and regulation of various cellular functions.

Key benefits of vitamin K supplementation:

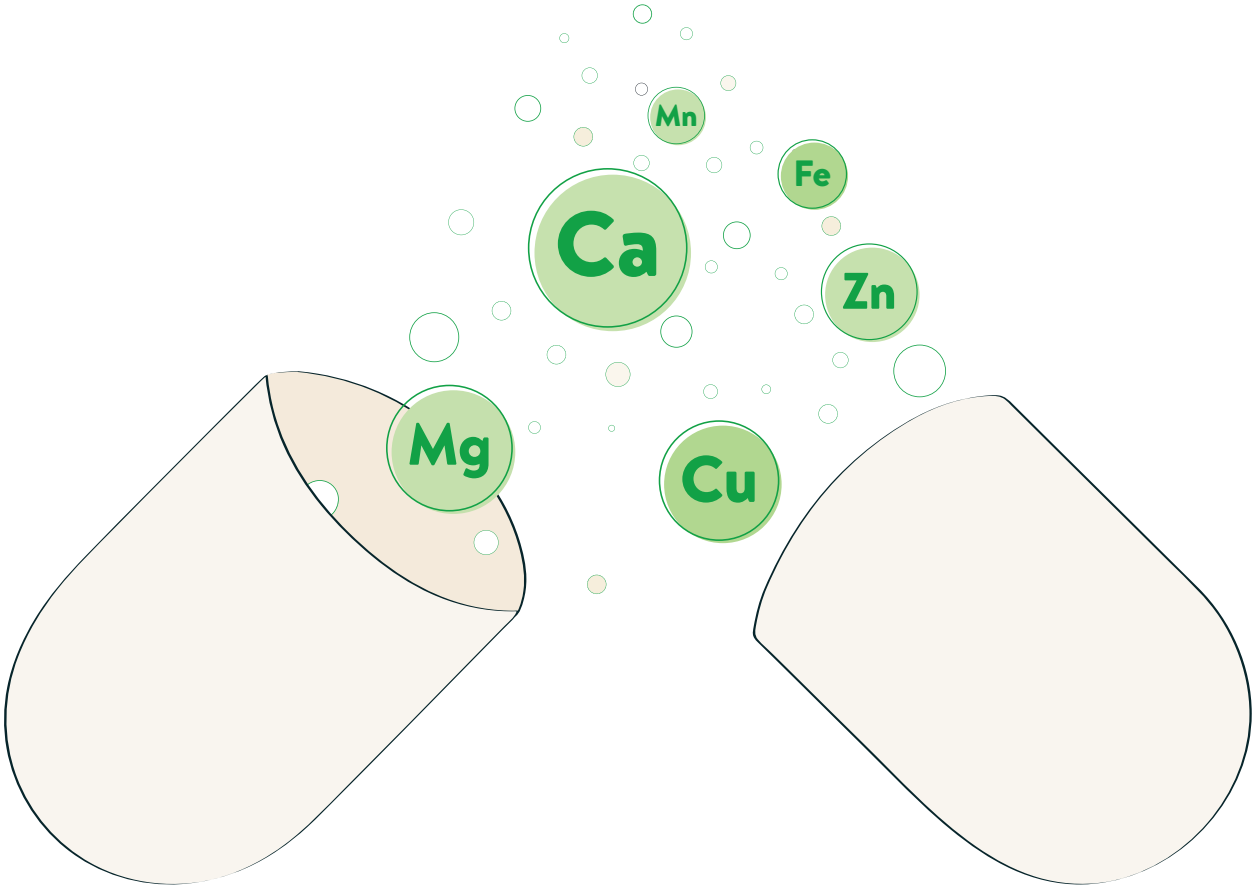
- Reduces vascular calcification, a marker for

vascular health associated with cardiovascular events
- May improve insulin sensitivity
- May improve glucose tolerance
- Improves anticoagulation control in those on vitamin K antagonists (VKAs)
- Reduces bone loss

Research suggests that vitamin K supplementation significantly reduces vascular calcification, which is a marker for vascular health associated with cardiovascular events.[89] In addition, there is evidence to show that vitamin K may help manage insulin sensitivity and glucose tolerance.[90] Vitamin K antagonists (VKAs) have been used for a number of decades to prevent thromboembolic events, and research has shown that low-dose vitamin K supplementation helps to improve anticoagulation control in those patients on VKAs.[91] Supplementation with both the more common vitamin K1 (found abundantly in vegetables) and the less prevalent forms of vitamin K2, reduce bone loss and may assist in reducing the incidence of bone fractures.[92,93]

Why K1 and K2 MK-7?

Vitamin K1 is more commonly found in the diet from vegetables but may be lacking in diets that are lower in high-quality nutrient-dense plant foods. Vitamin K2 MK-7 is less common in the diet, coming from fermented foods such as natto. Vitamin K2 MK-7 is more stable, has a longer half-life, and is likely to have a greater effect on bone quality than K1,[94] and reduces



both arterial calcification and stiffness,[95] not always observed with K1 supplementation, but both have significant and complementary benefits to health. MK-7 supplements have specifically demonstrated the ability to reduce bone loss in older women.[96]

MINERALS

Calcium

See: Red marine algae

Chromium

Form:
Chromium picolinate
Key body systems:
Endocrine

Chromium is a trace mineral that appears to play an important role in enhancing the action of insulin and thus, blood sugar regulation, as well as being directly involved in carbohydrate, fat and protein metabolism.

Key benefits of chromium supplementation:

- Improves insulin function
- May improve triglycerides and HDL cholesterol
- Improves BMI
- Improves free testosterone levels in PCOS patients

Research shows that chromium supplementation (specifically chromium picolinate) significantly reduces hyperglycaemia and hyperinsulinaemia (high blood sugar and blood insulin levels respectively) in patients which diabetes.[97-99] It may also improve triglycerides and HDL-c levels,[100] and has also been shown to have positive effects on oxidative stress, lipid profile, protein synthesis, binge eating disorder and cognitive decline.[101] Chromium supplementation has also been shown to significantly improve BMI,[102] and improve testosterone levels in patients with polycystic ovary syndrome (PCOS).[103]

Why chromium picolinate?

Chromium picolinate is the most studied form of chromium and is considered well-absorbed, safe at supplemental doses and effective.

Copper

Form:
Copper gluconate
Key body systems:
Immune, circulatory, nervous, skeletal

Copper is a mineral (Cu) that has a long history of use in its directly usable form (most commonly from blue-green copper salts) as one of the oldest materials for weapons, jewellery, and for industrial and anti-microbial applications. As a nutrient it is one of the essential minerals that must be supplied by the diet. It aids iron uptake and a deficiency can produce anaemia-like symptoms, neutropaenia, bone abnormalities, impaired growth, increased incidence of infections, osteoporosis, hyperthyroidism, and abnormalities in glucose and cholesterol metabolism.

Key benefits of copper supplementation:

- Reduced oxidative stress
- Reduced triglycerides
- Neuroprotective
- Important in pregnancy
- Support of bone health

Minerals can compete for absorption, especially at the divalent mineral transporter (DMT). Zinc can compete with copper and so, excessive or prolonged supplementation with zinc can reduce availability of copper. Therefore, it is important to supplement with copper if supplementing with zinc. However, the upper limit that has been set for zinc, primarily to avoid a secondary copper deficiency, may be too low. In evaluations of elderly patients,[104] boys taking 5-15mg of zinc per day, with a relatively zinc-rich diet, infants taking 10mg per day for four months, and healthy, adult men taking 30mg of zinc per day,[105] there was no effect observed on total body copper status.[106-107] A higher dose of 22mg per day for 30 days did reduce copper levels in athletes and might reduce glucose utilisation.[108] Similarly, dosages between 15 and 50mg of zinc gluconate per day significantly reduced copper levels in adults.[109,110]

High ascorbic acid (vitamin C) intakes are also likely to inhibit copper status.[111]

Note: Copper and iron supplementation do not appear to reduce availability of either nutrient.[112]
The modern diet is assumed to be sufficient in copper because of its ubiquitous availability in food but research has demonstrated that there might be marginal (sub-clinical) deficiency in 38% of hyperlipidaemic patients (with high blood triglyceride and cholesterol levels). Supplementation with copper at ~5mg per day improved cholesterol, LDL, HDL, and especially triglycerides.[113,114] A study on severely copper deficient elderly patients using only 3mg per day did not find any change in these blood measures though.[115]

Copper is also involved in antioxidant enzyme activities and supplementation in those with lower copper status improves levels of superoxide disumatase (SOD) and diamine oxidase (DAO).[116]
Copper deficiency can present similarly to the neural effects (myeloneuropathy) seen in a B12 deficiency and this has been reversed with copper supplementation.[117] Those with cystic fibrosis might also be at greater risk of a copper deficiency.[118]

In a study of pregnant women, those taking a folate-iron supplement were found to have lower serum copper levels,[119] and research has shown that copper retention is not typically possible during pregnancy without supplementation.[120]

Copper supplementation also appears to reduce age-related bone mineral loss.[121]

Why copper gluconate?

Copper is included to help provide copper sufficiency, especially in relation to possible antagonists like zinc and vitamin C, and therefore to ensure balance within the systems of the body. The gluconate form is included as a soluble, easily absorbable form of this mineral.

Iodine

See: Kelp

Magnesium

Form:
Magnesium citrate
Key body systems:
Circulatory, endocrine, nervous, muscular, skeletal

Magnesium is a very important, essential mineral for the human body. More than 300 enzymes require magnesium ions for their actions, including all enzymes using or synthesising adenosine triphosphate (ATP) and those that use other nucleotides to synthesise DNA and RNA. ATP, the molecule that provides the body energy, is normally found as magnesium-ATP. Many people eating a modern 'American-style' diet do not consume enough magnesium and have low serum magnesium levels. Research from the US suggests that almost half of the population do not consume the required daily amount of magnesium from food.[122] Magnesium is found in high amounts in spices, nuts and seeds, cereals, cocoa and vegetables.

Key benefits of magnesium supplementation:

- Supports heart and circulatory health
- Supports healthy blood sugar regulation
- Relaxing and anti-anxiety
- Might improve strength in some populations

Magnesium status is important for preserving cardiac rhythm and supplements appear to reduce arrhythmia,[123] along with endothelial function.[124]

Magnesium is involved with blood glucose regulation and while the research is equivocal in those without diabetes, people with metabolic syndrome and diabetes might achieve positive changes in blood glucose, insulin levels, and HDL and LDL cholesterol, and triglycerides from magnesium supplementation.[125-128]

Magnesium works in concert with calcium to regulate nerve firing and reduces over-excitation of the nervous system, thus, supplementation might help to reduce anxiety.[129] Magnesium supplementation is likely to improve strength in those with low dietary intakes and poor magnesium status.[130]

Why magnesium citrate?

Magnesium citrate is both soluble and highly absorbable and is a preferred form of magnesium for both supportive and therapeutic use.[131]

Manganese

Form:
Manganese gluconate
Key body systems:
Immune, endocrine

Manganese is an essential mineral. It is involved in macronutrient metabolism, bone formation and free radical defence. Manganese is found in water, and many foods, from shellfish through to nuts, legumes, fruits, vegetables, and tubers. Deficiency is extremely rare.

Key benefits of manganese supplementation:

- Support of overall health, metabolism and antioxidant status

Manganese is an essential mineral and in association with all the other micro- and macronutrients, supports optimal health. While rare, a deficiency of manganese could result in poorer bone health and poor growth in children; skin rash, mood disturbance and problems with macronutrient metabolism.

Why manganese gluconate?

Manganese gluconate is included as a bioavailable form of manganese to support overall health, as part of the complex of nutrients in the formula.

