

Supplement

An Encyclopaedia of Nutritional and Herbal Supplements

Vitamin A

Retinol

A) GROWTH AND DEVELOPMENT

It appears that vitamin A influences growth and development due to its effects on the synthesis of glycoproteins, which in turn may maintain proper cellular function and expression of genes. Deficiencies are especially apparent in the lining of the cornea of the eyes, respiratory tract, intestinal tract, skin, urinary tract and the ducts of secretory glands.

B) SKIN HEALTH

Vitamin A influences the cellular production of mucin and keratin. A deficiency of vitamin A causes an abnormal increase in keratin production, leading to hyperkeratinisation of the skin cells. Vitamin A supplementation has been shown in research to benefit various skin disorders (e.g. acne, psoriasis).

C) EYE HEALTH

Vitamin A is needed by the rods and cones in the eye's retina, responsible for night and daytime vision respectively. Impaired adaptation to changes in light and poor vision are often found in people with low vitamin A status. A deficiency of vitamin A also causes a 'hardening' of the cornea of the eye due to an abnormal increase in keratin production.

D) RESPIRATORY HEALTH

Vitamin A is essential for the integrity of the epithelial lining and protective secretions of the respiratory tract. A deficiency of vitamin A causes an abnormal increase in keratin production, leading to hyper-keratinisation of the cells in the respiratory tract.

E) IMMUNE FUNCTION

The positive effect of vitamin A on maintaining the normal integrity, function and secretions of the body's epithelial tissue reduces the risk of the tissue becoming infected. Vitamin A also possesses antiviral and immune-enhancing properties, and is essential for proper function and growth of the thymus gland (the master gland of the immune system), while preventing thymus wasting caused by oxidative stress.

Potential Applications

- Tissue healing / repair
- Skin health (general)
- Acne
- Psoriasis
- Eye health
- Respiratory health
- Immune system support and improved thymus function

Typical Supplemental Dosage Range

- 800-2252ug (2664-7500iu) per day

(To convert iu (international units) to mg (milligrams) for pre-formed vitamin A (retinol): divide iu potency by 3.33)

Common Food Sources (retinol form)

- Liver
- Milk
- Kidney
- Butter

*(see **Carotenoids** chapter for provitamin A food sources)*

Contraindications/Drug Interactions

- Due to an increased risk of causing birth defects, vitamin A supplementation (as retinol) should NOT exceed 1501ug (5000iu) during pregnancy without doctor's supervision; regular consumption of liver should also be avoided.
 - Retinol is stored in the liver and supplementation in massive doses over extended periods can lead to toxicity. Toxicity symptoms (e.g. headache, chapped lips, dry fissured skin, brittle nails, alopecia, gingivitis, anorexia, irritability, fatigue, nausea) may occur in adults who take doses above 15,013ug (50,000iu) per day over several years.
 - High levels of vitamin A are not recommended in those with chronic kidney complaints.
 - High-potency supplemental intake should be avoided in oral contraceptive users.
- Please Note: Though certain carotenoids (e.g. beta carotene) convert into vitamin A in the body, they are not associated with the same risks/precautions as pre-formed vitamin A (retinol and its derivatives).

AC-11

AC-II is a botanically-based, patented water-soluble extract of *Uncaria tomentosa* that has been scientifically shown to support DNA repair.

A) AGEING

DNA damage is associated with suppressed immune function, the progression of disease and premature ageing. In one clinical study, after eight weeks of supplementation with AC-II at dosages of both 250mg and 350mg per day, subjects showed a significant increase in their ability to repair DNA (about 12 to 15%) following a dose of free radical-producing hydrogen peroxide.

B) ANTI-INFLAMMATORY

Oral AC-II has been shown to decrease DNA damage and to increase DNA repair capacity in human volunteers. Research has demonstrated that AC-II inhibits the nuclear transcription factor NF-kB, which is activated in arthritis and other inflammatory conditions.