Phosphorous

See: Potassium (form used is potassium phosphate)

Potassium

Form:
Potassium phosphate
Key body systems:
Circulatory, skeletal, muscular, nervous

Potassium is an electrolyte and the major cation in the intracellular fluid. It plays an important role in maintaining homeostasis in conjunction with sodium. Potassium is essential for normal cell, nerve and muscular function.

Key benefits of potassium supplementation:

- Reduced blood pressure
- Improved circulatory health
- Supports bone health

Research suggests that oral potassium supplementation can significantly and safely lower both systolic and diastolic blood pressure, with a greater magnitude in this blood pressure lowering effect seen in those patients with hypertension,[132-134] those who consume high amounts of sodium, those not on hypertensive drug treatment, and those in the lowest category of potassium intake.[135] An adequate dietary intake of potassium is also likely to be effective for lowering blood pressure.[135] Potassium supplementation has been associated with a significant improvement of pulse pressure,[136] though a chronic increase in potassium intake with supplemental doses of 2-3g/day has been shown to have no impact on the heart rate in healthy adults.[137]

Supplemental potassium has been shown to lower urinary calcium excretion and reduce bone resorption, indicating a benefit to bone health.[138]

Why potassium phosphate?

Several forms of supplemental phosphate appear to be well absorbed. Potassium phosphate also supplies phosphorous, important for the structure of RNA, DNA, and bone tissue (as calcium phosphate). Potassium phosphate (in high doses of around 4000mg) has also been demonstrated to help reduce perceived exertion during exercise.[139]

Selenium

Form:
L-selenomethionine
Key body systems:
Immune, endocrine

Selenium is a non-metal essential mineral. It is a component of the antioxidant enzymes glutathione peroxidase and thioredoxin reductase and is a component of deiodinase enzymes which convert T4 (thyroxine) to the active thyroid hormone T3

(triiodothyronine). Selenium is required in small amounts but many soils (like those in New Zealand) are sparse in selenium. Brazil nuts are a good source of this mineral.

Key benefits of selenium supplementation:

- Supports overall health (sparse in the soils and foods of many regions)
- Supports thyroid function
- Immune benefits
- Reduced inflammation and oxidation

There is an association between selenium intake and status and reductions in prostate cancer,[140,141] and breast cancer risk.[142] There might also be a benefit for lung cancer risk for those with low selenium status but an increased risk from supplementation in those with a high selenium status.[143] Lower selenium concentration are also associated with gestational diabetes.[144] Selenium supplementation also significantly reduces the incidence of preeclampsia.[145]

Selenium supplementation results in significant reductions in thyroid peroxidase and thyroglobulin autoantibodies in people with Hasimoto's thyroiditis.[146,147] However some of the studies reviewed may suffer from bias.[148]

Selenium supplements might also reduce mortality in those hospitalised with sepsis.[149]

Selenium supplementation reduces C-reactive protein (a key marker of inflammation) and increases glutathione peroxidase, a key antioxidant enzyme, without concurrent reductions in cardiovascular mortality or improvements in lipid status, with the possible exception of marginal improvements in triglycerides and V-LDL.[150-151]

Why L-selenomethionine

L-selenomethionine is an amino acid containing selenium and the amino methionine. It is the naturally occurring form of selenium found in Brazil nuts and other plant foods and is more easily absorbed than the inorganic mineral form of selenium, selenite.

Zinc

Form:
Zinc citrate
Key body systems:
Immune, endocrine, circulatory, digestive, muscular, nervous

Zinc is an essential mineral that is required Zinc is required for the function of hundreds of enzymes and thousands of transcription factors in the body. It is the second most abundant trace metal in humans after iron and the only metal which appears in all enzyme classes. Because of the relative abundance of zinc and its use in so many enzyme reactions, zinc is essential to metabolism, RNA and DNA creation, cell signalling, immune function and gene expression.

Key benefits of zinc supplementation:

- Improved metabolic status
- Improved heart and circulatory health
- Improved immunity
- Reduced depression

Zinc status is often low in those with metabolic syndrome and zinc has been shown to reduce fasting and post-meal glucose, fasting insulin, HbA1c, and C-reactive protein,[152] and improves insulin resistance in both men and women.[153] Zinc supplementation also significantly reduced triglycerides, cholesterol and LDL cholesterol.[154] The anti-inflammatory effect of zinc is even more apparent in those with renal insufficiency and at doses ~50mg/day.[155]

Zinc supplementation helps to reduce childhood diarrhoea and is especially important for reducing this in children less than 6 months of age, and in developing nations where zinc status may not be optimal.[156]
Zinc supplements might improve body composition (lean mass vs fat mass),[157] and growth in children,[158] especially in those failing to grow at normal rates.
Zinc supplementation might significantly reduce mortality in neonatal sepsis.[159]

Despite methodological limitations, the evidence trends towards zinc supplementation improving depression with or without pharmaceutical treatment.[160]

Why zinc citrate?

Zinc citrate is considered one of, if not the most absorbable forms of zinc, with absorption rates demonstrated greater than 61% (higher than both gluconate and oxide).[161]

IMMUNE AND NEURAL BLEND

Protein

Form:
Pea protein isolate from *Pisum sativum*
Key body systems:
Muscular, skeletal, circulatory, integumentary

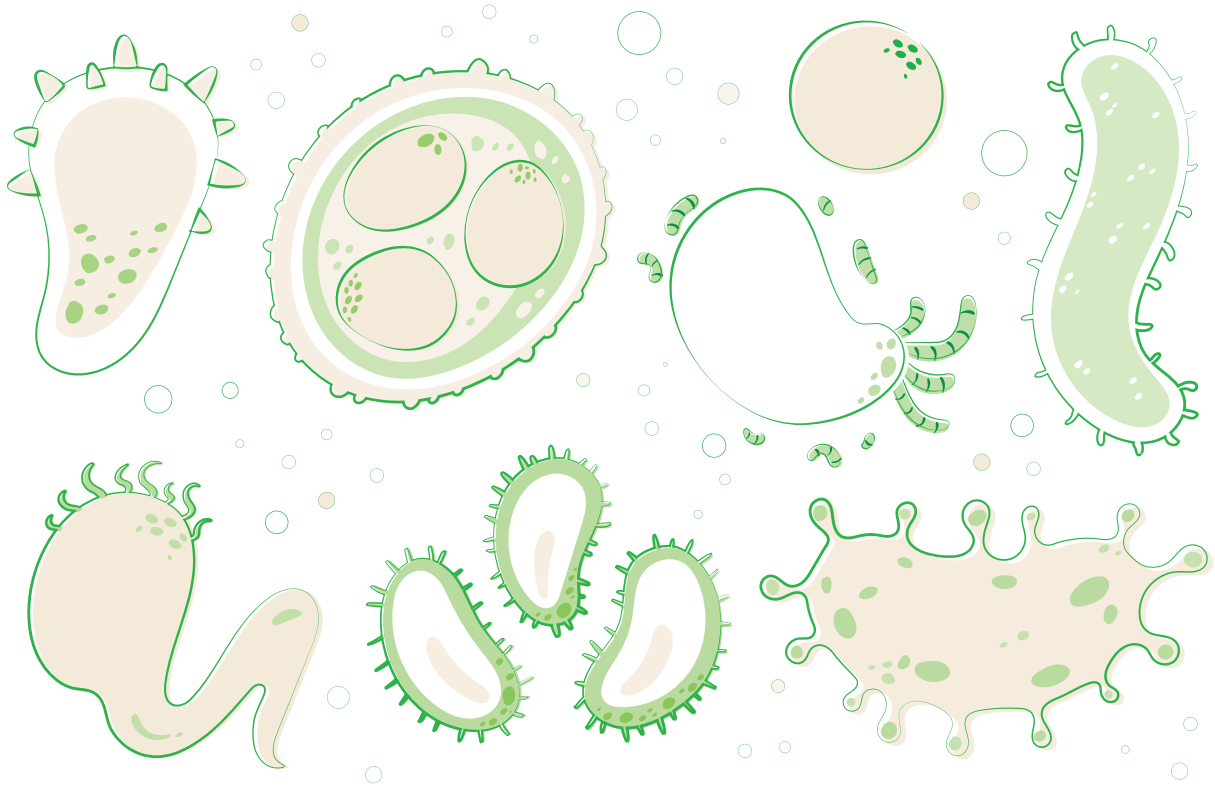
Amino acids, which make up protein, are the building blocks for all cells, tissue and organs in the body. Having an optimal protein intake is essential to sustain and improve health and performance.

Key benefits of protein supplementation:

- Improved growth and maintenance of lean muscle
- Improved muscle recovery
- Improved bone health
- Increased satiety
- Improved cardiovascular health

As the building block of all tissue, it's not surprising that it offers a broad range of benefits. In fact, protein supplements are associated with lower hospital admissions and fewer health complications (in older adults).[162] Higher protein intakes are also good for our 'cardiometabolic' health. Increased dietary protein has a small, beneficial effect on blood pressure, reduces triglycerides (one of the most important markers of poor cardiovascular and metabolic health) and reduces body fat stores.[163,164]

Protein is also crucial to help preserve or grow muscle mass, reduce fat, reduce soreness from exercise, and support strength and power development.[165-167]



Older adults also retain more lean mass and lose more fat mass during weight loss when consuming higher protein diets.[168,169]

Why pea protein isolate?

Pea protein isolate is a vegan, gluten-, soy-, and dairy-free option, free from common allergens and gastric irritants and antinutrients (like lectins, and phytic acid). Pea protein isolate contains all the essential amino acids needed for human growth and development and is considered compares very favourably with the recommended amino acid pattern proposed by the Institute of Medicine of the United States National Institutes of Health.[171] It boasts an absorption rate over 89%,[172] and in a head-to-head trial performed equally as well for muscle growth and retention as the previous 'gold-standard', whey protein.[173]

Lecithin

Form:
Sunflower lecithin from *Helianthus annuus*
Key body systems:
Nervous, muscular

Lecithin contains phospholipids such as phosphatidylserine, phosphatidylcholine, and phosphatidylinositol (PI), substances that help form the cell-membrane and provide choline, a precursor of acetylcholine and major neurotransmitter (a chemical 'signal' between cells). Lecithin supports the healthy development of all cells, especially cells of the brain and central nervous system and aids the production of acetylcholine.

Key benefits of lecithin supplementation:

- Improved cardiovascular health
- Reduced stress

Studies have demonstrated fairly significant results from relatively small doses of lecithin (~500mg).
In one study, 500mg per day resulted in reductions of cholesterol (42%) and LDL cholesterol (56%) after two months.[174] A complex of phosphatidic acid and phosphatidylserine from lecithin have also been shown to reduce both cortisol and survey responses to stress.[175]

Why sunflower lecithin?

While soy lecithin is the most common form available, sunflower lecithin provides high levels of phospholipids and is a useful alternative for those suffering from a soy intolerance or allergy.

Flaxseed

Form:
Organic whole ground seed from *Linum usitatissimum*
Key body systems:
Circulatory, immune

Flaxseed contains a range of health-promoting compounds including lignans, other phytochemicals and omega-3 fatty acids.

Key benefits of flaxseed supplementation:

- Improved cardiovascular health
- Improved metabolic health

Flaxseed supplementation is considered to be beneficial for the cardiovascular system. Systematic reviews and meta-analyses have shown significant reductions in blood pressure with flaxseed supplementation.[176-177] Other research suggests that flaxseed supplementation might help people to reduce weight and improve body-composition (lean vs fat mass).[178] Flaxseeds also help to regulate blood-sugar balance with reductions in blood-glucose, insulin and insulin resistance models in those consuming supplemental flaxseed.[179]

Why organic flaxseed?

While some of the benefits seen in studies are with relatively large doses of flaxseed (≥30g/day), we see organic flaxseeds as a valuable addition to the formula as part of a complex of wholefood derived, nutrient-dense foods. They contain valuable antioxidant lignans and the 'base' omega-3 fatty acid alpha-linolenic acid, suitable for vegans, from which the body produces active metabolites that help to combat excess inflammation and help to modulate immunity.

Bioflavonoids

Form:
Mixed bioflavonoid citrus extract
Key body systems:
Circulatory, immune, respiratory, digestive, nervous

Bioflavonoids are naturally occurring compounds found in many plant and fungi foods. They are considered to be antioxidants and have a range of health benefits.

Key benefits of bioflavonoid supplementation:

- Improved cardiovascular health
- Improved respiratory health
- Reduced inflammation and oxidation
- Improved cognition
- Improved eye health

Foods high in bioflavonoids like citrus, tea, coffee, red wine, pomegranate, and chocolate, are considered to be beneficial to overall health, and have also been shown to reduce inflammation and oxidation.[180] Reviews of observational studies suggest that increased bioflavonoid intake reduces the risk of cardiovascular disease, cardiovascular disease mortality, all-cause mortality,[181-183] incidence of upper-respiratory tract infections,[184] and might also have a protective effect against lung and gastric cancers.[185,186] Preliminary evidence also suggests that bioflavonoids can help to improve cognition and memory,[187] as well as reduce vision loss, and improve effects of the eye disease glaucoma.[188]

Why mixed bioflavonoids?

Different bioflavonoids have slightly different actions and so, by providing a spectrum of flavonoid compounds, there is the optimal opportunity to support the body's overall health. The evidence suggests that taking wholefood derived bioflavonoid complexes, like those you get in food, is superior to taking isolated flavonoids.

Grapeseed

Form:
Extract from seeds of *Vitis vinifera*
Key body systems:
Circulatory, immune, reproductive

Grapeseeds contain antioxidant and anti-inflammatory compounds, especially proanthocyanidins and procyanidins.

Key benefits of grapeseed extract supplementation:

- Improved cardiovascular health
- Increased antioxidant activity
- Reduced oxidation and inflammation
- Improved reproductive health

Grapeseed extracts contain antioxidants that increase the total antioxidant activity of the body,[189] with a range of purported health benefits. In a study of 150 and 300mg of grapeseed extract vs placebo, over 4 weeks, there was a significant reduction in blood pressure.[190] A meta-analysis of studies up to 2011 confirmed this, with consistent, significant reductions in systolic blood pressure and heart rate.[191] Grapeseed extract also improves blood-flow and reduces oxidative damage to the cardiovascular system,[192] and might reduce leg swelling.[193] It has been demonstrated that 75mg of grapeseed extract can increase glutathione (a key antioxidant) concentration and reduce C-reactive protein (a marker of total body inflammation) in people with type 2 diabetes.[194] Preliminary evidence also suggests a role for the modulation of hormone balance by acting as an aromatase inhibitor.[195]

Why grapeseed extract?

Extracts allow for higher quantities of the beneficial, naturally derived proanthocyanidins and procyanidins and other beneficial phytochemicals to be included in the product.

Green Tea

Form:
Extract from leaves of *Camelia sinensis*
Key body systems:
Immune, muscular, endocrine, circulatory, nervous

Green tea is high in antioxidant catechins, such as epigallocatechin-3-gallate and epicatechin-3-gallate.[196,197] It is traditionally used in beverages for

both relaxing and energising properties and for its overall health benefits. Scientific research has suggested benefits for relaxation, cardiovascular health, cancer, oral health, UV protection and neural benefits.[197,198]

Key benefits of green tea supplementation:

- Possible reduction in cancer risk
- Reduced body-fat
- Improved blood sugar control
- Improved cardiovascular health
- Reduced risk of liver disease

Reviews of the research suggest a potential protective effect of green tea on several types of cancer,[199,200] with trends towards prevention of breast and prostate cancers and improvements in survival rates for ovarian cancer.[201,202] Green tea catechins can help to reduce body-fat levels, and it has been hypothesised that this is due to synergistic effects including those of caffeine and green tea catechins on fat oxidation.[203-205] There are also positive effects on blood glucose and insulin.[206] Green tea catechins also result in significant reductions in blood pressure, total cholesterol and LDL-cholesterol.[207-210] Green tea consumption may reduce the risk of liver disease.[211] The antioxidant, chelating, and anti-inflammatory effects of green tea might also be able to help protect against the effects of environmental and lifestyle toxins.[212] Green tea also has positive effects on mental function, reducing anxiety, and improving memory and attention.[213]

Why green tea extract?

Extracts allow for higher quantities of the beneficial, naturally derived catechins to be included in the product.

Rosehip

Form:
Powdered extract from the fruit of *Rosa canina*.
Key body systems:
Immune, skeletal, endocrine, integumentary

Rosehips are the fruiting body of the rose plant. Rosehips are one of the traditional foods highest in vitamin C. They also contain carotenoids such as beta-carotene, lutein, zeaxanthin, and lycopene and are considered a nutrient-dense food, containing, in addition to these flavonoids, proanthocyanidins, catechins, essential fatty-acids, folate, vitamin E and minerals such as magnesium, calcium, selenium and silica. Traditional medicine and emerging research is suggesting a role for rosehip as an antioxidant, anti-inflammatory, immunomodulatory, anticancer, cardioprotective, antidiabetic, neuroprotective and antimicrobial ingredient.[214,215]

Key benefits of Rosehip supplementation:

- Improved mobility and reduced pain in osteoarthritis
- Kidney and gastrointestinal protection
- Anti-inflammatory effects
- Antioxidant effects

In addition to the beneficial effects observed in studies from the isolated active constituents found in rosehip, the fruit and its extracts have been shown to improve mobility and pain in those with arthritis.[216-219] Preclinical trials also provide evidence for the traditional use of rosehip for kidney protection and improved gastrointestinal health.[220-221]

Why rosehip extract?

There are many active and beneficial nutrients in rosehip. To get the benefits of these and to increase the efficacious amount within the formula, a wholefood derived extract has been used.

Ginseng

Form:
Extract from the root of *Panax ginseng* (Korean Ginseng).
Key body systems:
Immune, endocrine, nervous, respiratory

Korean ginseng has been used in traditional eastern medicine systems and culinary spaces for over 2000 years. It is thought to be calming, stress-adaptive, anti-fatigue and helpful for control of blood sugar.

Key benefits of ginseng supplementation:

- Possible cancer-protective effects
- Improved blood sugar control

- Improved immune function
- Improved neural performance
- Reduced inflammation

Case studies and cohort evidence suggests that ginseng might have some cancer-protective effects.[222] Evaluations of randomised trial data shows promising results for ginseng improving blood sugar control,[223] helping to modulate immune responses,[224] and for respiratory diseases and neural performance.[225] Ginseng extracts and ginsenosides in particular might reduce inflammation.[226]

Why ginseng extract?

Whole ginseng contains many different, beneficial compounds. To capture these and provide the greatest efficacy by-dose, a high-quality *Panax ginseng* extract is used in the formula.

Cacao

Form:

High-potency polyphenol extract from the bean of *Theobroma Cacao*

Key body systems:

Circulatory, nervous, endocrine, immune

Cacao has been cultivated and used as a food, beverage, and medicine for at least 3000 years in the Americas, where it had been known as 'the food of the Gods'. Cacao is high in many plant phenols including antioxidant flavanols (including epicatechin), procyanidins, and many other flavonoids.

Key benefits of cacao supplementation:

- Improved cardiovascular function
- Improved blood sugar control
- Reduced blood pressure
- Reduced inflammation and oxidation
- Improved mood
- Improved exercise performance

There are many purported benefits to overall health from the traditional use of cacao and cacao-containing foods and drinks for cardiovascular, neurological, oral, endocrine, immune, respiratory and reproductive systems, and these are beginning to be shown in modern, scientific studies.[227,228]

Reviews of the research have shown that cacao and its plant phenols can improve insulin function and sensitivity, blood pressure, and improve flow-mediated dilation,[229,230] important for proper blood-flow and overall health of the cardiovascular system. The benefits to blood pressure are greater than drastic reductions in sodium.[231] Cacao flavanols can also improve HDL ('good') cholesterol, and reduce triglycerides (fats in the blood) and insulin.[232] Additionally, improvements in inflammation have been seen in those with diabetes and metabolic syndrome.[233]

The antioxidant, vasodilation, anticoagulant, and anti-inflammatory properties of cacao are suggested as the reason why dark chocolate and cacao might have mood-boosting and anti-depressant properties.[234] There is also evidence to suggest that cacao might help to reduce cancer risk.[235]

Cacao flavanols could benefit performance by improving mitochondrial efficiency and vascular function, and reducing exercise-induced oxidative stress.[236]

Why cacao bean extract?

Whole cacao contains many different, beneficial compounds but is relatively 'bulky'. To capture these various phenols that are indicated to provide benefit in the research, a high-quality *Theobroma cacao* extract is used in the formula.

Rosemary

Form:

High-potency extract from the leaf of *Rosmarinus officinalis*

Key body systems:

Immune, circulatory, endocrine

Rosemary is a commonly used plant for ornamental, culinary, and medical purposes. It contains a number of phytochemicals, including rosmarinic acid, camphor, caffeic acid, ursolic acid, betulinic acid, carnosic acid, and carnosol. Rosemary was considered a sacred plant and medicine by the Egyptians, Greeks and Romans.

Key benefits of rosemary supplementation:

- Possible liver-protective effects
- Improved blood sugar control
- Reduced inflammation and oxidation

Rosemary is considered to be liver-protective, antioxidant, anti-inflammatory, anti-fungal and anti-bacterial.[237] It has been used traditionally as an anti-cancer agent, especially for breast-cancer, and some animal research suggests potential in humans for this traditional use.[238] The antioxidant properties of rosemary have been utilised to improve the shelf-life of foods,[239] and the compound effects of antioxidants, anti-inflammatory, hypoglycaemic, hypolipidaemic, hypotensive, anti-atherosclerotic, anti-thrombotic, hepatoprotective, and hypocholesterolaemic actions of rosemary compounds have led to the suggestion that rosemary and rosemary extracts could be useful for the treatment of diabetes and metabolic disorder.[240,241]

Why rosemary leaf extract?

There are a range of beneficial compounds in rosemary leaf that can be extracted. A high-quality extract is able to capture the various phenols and so, a high-quality *Rosemarinus officinalis* extract is used in the formula.

Turmeric

Form:
High-potency extract from the rhizome of *Curcuma longa*
Key body systems:
Immune, circulatory, endocrine

Turmeric is a flowering member of the ginger family *Zingiberaceae*. The root and rhizome (the creeping rootstalks of the plant) have been used for thousands of years in traditional medicine systems and cooking, particularly in the Middle East, South Asia and the Indian sub-continent, where it has been called the spice of life. It contains various phenolic compounds, especially various curcuminoids that are suggested to have health benefits.

Key benefits of turmeric supplementation:

- Reduced systemic inflammation
- Antioxidant effects
- Reduced pain and symptoms of arthritis
- Improved oral health
- Reduced inflammatory skin conditions

Traditional uses for turmeric are wide and varied. There have been explorations in modern, scientific research into turmeric, and particularly its anti-inflammatory and antioxidant properties.