C) IMMUNE SUPPORT

White blood cells are an essential part of the immune system because their job is to defend the body against foreign invasion. Several studies have found that AC-II increases white blood cell (WBC) counts. A randomised human intervention study in 23 men found that those who took 350mg of AC-II twice a day for two months experienced statistically significant immune enhancement compared to controls, with higher total WBC counts and enhanced lymphocyte to neutrophil ratios.

Potential Applications of AC-11

- Anti-ageing
- Immune support
- Autoimmune conditions
- Inflammation
- Arthritis
- Healing (injury or surgery)
- Family history of heart disease, diabetes, other ageing conditions

Typical Supplemental Intake Range

350mg per day

Contraindication/Drug Interactions

Caution if taking warfarin.

Do not use if pregnant or breastfeeding

AC-II

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Acai Berry

Euterpe oleracea Mart

The acai (pronounced Ah-Sa-E) palm tree, *Euterpe oleracea*, is found in Central and South America and is most plentiful in Brazil, particularly in the flood plains of the Amazon. For centuries, acai, which translates to "fruit that cries," has been included in the diets of the Amazon's native peoples.

A) ANTIOXIDANT/FREE RADICAL SCAVENGER

Acai berries are a potent source of antioxidant compounds, including anthocyanins, flavonoids and polyphenols. The major anthocyanins in the acai fruit are cyanidin 3-glucoside (C3G) and cyanidin 3-rutinoside (C3R). To date, the radical scavenging/antioxidant capacity of C3G has been demonstrated in at least a dozen different assays. In one study, C3G came out on top when compared to 13 other anthocyanins in the ORAC (oxygen radical absorbance capacity) test, which evaluates antioxidant activity. Another study found that C3G was 40 times better than vitamin E in preventing damage caused by ultra violet light.

B) ANTI-INFLAMMATORY

Inflammation is a normal immune response to infection or irritation that involves the mobilisation of white blood cells to the injured site. Cytokines are chemical messengers involved in signalling the immune cells to the site of inflammation. Unfortunately, these pro-inflammatory cytokines also release free radicals into the system, so sometimes their presence is less than helpful. C3G, one of the anthocyanins found in acai, has been shown to modulate pro-inflammatory cytokines and may therefore be of value in conditions characterised by chronic inflammation.

Specific research utilising acai fruit pulp showed it to exert anti-inflammatory effects, an important finding, since inflammation underlies many chronic diseases of ageing. Further research investigated other bioactives related to anti-inflammation and immune functions. Acai was found to be a potential cyclooxygenase (COX)-1 and COX-2 inhibitor.

C) CHOLESTEROL REGULATION

Acai berries are rich in plant compounds called Phytosterols. Research has demonstrated that phytosterols play a role in the reduction of Low-density lipoprotein (LDL) or bad cholesterol. Phytosterols interfere with absorption of cholesterol within the intestines and have been shown to reduce cholesterol in human subjects by up to 15%. Furthermore, anthocyanins contained within acai berry, promote blood flow and inhibit cholesterol synthesis. Research suggests that C3G may help to maintain cholesterol levels that are already within a healthy range.

D) ARTERIAL PROTECTION

A mechanism by which atherosclerotic plaque accumulates on the walls of arteries is the oxidation of LDL cholesterol. Research has shown that C3G decreases the susceptibility of cholesterol and triglycerides to oxidation, which in turn supports the health of the arteries. Also, inflammation is an emerging trigger in heart disease; acai berry is a potent anti-inflammatory agent.

Potential Applications of acai berry

Protection for cardiovascular health (including cholesterol management)

Inflammation

Antioxidant protection

Skin health

Vascular health (e.g. varicose veins, phlebitis, haemorrhoids)

Ageing

Principle actives:

Flavonoids, phytosterols and polyphenols

Anthocyanins including cyanidin-3-glucoside (C3G) and cyanidin-3-rutinoside (C3R).

Contraindications/Drug interactions

None noted.

Acai

Rodrigues RB et al. Agric Food Chem. 2006;54(12):4162-7.

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Mertens-Talcott SU et al. J Agric Food Chem. 2008;56(17):7796-802.

Schauss AG et al. J Agric Food Chem. 2006;54(22):8598-603.