In vitro and animal studies suggest that curcuminoids from turmeric have high biological activity and act as antioxidants and are potentially neuroprotective, anti-tumour, anti-inflammatory, radio-protective, and anti-arthritic. Human trials suggest value for cancers of the colon, breast, and lung, and inflammatory bowel diseases, [242] and protection against environmental toxins. [243] In addition to these, other pharmacological actions are considered likely, including blood-glucose control, reductions in cholesterol and blood lipids, and improved immune function. [244]

A systematic review of the effect of turmeric and curcumin-containing turmeric extracts on arthritis found significantly reduced symptoms compared to placebo and comparable reductions in pain to pain medications. [245]

Turmeric might also be able to reduce the liver enzymes ALT and AST, markers of non-alcoholic fatty liver disease. [244]

There is also a significant effect of turmeric on skin conditions, including dermatitis and eczema, psoriasis, age-related damage to skin, and itching. [246] For oral health, and the gum disease gingivitis, turmeric can significantly reduce gingivitis and is an alternative to the commonly used drug chlorhexidine which can cause discolouration of teeth and damage to the oral mucosa. [247]

Why turmeric rhizome extract?

The beneficial curcuminoids are found in the roots and rhizome of the *Curcuma longa* plant and in the highest amount in rhizome. Extracts allow for greater amounts of active compound without the 'bulk' of the whole rhizome as powder.

Gotu Kola

Form:
High-potency extract from the herb top of *Centella asiatica*
Key body systems:
Integumentary, nervous, circulatory

Gotu kola (or asiatic pennywort) is a culinary and medicinal herb that grows in wetlands of the Asian continent. The leaves are used extensively in South Asian cooking and it is also used medicinally as a general health tonic and for treating minor wounds, lupus, varicose ulcers, eczema, psoriasis, diarrhoea, fever, amenorrhea, diseases of the female genitourinary tract and also for relieving anxiety and improving cognition.[248] The active constituents are a range of saponins and glycosides along with phytosterols and fatty acids.

Key benefits of gotu kola supplementation:

- Reduced pain and swelling of the limbs
- Cognitive and mood benefits
- Antioxidant effects
- Improved wound healing
- Reduced inflammation

Much of the current research is preliminary and has been focussed on animal subjects. In these studies, gotu kola has demonstrated cardio-, hepato-, and gastroprotective properties against damage, along with benefits to memory, the immune system, antioxidant status, anti-inflammatory effects, anti-viral activity, benefits to vascular function, and antidepressant properties.[249,250]

In human studies, gotu kola shows benefit for reducing swelling, pain, and water retention in the limbs,[251] and might improve alertness while also reducing anger.[252]

Why gotu kola extract?

There are a range of active compounds in gotu kola and it is likely that they all affect outcomes and may be 'synergistic' (the benefits of them together are more than the sum of the parts). Extracts derived from wholefoods like gotu kola help to provide these compounds while reducing the total ingredient required in the formula.

Rhodiola

Form:
High-potency extract from *Rhodiola rosea* root
Key body systems:
Nervous

Rhodiola (or golden root), is a culinary and medicinal herb that grows throughout Central Asia, North America and the mountainous regions of Europe. The leaves and shoots are often eaten raw, or cooked, and can be added to salads and other dishes. The plant has been used, especially in Scandinavia, Russia, and China as an anti-depressant and 'adaptogenic' herb, helping the body to deal more effectively with stress and is thought to improve physical and mental performance and resilience, and to help cope with extreme climates and altitude sickness.

Key benefits of rhodiola supplementation:

- Improved resilience and tolerance to stress
- Improved physical and mental performance
- Cardiovascular benefits
- Potential anti-depressant effects

Overall, studies have suggested potential benefits from rhodiola for physical and mental performance and mental health.[253] There is also evidence that rhodiola might help in the treatment of heart disease, improving both symptoms and ECG results more than placebo in several trials.[254] Rhodiola sextracts have also been suggested as a likely stress-protective treatment in psychiatry.[255]

Why rhodiola extract?

Extracts derived from wholefoods like rhodiola help to provide the various beneficial active ingredients, while reducing the total ingredient required in the formula.

Ashwagandha

Form:
High-potency extract from *Withania somnifera* root
Key body systems:
Nervous, reproductive, immune

Ashwagandha, known as Indian ginseng, or winter cherry is a medicinal herb from China, the Indian Sub-Continent and Southern Arabian Peninsula. It contains phytochemical compounds including various withanolides, alkaloids, and numerous sitoindosides. It has been traditionally used as an adaptogen that helps improve tolerance to stress, improve performance, and help immunity and resistance to infections.

Key benefits of ashwagandha supplementation:

- Reduced anxiety
- Reduced stress
- Improved physical and mental performance
- Possible improvements in fertility

The active compounds in ashwagandha are suggested to have a range of pharmacological actions including immunomodulation, resistance to infections, anti-cancer, anti-epileptic, mood and cognitive benefits, stress-protection, improved cardiovascular performance, hypolglycaemic and hypolipidaemic actions and are antioxidants.[256]

In a review of placebo or treatment controlled studies on ashwagandha for anxiety, the herb resulted in significant improvements vs placebo for reductions in anxiety and stress.[257] Ashwagandha also shows promise as a potential adjunctive treatment to improve fertility in both men and women.[258,259]

Why ashwagandha extract?

The root of ashwagandha provides many beneficial compounds but also non-medicinal compounds that provide a lot of relative 'bulk'. High-quality extracts provide the beneficial active ingredients, while reducing the total ingredient load required in the formula.

Astragalus

Form:
High-potency extract from *Astragalus membranaceus* root
Key body systems:
Nervous, reproductive, immune

Astragalus refers to a large family of herbs used for culinary and medicinal use throughout the Middle East, North America and Asia. *A. membranaceus* in particular, has been used as an adaptogen—to increase resilience and tolerance to stress, and for the healing and repair of tissue. Recent medical research suggests a role for astragalus compounds for positive effects on telomeres and this offers potential for anti-ageing, HIV treatment, and could benefit the immune system, cardiovascular disease, cancer treatment, and liver disease. Over 200 active components, including various saponins and flavonoids, have so far been identified.[260]

Key benefits of astragalus supplementation:

- Improved blood glucose control
- Reduced cell damage
- Antioxidant effects
- Anti-inflammatory
- Improved immunity

Evidence from animal models show that the early stages of diabetic nephropathy (death of kidney cells), which is characterised by inflammation, can be reduced by astragalus root.[261] Preclinical evidence in humans suggests that astragalus can aid immunity and might offer anti-cancer potential.[262] The anti-cancer potential of astragalus is indicated by it's immune-modulating, anti-inflammatory and antioxidant activities, and it offers promise for a range of cancers, including lung, colorectal, breast, ovarian, liver, colorectal, stomach, colon, gastric, cervical, and nasopharyngeal cancers.[263,264] While further research needs to be conducted, data indicates that astragalus is safe and can reduce cancer treatment effects.[265] The protection against intestinal inflammation and resulting gastric cancers is being researched.[263]

Why astragalus root extract?

The membranaceus member of the astragalus family has the most research to back its use and has a long history of use as an adaptogen and medicine in traditional Chinese medicine. Extracts from the root (which has the most active constituents compared to other parts of the plant) of *A. membranaceus* are used to increase the relative amount of active

compounds available in the formula.

Alpha-lipoic acid

Form:
R,S alpha-lipoic acid
Key body systems:
Endocrine, immune, nervous

Alpha-lipoic acid is an organo-sulphur compound derived from the 8-chain fatty acid caprylic acid (a medium chain triglyceride) that is able to exert antioxidant effects in both water and fatty compartments of tissue. It is touted as a universal antioxidant for this reason and has been the subject of a lot of research for its effects on body composition, glucose control and cardiometabolic health.

Key benefits of alpha-lipoic acid supplementation:

- Improved body composition
- Improved blood sugar regulation
- Improved lipid and cholesterol profiles
- Reduced inflammation
- Improved neurological health

Meta-analyses of the available human evidence shows that alpha-lipoic acid supplementation can aid weight- and fat-loss, and reduce waist circumference.[266] Further evidence demonstrates benefits to cardiometabolic health. ALA improves blood sugar control by reducing glucose levels, fasted insulin levels, and improving insulin sensitivity, along with reductions in LDL-cholesterol (known as 'bad' cholesterol), triglycerides (fat in the blood), with no concurrent effect on 'good' HDL-cholesterol.[267-269]

ALA also offers additional health benefits by reducing inflammatory markers such as C-reactive protein (a marker of general, systemic inflammation) and tumour-necrosis-factor-alpha (TNF-a), a common marker of inflammatory disorders.[270] Reductions in inflammatory markers are likely to be greatest with longer-term use of ALA (greater than 8 weeks) and when C-reactive protein levels are high (>3mg/l).[271] Benefits for mental and neurodegenerative conditions have also been noted, with ALA supplementation associated with improvement in schizophrenia symptoms and reducing the progression of Alzheimer's disease.[272]

Why R, S alpha-lipoic acid?
This is the most widely studied form of alpha-lipoic acid and consists of a mixture of both R-(natural) and S-(unnatural) lipoic acid (this is referred to as a racemic mixture). Research indicates that the presence of S-lipoic acid in the racemic mixture may limit the polymerisation of R-lipoic acid thus enhancing bioavailability. Accordingly, R,S alpha-lipoic acid was included in this formula.

Shiitake mushroom

Form:
Lentinula edodes powder
Key body systems:
Endocrine, immune, muscular, nervous
Shiitake is a mushroom found in East Asia and used for thousands of years as a culinary and medicinal mushroom. It is known in China as xiang gu, or the "fragrant mushroom" and is the second most commonly cultivated edible mushroom worldwide. It is commonly used in East Asian cuisine and is becoming increasingly popular in Western cooking. Shiitake is purported to exhibit immune-modulating, antitumor, antiviral, and cholesterol-regulating effects and based on the existing research and the long history of common use, shiitake is considered safe for consumption as a food and as powder or extracts from both the fruiting bodies and mycelium.[237]

Key benefits of shiitake supplementation:

- Possible anti-cancer food
- Reduced oxidation
- Immune stimulating
- Reduced fatigue

Like other mushrooms, the major, known active substances are various beta-glucans, in particular in shiitake, a-beta-glucan known as lentinan 1/3,1/6. Polysaccharides derived from shiitake have been isolated and have exhibited anti-tumour effects

in vitro,[274,275] and reduce oxidation *in vitro*,[276] and induced by galactose (a strong glycator) *in vivo*,[277] and might potentially aid immunity by stimulating macrophage activity.[278]

In one of the few human studies to date, a beta-glucan from shiitake was compared to placebo in a study of 42 healthy, elderly subjects. This beta-glucan from shiitake was found to be safe and when given induced an increase in the number of circulating B-cells.[279] Polysaccharides from shiitake may also reduce blood urea nitrogen (BUN) and improve glycogen reserves.[280]

Why shiitake powder?

Shiitake powder contains the full range of active beta-glucans and other polysaccharides and nutrients that have demonstrated positive effects for health and performance.

Resveratrol

Form:

Resveratrol from *Polygonum cuspidatum* (Japanese knotweed) extract

Key body systems:

Endocrine, immune, nervous, circulatory

Resveratrol is a natural plant phenol usually extracted from red grapes but also found in foods such as peanuts and cacao. Resveratrol has long been considered an 'antiaging' supplement, a property observed in animal trials, and it has been suggested that resveratrol might also aid diabetes management, neural health, skin health, and provide anti-cancer effects. Health research into these effects is ongoing.

Key benefits of resveratrol supplementation:

- Anti-inflammatory
- Antioxidant effects
- Improved insulin sensitivity
- Reduced blood glucose and insulin
- Improved blood lipids
- Improved mood and memory

Resveratrol has demonstrated anti-inflammatory and antioxidant effects and in animal models of cancer formation, has inhibited the initiation, growth, and progression of cancer cells.[281] It might also improve mitochondrial efficiency, improve insulin sensitivity, and reduce bodyfat.[282]

Human evidence also shows that resveratrol supplementation can reduce triglyceride levels.[283] A summary of randomised controlled trials found a significant reduction of bodyweight, BMI, and waist circumference, all markers of future health risk, from resveratrol supplementation.[287] Resveratrol, in addition to its antioxidant roles, increases nitric oxide, and this is thought to be the mechanism by which it can reduce hypertension (high blood pressure),[285] an effect mostly seen with doses of >300mg per day and in those with diabetes.[286]

Resveratrol has been purported to be anti-inflammatory. In a review of 15 trials (n=658), it was found to reduce C-reactive protein overall, and also reduced tumour-necrosis-factor-alpha (TNF-a) in young adults and those with obesity.[287]

A meta-analysis of the effect of resveratrol in diabetes showed dose-dependent and significant reductions in glucose and insulin concentrations.[288] Resveratrol is a specific and beneficial antioxidant, preliminary reviews of studies show that resveratrol could improve parameters of memory and mood.[289]

Beta-glucans

Form:

1,3/1,6 beta-glucans

Key body systems:

Endocrine, circulatory, integumentary

Beta-glucans are a group of polysaccharides (long chain carbohydrates) found in a wide variety of foods in small amounts, including cereal grains like oats, bacteria, and commonly taken in the diet through edible and medicinal mushrooms. Beta-glucans are considered to be butyrogenic prebiotic fermentable fibres with applications for gut health and oat and barley glucans have been linked to improved cholesterol profiles.

Key benefits of beta glucan supplementation:

- Reduced blood lipids
- Possible anti-diabetic effects
- Anti-ageing

Beta-glucans have demonstrated the ability to reduce blood glucose from either high doses (~6g

per day) or longer-term use of lower doses.[290] They can also reduce both total and LDL cholesterol, improving blood-lipid profiles.[291,292]

Beta-glucans have also been suggested as being beneficial to anti-wrinkle, anti-ageing and wound healing.[293]

Co-enzyme Q10

Form:
Ubiquinone
Key body systems:
Circulatory, endocrine, nervous

Coenzyme Q10 (ubiquinone, ubidecarenone, coenzyme Q, or CoQ10) is a coenzyme found in most animals and bacteria (hence, ubiquinone from ubiquitous). It is a fat-soluble, vitamin-like substance that is a component of the electron transport chain which provides energy to cells of the body. People with cardiovascular disease, cancer, Acquired Immune Deficiency Syndrome (AIDS), muscular dystrophy, spontaneous abortion, male infertility, and periodontal disease are often lacking in this pro-vitamin.[294]

Key benefits of CoQ10 supplementation:

- Improved cardiac health
- Indicated for use with statins and in existing heart disease
- Reduced blood pressure
- Improved blood lipid profiles
- Possible neuroprotective effects
- Reduced fatigue
- Reductions in migraine frequency

CoQ10 has a long history of use both for prevention of cardiovascular disease and as part of the supplemental regimen of those with heart disease, especially with statin use, which can reduce both production and availability of CoQ10 in the body.[295,296] Meaningful reductions in blood pressure (up to 16mmHg reduction in systolic blood pressure) and improved mortality outcomes, and fewer cardiac events and complication for those with heart disease have been observed,[297,299] along with functional outcomes such as improved cardiac output and stroke volume.[298] CoQ10 has also resulted in meaningful reductions (~0.3mmol/L) of triglycerides, a key marker for cardiovascular and cardiometabolic risk.[300] For those with existing coronary artery disease, CoQ10 can improve HDL and total cholesterol levels.[301] The most recent reviews of the evidence conclude that CoQ10 is a useful tool for managing heart disease.[302] In those with type 2 diabetes, CoQ10 might help to control blood glucose and improve triglyceride and HDL cholesterol concentration in the blood.[303]

CoQ10 shows promise as a neuroprotectant with supplementation possibly reducing the progression of Parkinson's disease.[304] It has also been shown to reduce tumour-necrosis-factor-alpha (TNF-a), a key marker of inflammatory disorders,[305] and might reduce inflammation overall and other markers, C-reactive protein (CRP) and interleukin-6 (IL6).[306,307] Research shows reduced fatigue in those taking CoQ10, especially those with fibromyalgia, chronic fatigue and using statins.[308]

While further research is required, preliminary studies show that CoQ10 can reduce liver damage resulting from cancer treatment.[309]

CoQ10 might reduce the frequency of migraine attacks.[310]

Why Ubiquinone CoEnzyme Q10

There are three redox states of CoQ10: fully oxidized (ubiquinone), semiquinone (ubisemiquinone), and fully reduced (ubiquinol). The capacity of this molecule to act as a two-electron carrier (moving between the quinone and quinol form) and a one-electron carrier (moving between the semiquinone and one of these other forms) is central to its role in the electron transport chain due to the iron–sulphur clusters that can only accept one electron at a time, and as a free-radical–scavenging antioxidant.

Black pepper

Form:
Cooked and dried *Piper nigrum* seed
Key body systems:
Digestive, immune, circulatory, endocrine

Black pepper is a common culinary spice derived from the cooked, dried, and ground seeds of the *Piper nigrum* vine. Originally from Southern India, black pepper has spread over hundreds of years to cuisine around the world. As a traditional medicine,

it was originally used as part of the treatment for constipation, abscesses, sunburn, insomnia, and toothache, and later applications have been mostly to encourage the absorption of nutrients like selenium, B12, carotenoids and curcumin.

Key benefits of black pepper supplementation:

- Improved overall health
- Improved digestion
- Increased absorption of beneficial nutrients

Black pepper and its constituent chemical piperine are mostly used to increase absorption of curcuminoids from turmeric but also carotenoids, selenium, and other beneficial nutrients. There are also plausible biological effects of black pepper itself for antimicrobial, anti-inflammatory, anti-hypertensive, anti-tumour, hypolipidaemic, neuroprotective, and antioxidant activities amongst others.[311,313]

The ability for piperine from black pepper to enhance absorption is well known and it is thought to accomplish this by enhancing blood-flow to the gastrointestinal tract, and modifying metabolising enzymes and transport mechanisms for these chemicals.[314] It also stimulates the release of digestive enzymes,[315] a biological rationale for its traditional use as a digestive 'tonic'. For curcumin, the increase in bioavailability when administered with piperine from black pepper is increased by 2000%.[316]

A review of human studies since 2014 demonstrate that *Piper nigrum* can improve cognitive function and reduce cognitive decline, along with the suggestion that it may have a role in the prevention of Alzheimer's disease.[317]

Why black pepper?

Black pepper performs two roles in the formula:

1) to provide the beneficial phytochemicals found in the whole fruit that have been linked to improvements in health; and

2) to encourage the absorption of beneficial nutrients, like curcumin from turmeric rhizome, and selenium and mixed carotenoids. Thus, the whole fruit is used.

GUT AND DIGESTIVE BLEND

Aloe vera

Form:
Aloe barbadensis gel powder
Key body systems:
Digestive, endocrine, circulatory

Aloe vera is a species of succulent plant originally from the Arabian Peninsula and now grown in tropical and sub-tropical climates around the world. It is used as a topical medicine for the treatment of minor burns, including sunburn and is also used as a 'soothing' and nourishing herb for the gastrointestinal tract.

Key benefits of aloe vera supplementation:

- Oral anti-inflammatory and microbial properties
- Reduced markers of cardiovascular risk
- Improved blood-sugar control

Topical use of aloe vera in the mouth is purported to have anti-inflammatory and anti-microbial properties and aids wound healing in the mouth.[318] Significant improvements in oral diseases including oral lichen planus, oral submucous fibrosis, burning mouth syndrome, radiation induced mucositis, candida associated denture stomatitis, and xerostomia patients have been seen in the research.[319]

Studies on oral use of Aloe vera extracts have shown reduced blood glucose,[320] cholesterol, triglycerides, LDL cholesterol, blood pressure, and improved HDL cholesterol.[321,323]

Why aloe vera gel powder

The soothing actions of aloe vera occur as a result of the polysaccharides contained within the gel of the plant, which is dried and added to this formula in powdered form.

Globe artichoke

Form:
Concentrated extract of *Cynara scolymus* leaf
Key body systems:
Circulatory, endocrine, immune, digestive

Globe artichoke is a type of thistle that has an edible flower bud and has a long history of culinary use. More recently, artichoke has been investigated for its potential to lower cholesterol levels in those with high cholesterol.

Key benefits of globe artichoke supplementation:

- Reduced cholesterol levels
- Possible improvement in blood sugar control
- Possible improvement in digestive health
- Antioxidant effects
- Liver-protective

Globe artichoke, in preliminary research, has been suggested as being hepatoprotective, anticarcinogenic and hypocholesterolaemic.[323] Globe artichoke appears to exhibit antioxidant activity, with increased superoxide dismutase, catalase, glutathione, and glutathione peroxidase level in liver, as well as, decreased malondialdehyde level in liver and plasma of disease models.[324]

At least one randomised controlled trial has demonstrated significant, modest reductions (approximately -0.3mmol/L) in total cholesterol resulting from globe artichoke supplementation.[325] An extract of globe artichoke has also resulted in improved blood glucose and insulin homeostasis in another randomised, double-blinded trial.[326]

Why globe artichoke extract

This relatively high-dose extract from the edible 'leaves' of the flower-bud contain the range of whole food derived active ingredients posited to give health benefits from artichoke.

Apple pectin

Form:

Pectin fibre from the fruit of *Malus pumila*

Key body systems:
Circulatory, digestive, immune

Pectin is a type of polysaccharide prebiotic fibre found in the cell walls of various plants and in their various fruits. Pectin has been used in various foods to improve 'mouth feel', consistency, and gelling and has been researched for its benefits to the digestive tract.

Key benefits of apple pectin supplementation:

- Reduced cholesterol levels
- Possible improvement in gut health
- Improved assimilation of nutrients

Much of the research on the potential medicinal use of pectin has been done in animals in relation to it's potential to ameliorate gut-related disorders, including cancers. Apple pectin in particular (as compared to citrus pectin) has shown benefits in both animal and human models for improved bacterial status and increased production of beneficial short-chain fatty acids in the colon,[327,328] and reduced incidence of colon tumours.[329] Pectin also results in reduced total cholesterol, LDL-cholesterol, triglycerides, and might have anti-obesity effects.[330,331] Changes in the gut of laboratory animals from apple pectin supplementation has also been shown to increase the bioavailability of quercetin, an antioxidant bioflavonoid,[332,333] with the suggestion that apple pectin may help improve overall nutriment and health.

In children, a combination of the herb chamomile with apple pectin resulted in significant improvements in the duration of diarrhoea when compared to placebo.[334]

Why apple pectin prebiotic?

Apple pectin is considered a 'gentle' prebiotic that, anecdotally, doesn't result in gastric disturbance when compared to some other fibres. It has also demonstrated superior results for improving bacteria status when compared to other pectin.

Psyllium husk

Form:
Fibre from the husk of the seeds of *Plantago psyllium*
Key body systems:
Circulatory, digestive, endocrine

Psyllium is a dietary fibre derived from the seeds of Plantago species. Research has shown roles for psyllium in reducing elevated cholesterol, lowering of blood glucose in type 2 diabetes and improved gut-health.

Key benefits of psyllium husk supplementation:

- Reduced cholesterol levels
- Improved gut and digestive health
- Improved blood sugar responses
- Increased satiety (satisfaction and feeling of 'fullness' after eating)

It is well known that dietary fibre of various types is beneficial for gut health. Psyllium husk specifically is known to reduce constipation, has anti-diabetic and cholesterol-lowering properties and is associated with reduced rates of colon cancer.[335] Reviews of the many studies that have been conducted on psyllium specifically show that it can help to reduce total and LDL cholesterol, apolipoprotein B, along with improve blood sugar responses and increases satiety.[336-338]

Why apple psyllium husk?

The husk of the psyllium plant contains the polysaccharide fibres that are beneficial to the gut and for systemic health.

Milk thistle

Form:
Extract from the seed of *Silybum marianum*
Key body systems:
Circulatory, digestive, endocrine, immune

Milk thistle is an annual plant native to Europe but now found throughout the world. Milk thistle roots, flower heads, stems and leaves (trimmed of prickles) have been used traditionally as a food and the plant also has a long history of medicinal use, particularly for gastric health and liver support, which are now being studied using modern, scientific methods.

Key benefits of milk thistle supplementation:

- Improved blood lipids
- Improved blood-sugar control
- Liver protective
- Antioxidant and anti-inflammatory effects

Milk thistle is composed of several flavonoids with antioxidant and anti-inflammatory properties.[339] It has also been found to have lipid-lowering, anti-diabetic, liver-protective and blood-pressure-lowering properties and it is hypothesised that it may help in the treatment of metabolic syndrome (pre-diabetes).[340] The known action of milk thistle as a liver-protector is due to its antioxidant, anti-inflammatory and chelating (helping the body to remove heavy metals) properties.[341] While further research needs to be performed, it does appear that milk thistle is effective and safe.[342]

Why milk thistle extract?

The seeds of the milk thistle contain active compounds such as silymarin. To ensure this and other active compounds are included, a high-quality extract is used in the formula.

Dandelion

Form:
Extract from the leaves and roots of *Taraxacum officinale*
Key body systems:
Digestive, immune

Dandelions encompass several members of the Taraxacum family found originally in Eurasia and North America and now found throughout the world as wildflowers. They are a nutritious herb-vegetable and the whole plant has been used as a food for millennia. It has also been used traditionally as a medicine in European, Asian, and Native American medicine systems. Its traditional use has mostly been as a liver and kidney protective, anti-inflammatory, and diuretic.

Key benefits of dandelion supplementation:

- Antioxidant and anti-inflammatory effects
- A highly nutritive herb likely to benefit all body systems

Dandelion has a long history of medicinal use and is known to be a very nutritive plant with diuretic properties. Ongoing research suggests that dandelion may also have anti-inflammatory, antioxidant, and potential anti-cancer applications which demand additional research.[343,344] In addition, it may also have prebiotic and anti-coagulatory effects.[345]

Why whole-plant dandelion extract?

There are a range of beneficial compounds in dandelion that are thought to exert both nutritive and medicinal value. Traditionally, it was thought that the combination of both roots and leaves gave the best overall benefit especially for the kidney and liver.

Ginger

Form:
Extract from the rhizome of *Zingiber officinale*
Key body systems:
Digestive, immune, endocrine, reproductive
Ginger has been widely used as a spice and medicinal herb by people throughout the world. Originating in South Asia, ginger was transported through the Asia-Pacific region and via the spice trade to ancient Europe. It has traditionally been used to reduce nausea and as a digestive tonic.

Key benefits of ginger supplementation:

- Antioxidant and anti-inflammatory effects
- Reduced nausea
- Improved menstrual regularity
- Improved blood lipid profiles
- Improved blood-sugar control
- Possible improvements in body-composition

Ginger is mainly known for possessing the ability to help relieve nausea. Studies show that ginger consumed at around 1500 mg per day in divided doses has helped symptoms.[346] It is also likely to reduce the nausea associated with pregnancy with no observed risk or adverse effects at common dosages.[347,348] While data is limited and there is a need for further, robust studies, the available evidence does suggest that ginger might also help to reduce dysmenorrhoea.[350,351]

Ginger has known antioxidant, anti-inflammatory, and anti-tumour effects and these along with the actions of various compounds in ginger that modulate tumour suppressor genes, cell cycle, apoptosis, transcription factors, angiogenesis and growth factors, is being considered as an adjunct for cancer treatment.[352,353] In addition, the anti-inflammatory, antioxidant and

immune effects have suggested ginger as a promising treatment for multiple sclerosis treatment.[354]

Ginger is also likely to have anti-diabetic properties by improving insulin sensitivity, reducing blood glucose, increasing HDL-cholesterol, reducing LDL-cholesterol, reducing triglycerides and weight and BMI,[355-359] and reduces the inflammatory marker C-reactive protein.[360] One study suggests that ginger could also be used to help reduce damage resulting from radiation and chemotherapies and from chemical toxicity from drugs, or environmental pollutants.[361] It is also effective for reducing nausea and vomiting resulting from chemotherapy treatment.[362]

Data suggest that ginger could accelerate recovery of maximal strength after exercise and reduce the inflammatory response to cardiorespiratory exercise.[363]

Why ginger rhizome extract

The root-like rhizome contains the active compounds in ginger and a high-quality extract is used to provide these to the formula.

Liquorice

Form:
Extract from the root and rhizome of *Glycyrrhiza glabra*
Key body systems:
Digestive, immune, endocrine, reproductive

Liquorice is a perennial herb native to the Middle East, Europe and South Asia. It has a distinct flavour that has been prized for culinary use. Liquorice has a long history of use as a herbal medicine for respiratory health, liver protection and to improve stamina.

Key benefits of liquorice supplementation:

- Antioxidant and anti-inflammatory effects
- Possible protective effects against a range of disorders

Liquorice root has a large number of constituents including triterpene saponins, flavonoids, isoflavonoids and chalcones, with glycyrrhizic acid being considered to be the main active component and has anti-inflammatory, antiviral, antimicrobial, antioxidative, anticancer activities, hepatoprotective, immunomodulatory, cardioprotective and other health effects.[364-366]

Note: Very high doses can result in kaliuresis and hypertension from pseudohyperaldosteronism.[367]

Why liquorice root and rhizome extract?

The roots and rhizomes of the liquorice plant contain the greatest proportion of the active, health-promoting compounds. An extract from the root allows for these active components to be included in supportive amounts that are safe for daily use, in the formula.

Dietary enzymes

Form:
Bromelain derived from the stems of *Ananus comsus*
Key body systems:
Digestive, immune, circulatory, integumentary

Pineapples and other tropical fruits have long been considered digestive aids in traditional medicine systems. Bromelain is now thought to aid protein digestion and be anti-inflammatory.

Key benefits of bromelain supplementation:

- Antioxidant and anti-inflammatory effects
- Improved immunity
- Reduced pain
- Improved wound-healing
- Improved cardiovascular health

Bromelain is not being studied for a range of health effects. It is considered to inhibit platelet aggregation, be anti-inflammatory and anti-tumour, and improve immunity and digestion. It may also enhance wound-healing and provide cardiovascular benefits.[368,369]

The existing evidence suggests that bromelain can improve symptoms of osteoarthritis.[370] It has also been shown to reduce post-operative pain.[371]

Why bromelain from pineapple?

The stem of the pineapple plant contains the highest concentration of complex enzymatic compounds known as 'bromelain'. These have a long history of use for digestive and other health benefits and are now being extensively studied.

Slippery elm

Form:
Mucilaginous inner bark (powder) of *Ulmus rubra*
Key body systems:
Digestive, respiratory, integumentary

Slippery elm is a species of tree native to Eastern North America that has a long history in the traditional medicine of that continent for the soothing, anti-inflammatory properties of the inner bark, especially for the gastrointestinal tract when taken orally.

Key benefits of slippery elm supplementation:

- Anti-inflammatory effects
- Improved respiratory health
- Improved gastro-intestinal health
- Improved wound-healing

Slippery elm is approved by the Federal Drug Administration of the United States for use as a demulcent (soothing agent) for sore throats. This is due to its long history of common use in the US and because it is generally considered to be safe and effective for this purpose. Anecdotal effects of the effectiveness for slippery elm for sore throats and upper airway conditions and for inflammation of the bowel is ubiquitous and there is rationale for the soothing and anti-inflammatory properties of this herbal medicine, but there is not, at this time, sufficient scientific research in this area.[372,373]

Why the inner bark of the slippery elm?

The inner-bark layer of *Ulmus rubrus* contains mucilaginous compounds consisting of a range of saccharides that are soothing for mucous membranes and may play a role in helping to feed cells of the gastrointestinal tract and gut bacteria.

Probiotics

Form:
Lactobacillus acidophilus and *Bifidobacteria lactis*
Key body systems:
Digestive, endocrine, circulatory, immune

Lactobacillus and *Bifidobacteria* are naturally occurring bacteria in nature, fermented foods, and in as part of the human microbiome of the gut. They are essential for the proper regulation of digestion, absorption, resistance to endotoxicity, and to immunity and resistance to illness.

Key benefits of probiotic supplementation:

- Anti-inflammatory and antioxidant effects
- Improved gut health (reduced diarrhoea, constipation, IBS, IBD)
- Improved cardiovascular health
- Reduced risk of diabetes
- Possible improvements in body composition
- Improved immune function

Reviews of the scientific literature show a range of benefits from probiotic supplementation including reducing diarrhoea, gastrointestinal pain and bloating, and symptoms of lactose intolerance[374,375] and inflammatory bowel diseases[376]; benefits for weight- and fat-loss and reduced markers of diabetes and metabolic syndrome[371-381]; reducing oxidation,[382,383] inflammation and inflammation-related pain[384,385]; improved cardiovascular markers (cholesterol and lipid profiles)[386]; depression,[387-389] anxiety, and autism spectrum disorder.[390]

Probiotics also improve constipation in children by increasing stool frequency,[391] and reduce constipation in the elderly.[392]

Furthermore, in children probiotics significantly reduce jaundice,[393,394] and reduce the incidence and severity of respiratory tract infections,[395-397] and allergic rhinitis.[398-400] Overall, the use of probiotics is associated with reduced mortality and morbidity in children in low-to-middle income countries,[400] and improved growth rates in under-nourished children.[402]

The extant evidence shows reduced eczema for pregnant and breast-feeding mothers[403] and infants,[402-404] and probiotics also appear to reduce atopic dermatitis and are protective in moderate-to-severe cases of this condition.[405]

Probiotics are suggested for use to reduce inflammation and infection following colorectal resection surgery,[406-408] and might reduce post-operative infections in other gastro-intestinal surgeries.[409] The use of pre- and probiotics before, or on the day of liver transplantation reduces the rate of post-surgery infection.[410] Overall, probiotics show a significant effect for reducing surgical site infections.[411]

Probiotics are likely to improve CD4 counts in those with HIV.[412]

They also improve the efficacy of the influenza vaccine and other vaccines by elevating immunogenicity by influencing seroconversion and seroprotection rates.[413,413]

Why *L. acidophilus* and *B. lactis*?

Specifically, *L. acidophilus* and *B. lactis* are able to bind with food-borne toxins like aflatoxin (from mould grown on food), effectively eliminating them from the body,[415] and also compete with and aid resistance to pathogens like *E. coli*, Staphylococcus aureus, Pseudomonas aeruginosa, Listeria monocytogenes, Vibrio parahaemolyticus, Vibrio cholerae, Helicobacter pylori, Klebsiella, Salmonella, Shigella, Bacillus, Clostridium, Mucor, Aspergillus, Fusarium, Trichoderma and Candida spp.[416] *L. acidophilus* also significantly reduces LDL cholesterol ($P<0.001$) compared to other types of strains and probiotic supplements including this strain are effective in lowering lipid levels and other factors associated with cardiovascular disease.[417,418]

Interestingly, the combination of probiotics with plant phenols (like those found in this formula) provides synergistic benefits, with greater survival, adhesion, and maintenance of beneficial bacteria and improved health benefits.[419]

SUPERFOODS

Spirulina

Form:
Powdered organic *Arthrospira platensis*
Key body systems:
Endocrine, circulatory, immune, excretory

Spirulina is the common name for a species of blue-green algae, a complex biomass of cyanobacteria that provides a nutrient-dense food source. Blue-green algae have been used for millennia as a food, especially by Mesoamerican cultures.

Key benefits of spirulina supplementation:

- Reduced seasonal allergies
- Liver protection and protection from toxins
- Antioxidant and anti-inflammatory effects
- Improved cardiovascular health
- Improved metabolic markers
- Improved immune function

Spirulina is thought to reduce the incidence and severity of seasonal allergies, along with protection from heavy metals and other toxins and general protection of the liver,[420] along with general benefits for reducing oxidation[420] and the signs of ageing, enhanced immunity, improved cardiovascular and diabetic markers,[422] reduced inflammation and resistance to cancer.[423,424]

Reviews of the scientific literature show that spirulina might offer interesting benefits to those with cardiovascular risk factors. It has been demonstrated to reduce total cholesterol and LDL-cholesterol and triglycerides, while increasing ('good') HDL-cholesterol.[425]

Why organic spirulina?

Spirulina and similar algae are able to accumulate heavy metals and toxins, one of their promising roles in the body. Hence, we have ensured that safe, organic forms of this ingredient are used in this formula.

Red marine algae

Form:
Whole, dried *Lithothamnion calcareum*
Key body systems:
Skeletal

L. calcareum is a species of nutrient-rich marine algae (seaweed). Red algae have a long history of use in human nutrition due to their high nutrient content, including many essential and trace minerals.

Key benefits of red marine algae supplementation:

- Improved multi-mineral nutrition
- Overall health benefits from improved micro-nutrition
- Support of bone health

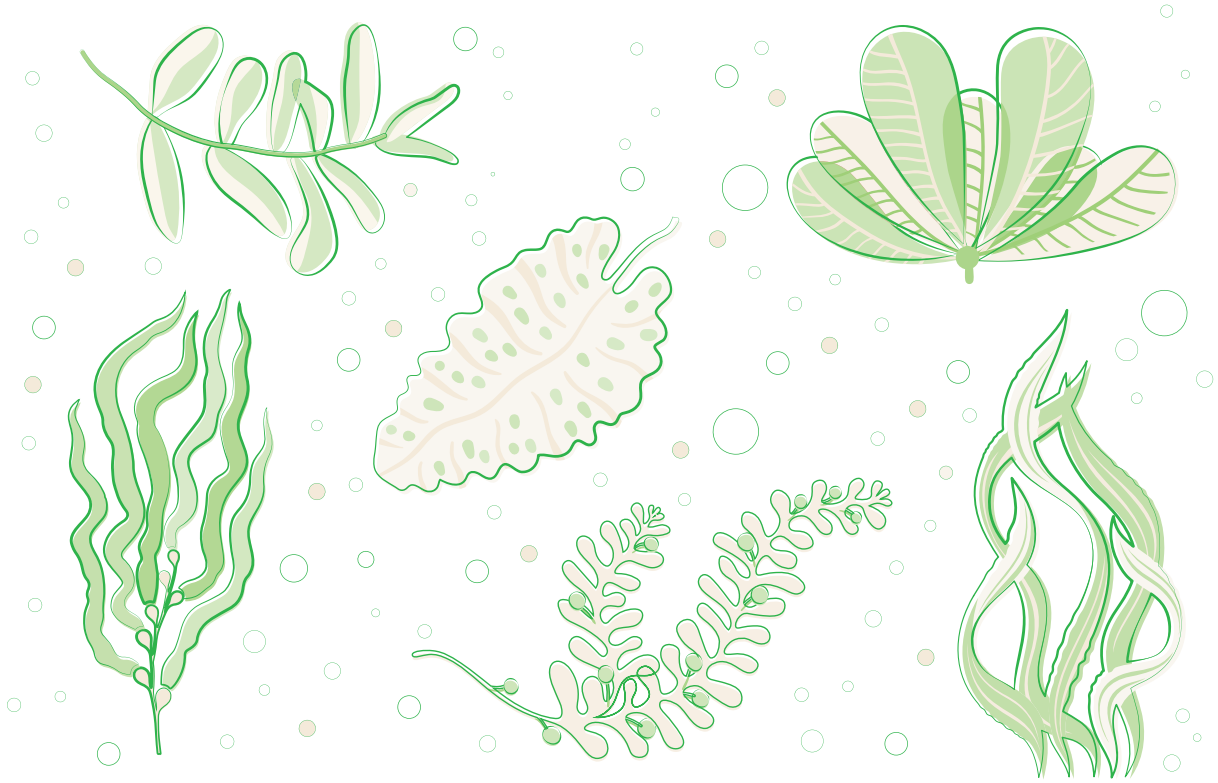
The main role of red marine algae is for its nutritive role. It provides various minerals, including calcium (30% of weight), magnesium (6%) and trace minerals.[426] This nutrient density is thought to be responsible for the benefits seen in animal research, namely, reductions in bone-loss in mice when fed *L. calcareum*.[427] It has also been shown to be as effective for reducing cancer growth in calcium sensitive cells as calcium itself.[428]

Why *L. calcareum*?

Red marine algae in the form of *L. calcareum* is included as a nutrient-dense multi-mineral. This provides not only important minerals like calcium to the formula, but a complex of synergistic minerals and trace nutrients beneficial for overall health and from a traditionally used source.

Organic wheatgrass

Form:
Powdered freshly sprouted leaves of *Triticum* plants
Key body systems:
Immune, digestive



Wheatgrass is the freshly sprouted leaves of the wheat plant. Wheatgrass provides a nutrient-rich food that is free-from gluten and rich in chlorophyll, flavonoids, and vitamins C and E.

Key benefits of wheatgrass supplementation:

- Improved micronutrient nutrition
- Reduced oxidation
- Anti-inflammatory effects

Studies are beginning to show additional clinical benefits and it offers promise for the adjunctive treatment of cancer, reducing effects of chemotherapy, along with improved immune responses and reduced oxidation. There might also be benefits from wheatgrass for a diverse range of conditions, from IBD, to rheumatoid arthritis, diabetes and obesity.[429]

Why organic wheatgrass?

Wheatgrass is a nutrient-dense food that supplies a range of essential and secondary nutrients to support the wholefood complex of nutrition in the formula.

Organic barley leaf

Form:

Powdered freshly sprouted leaves of *Hordeum vulgare*

Key body systems:

Immune, digestive

Barley leaf is the fresh shoots of the barley grass plant. It is a nutrient-dense food that is free-from gluten and high in antioxidants, and a range of vitamins and minerals.

Key benefits of barley leaf supplementation:

- Improved micronutrient nutrition
- Reduced oxidation
- Anti-inflammatory effects

Similar health benefits are claimed for barley leaf and wheatgrass, thus the functional outcomes are likely to be similar. Most of the research at this stage specifically on barley leaf has focussed on the antioxidant activity of the leaves and they have demonstrated a strong antioxidant action. [430-432]

Why barley leaves?

Barley leaf is a nutrient-dense food that supplies a range of essential and secondary nutrients to support the wholefood complex of nutrition in the formula.

Organic chlorella

Form:

Whole, dried, cracked-wall *Chlorella vulgaris*

Key body systems:

Immune, endocrine

Chlorella is a single-celled, green algae from the phylum *Chlorophata*. It has been used as a food and medicine in East Asia since ancient times. Chlorella became popular in the West in the twentieth century as people looked for nutrient-rich, sustainable food sources to help feed a burgeoning population.

Key benefits of chlorella supplementation:

- Improved micronutrient nutrition
- Improved immune function
- Reduced inflammation and oxidation
- Possible anti-diabetic effects

The range of amino acids, lipids, and minerals in chlorella have led to it being studied for a range of conditions, including hypertension and fibromyalgia. In randomised, controlled trials, chlorella has demonstrated the capacity to provide a short-term 'boost' to immunity by increasing natural killer cell counts and other immune cytokines.[433] A 2017 RCT also demonstrated reduced blood glucose, insulin, and inflammatory markers (TNF-a and C-reactive protein) after eight weeks of 1200mg chlorella per day vs a placebo.[434]

Why chlorella?

Chlorella is a nutrient-rich food with likely immune benefits. It is often considered to work most effectively in combination with spirulina by natural health practitioners and provides additional nutrient-density to the formula.

Kelp

Form:

Whole, dried *Fucus vesiculosus*

Key body systems:
Immune, endocrine

Kelps are large brown algal seaweeds that have been used by people throughout the world as nutrient-rich foods and as herbal medicine compounds since ancient times. Kelp is high in trace nutrients and minerals that are often deficient in modern soils (especially in some countries e.g. New Zealand) such as iodine and selenium.

Key benefits of kelp supplementation:

- Micronutrient support of the thyroid gland
- Improved overall nutrition status

Kelp is high in iodine, a mineral that is essential for the creation of thyroid hormones and traditional medicinal use has typically been for the nutritional support of the thyroid gland. Pre-clinical evidence has also suggested that there might be anticoagulant and anti-diabetic effects of kelp supplementation for which further research is required.[435]

Why kelp?

Kelp provides a natural source of trace nutrients, especially iodine, and is used in the formula to help provide this nutritional support (not therapeutic dosages, for which prescription by a registered practitioner is required).

Dunaliella salina

Form:
Dunaliella salina dried extract
Key body systems:
Immune, endocrine

Dunaliella salina is a green micro-alga that is found living in salt-fields. It is especially prized for its antioxidant activity due to its ability to make large amounts of carotenoids and glycerol which function to protect it against light damage and osmotic pressure respectively.

Key benefits of dunaliella supplementation:

- A natural source of carotenoids
- Improved antioxidant status

Dunaliella is known for its accumulation of large quantities of carotenoids. The antioxidant effects of these carotenoids, specifically from dunaliella have been demonstrated in rats, and interestingly, the naturally occurring carotenoids from *Dunaliella salina* were more effective for this purpose than dose-matched synthetic beta-carotene.[436]

Why dunaliella?

Dunaliella is rich in the antioxidant carotenoids. The emerging research suggests that this natural source is superior for antioxidant effects that synthetic beta-carotene commonly used as the sole carotenoid in supplements.

VEGETABLES, BERRIES, AND FRUITS

Vegetable blend

Beetroot, broccoli sprout, carrot, spinach

Form:
Whole vegetable powders of Beta Vulgaris Taproot, Brassica Oleracea 'italica' Sprout, Daucus Carota 'sativus' Taproot, Spinacia Oleracea leaves
Key body systems:
Immune, circulatory, respiratory, nervous

Nutrient-rich vegetables lack in the modern diet. Many people fail to get enough vegetables in their diets, and yet, there is a linear association between vegetable intake and health outcomes.

Key benefits of supplementing with vegetable blends:

- Improved overall nutrient status
- Antioxidant effects
- Improved endurance performance
- Anti-hypertensive
- Reduced inflammation
- Possible anti-cancer effects
- Improved cognition

Vegetables are rich sources of both primary, essential nutrients and secondary nutrients critical to health.

Beetroot is high in folate and manganese and also provide rich 'red' anthocyanins which have antioxidant

effects. Beetroot also contains high levels of nitrates that have been demonstrated to reduce high blood pressure[437] and improve endurance performance.[438]

Broccoli is rich in vitamins C and K, B vitamins, the carotenoids lutein and zeaxanthin, and the sprouts of the broccoli plant are high in the prospective anti-cancer compound sulforaphane. Early research suggests that sulforaphane-rich broccoli sprout extracts positively modify innate oxidative responses,[439] reduce inflammatory markers in those with diabetes,[440] and might be useful for cancer treatment.[441] They might also improve cognitive decline in people with schizophrenia.[442]

Carrots are especially high in vitamin-A precursor carotenoids beta-carotene and alpha-carotene, along with gamma-carotene, lutein, zeaxanthin, and vitamin K and B-vitamins. Insufficient intake of vitamin-A and its precursors can lead to problems with night-vision, along with immunity and gene expression.

Spinach is a rich source of vitamins A, C, E, and K, magnesium, manganese, iron, calcium, potassium, folate and the B-vitamins riboflavin and vitamin B6. Animal and other research has suggested that spinach, due to the combination of essential nutrients and secondary antioxidants it contains, could help to protect against oxidation, neurodegenerative disorders and improve cognition.[443]

Why added vegetables and extracts?

Many people do not routinely eat all the vegetables that they require for optimal health. Vegetable extracts and powders can help to address this and provide a range of synergistic primary and secondary nutrients for the whole-food base of this formula.

Fruit and Berry blend

Acerola, apple, bilberry, blackcurrant, goji berry, papaya

Form:

Fruit powders of *Malus pumila* and *Carica papaya*. High-potency extracts from the fruit of *Malpighia emarginata*, *Vaccinium myrtillus*, *Ribes nigrum*, and *Lycium barbarum*

Key body systems:

Immune, circulatory, respiratory, nervous

Fruits and berries contain many essential and 'conditionally essential' nutrients for health. Fruit powders provide additional nutrients, while berries provide a range of antioxidants beneficial to both health and performance and are considered both foods and traditional medicines.

Key benefits of supplementing with fruit and berry blends:

- Improved overall nutrient status
- Antioxidant effects
- Improved endurance performance
- Reduced inflammation
- Possible anti-cancer effects
- Improved cognition
- Improved eye-health

Acerola is one of the richest sources of vitamin C (50-100 times that of oranges) and has extremely high antioxidant properties which have led to it being researched for anti-aging properties and benefits to overall health.[444]

Apples contain a balance of essential micronutrients to increase the nutrient-density of the diet.
Bilberry is rich in anthocyanins and, while further research is required, may help play a protective role for a range of conditions including cataracts, heart disease, diabetes, dysmenorrhoea, and retinopathies.[445]

Blackcurrants are rich in vitamin C, iron, and manganese, along with very high levels of anthocyanin polyphenols that are being researched for their antioxidant effects and other health benefits. Early human studies have shown reduced visual deterioration in glaucoma,[446] and benefits to overall performance in repeated exercise activities,[447] from blackcurrant extracts.

Goji or wolfberry is another berry rich in antioxidants which has been used extensively in cuisine and medicine in Asia since ancient times. Current research suggests that goji might offer benefit to overall health and conditions such asthma, the prevention of cancer, cognition, immunity, vision, and anti-aging.[448]

Papaya is a traditional food and medicine, high in carotenoids, vitamin C and folate, along with antioxidant phytochemicals and papain and

chymopapain, protein-digesting enzymes that have anti-microbial properties.[449] *In vitro* research has suggested a potential anti-cancer role for papaya and this being investigated further.[450]

Why added fruit and berry extracts?
Fruits and berries provide a vast array of antioxidant phenols and other phytochemicals that exhibit an array of benefits to health. Whole food derived extracts of fruits and berries help to support overall nutrition more than simply providing the primary, essential vitamins and minerals.

Hawthorn

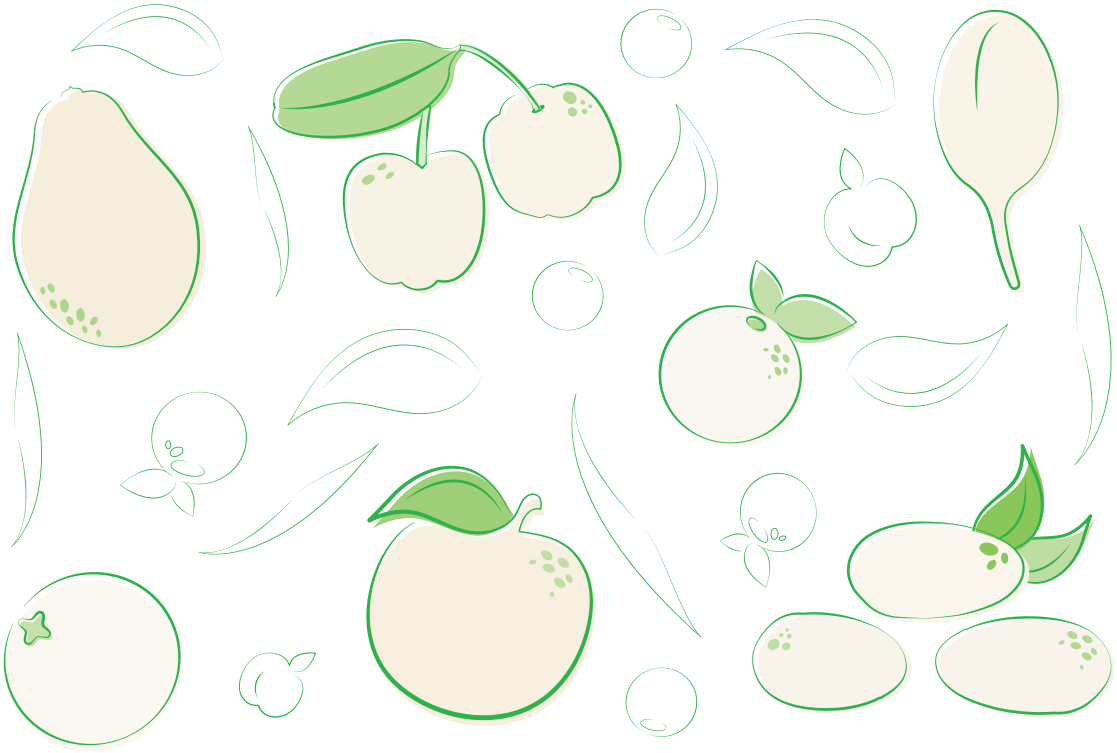
Form:
Dried extract from *Crataegus monogyna*
Key body systems:
Immune, circulatory

The leaves and fruits of hawthorn have been used in traditional cookery throughout Asia, Europe and North America. The leaves and fruit have also been used in traditional medicine systems in these areas as a digestive aid and for the improvement of cardiovascular function. Hawthorn is rich in various phytochemicals; tannins, flavonoids, oligomeric proanthocyanidins, and phenolic acids.

Key benefits of hawthorn supplementation:
- Antioxidant effects
- Improved cardiovascular health

Hawthorn has been mostly studied for its benefits in cardiovascular disease. A 2010 review of these studies concluded, current research to date suggests that hawthorn may potentially represent a safe, effective, nontoxic agent in the treatment of cardiovascular disease and ischemic heart disease.[451]

Why hawthorn extract?
Extracts provide greater amounts of active ingredient by volume. Using a hawthorn extract allows for inclusion of the cardiovascular supporting effects of hawthorn in the formula.



COMMON QUESTIONS

1

Gut health – why apple pectin and not inulin or FOS as a prebiotic?

Apple pectin is typically more easily tolerated by those who are sensitive to fibres and resistant starches (like those following a FODMAP restricted diet) than fructo-oligosaccharides or inulin.

2

Why use Vitamin D3 from lichen? – why not use D2 as a vegan solution?

D3 is considered to be a superior source for health and is the naturally occurring and produced form in the human body. However, most vitamin D3 is produced from sheep's lanolin and so, cannot be used by those following a vegan lifestyle. We use vegan vitamin D3 extracted from lichen plants so that all of our users can benefit from the superior form of this essential vitamin.

3

Why Vitamin K2 (as menaquinone 7)? – why not just rely on the K1 already present in the plant ingredients?

Both K1 and K2 are highly valuable for the body. However, specific benefits for circulatory health have been noted for vitamin K2, especially from the MK-7 form. It is also not very plentiful in most diets and so, both K1 and K2 MK-7 are used in the formula to give a spectrum of benefits not always provided by the modern diet.

4

What is the advantage using red marine algae as the calcium source?

Red marine algae in the form of *L. calcareum* provides an absorbable form of calcium from an entirely natural, traditionally used-source. It also provides a complex of synergistic minerals and trace nutrients beneficial for overall health.

5

What is the advantage of using kelp as the iodine source?

Kelp is nature's very best source of the essential mineral iodine. It also contains an array of other beneficial essential and secondary nutrients.

6

Why include mixed natural tocopherols and mixed natural carotenoids?

While alpha-tocopherol has been considered the 'active' vitamin E and is very important for health, all of the vitamin E family have benefits to human function. For example, alpha and gamma tocopherols provide contrasting and complementary actions for immune and inflammatory modulation. Gamma forms have also been shown to be more effective antioxidants and excessive amounts of alpha-tocopherol alone might inhibit these effects. For the balance of our innate immune, inflammatory and antioxidant pathways, we have included a mixed, natural vitamin E blend.

7

Why have we avoided rice bran, soy lecithin and alfalfa?

While these foods can be healthy additions to the diet, they can also contain anti-nutrients and allergens (in the case of soy and rice bran) which can affect the digestion and absorption of nutrients for some people. Alfalfa is also a nutrient-dense food but high intakes and isolated extracts might be of concern for triggering relapses of autoimmune conditions.

8

Why is there no added Iron?

Iron is an essential nutrient and many people are deficient in it. However, a large minority of people might also experience a sub-clinical iron overload that can out them at risk of increased risk of poor health (especially poorer cardiovascular health) over

time. There is a small, supportive amount of iron derived from the range of whole-food ingredients but additional iron has not been added due to the risk of iron overload for some. It is recommended that anyone who suspects they may require additional iron seeks advice from a qualified health practitioner.

9

Why has no significant level of protein been added?
This formula is intended as a supportive micronutrient formula, not a protein drink. A small amount of protein has been added to aid digestion and supply some amount of the essential amino acids. Clean Lean Protein, containing high-quality (great tasting!) pea protein isolate is the perfect accompaniment to Good Green Vitality for anyone wanting to supplement their protein intake.

10

How and when is Good Green Vitality best taken?
Good Green Vitality is best taken every day, in the morning. Many people start their day with Good Green Vitality in water or mixed with water and Clean Lean Protein as a healthy smoothie, or after breakfast if they have especially sensitive digestion. It is also a great addition to a protein drink before or after exercise.

11

Do I still need to take a multi vitamin?
Good Green Vitality IS a multi-vitamin. In fact, it's a multi that's much more than a multi because it also contains a range of nutrient-dense whole food ingredients, including berries, vegetables, fruits, herbs, and more!

12

Is it OK to take Good Green Vitality while pregnant or breast feeding?

According to our expert advisory team, Good Green Vitality is safe to use during pregnancy and breast-feeding. However, everyone is different and during pregnancy you may need to increase your intake of some vitamins and minerals (especially folate). If anyone is pregnant or breastfeeding it is recommended that they consult their health practitioner to find a supplement prescription that works best for them.

13

I am a large person, should I adjust my serve size due to my size?
Nutrient requirements do change with body size. While a serving is going to be effective for almost all people, you can adjust the serving if you are much larger or smaller than average.

14

Is Good Green Vitality safe for children?
While Good Green Vitality is safe for children, they do have lower nutrient requirements due to their smaller body size. It is recommended to use a child-specific formula like Kids Good Stuff.

15

I am a person who exercises regularly and often at reasonably intense levels. What size serve should I take, and should I consider additional supplementation?
Athletes do have nutrient requirements higher than sedentary people. Many of our athletes choose to take two servings of Good Green Vitality per day; in the morning and again before or after training or in the early afternoon. Athletes can also have a higher requirement for other nutrients too and many athletes combine Good Green Vitality with additional vitamin C, magnesium, omega-3s, and other nutrients as recommended by their healthcare practitioner.

References available upon request.

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