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Acetyl L-Carnitine (ALC)

A) BRAIN FUNCTION ENHANCEMENT

ALC appears to be a more active form of carnitine as far as brain health is concerned. ALC is structurally similar to the most abundant neurotransmitter in the brain, acetylcholine, which becomes poorly utilised in Alzheimer's disease. Researchers have theorised that ALC can mimic acetyl-choline in the brains of Alzheimer's patients. In fact studies suggest that ALC may also act as an antioxidant in the brain, stabilise cell membranes, aid the removal of cellular waste, improve energy production in brain cells, as well as mimicking acetyl-choline. Studies report that early-onset Alzheimer's disease may respond most effectively to ALC. The properties of ALC have also been studied in relation to other age related brain conditions such as senile dementia and depression, with positive results.

B) ENERGY ENHANCER/ATHLETIC PERFORMANCE

This nutrient is required to carry long chain fatty acids into the mitochondria, the energy-producing components of cells, so they can be metabolised into energy. Some studies have suggested a role for carnitine in endurance athletes where results suggested an increase in energy producing enzymes and improved cardiovascular function. Whilst ALC can be used for this purpose, L-Carnitine is the preferred form for this purpose.

C) AGEING

Carnitine levels have been shown to decline with age, which is thought to be responsible for age related alterations in mitochondrial function (mitochondria are cell components responsible for making energy). Recent preliminary studies have suggested a role for ALC in preventing these changes. Indeed one study suggests that supplementation along with nutrient co-factors, alpha lipoic acid and antioxidants can improve mitochondrial energy metabolism, decrease oxidative stress (a major cause of ageing in its own right) and improve memory. However, further long-term studies are required before these results can be confirmed.

D) LIPID-LOWERING

Research shows carnitine to reduce cholesterol and triglyceride levels, while improving the ratio between HDL (good) and LDL (bad) cholesterol. Studies have reported up to a 20% reduction in LDL cholesterol, a 28% reduction in triglycerides and a 12% *increase* in HDL cholesterol. Improving the ratio between HDL and LDL cholesterol is thought to be one of the most important factors in preventing cardiovascular disease.

E) HEART TONIC

Fatty acids are the primary source of fuel for the heart. Carnitine is required for the transport of fatty acids into the mitochondria, where they are metabolised into energy. Carnitine is therefore a crucial factor in the maintenance of heart health. Whilst ALC can be used for heart health, L-Carnitine is the preferred form for this purpose.

Potential Applications of ALC:

- Improved memory and mental alertness (especially in older adults)
- Senile dementia and Alzheimer's Disease
- Depression

- Ageing
- Atherosclerosis
- Angina
- Cardiomyopathy
- Heart arrhythmia
- Cholesterol and triglyceride reduction
- Fatty liver disease
- Muscle weakness
- Weight control
- Enhanced aerobic endurance to exercise

Please note:

In the case of enhancing brain function, ALC is preferred to 1-carnitine. When using in improving cardiovascular health, 1-carnitine is considered more appropriate.

Typical intake range:

250-1000 mg per day (taken on an empty stomach)

Food sources (of carnitine, which is converted to ALC in the body)

Beef, pork, milk, cod, chicken, ice cream, avocado, whole-wheat bread, asparagus

Contraindications/Drug Interactions

- Certain reports have suggested that ALC should be avoided if pregnant or breastfeeding unless under supervision by a qualified medical health practitioner.
- Carnitine deficiency may arise from use of various drugs, including valproic acid, phenobarbitol, didanosine, zalcitabine, stavudine, and pivalic acid containing antibiotics.

Acetyl-L-Carnitine

Spagnoli A, Lucca U, Menasce G, et al. *Neurology*. 1991;41(11):1726-1732
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Acetyl L-Carnitine Arginate (ALCA)

Acetyl-L-carnitine has the ability to cross the blood-brain barrier, therefore enabling it to influence brain function. ALC has been shown to protect and regenerate nerve cells and is structurally similar to acetylcholine - the most abundant neurotransmitter in the brain. ALC may therefore be valuable in aiding short term memory and motor control. Acetyl-1-carnitine arginate (ALCA) has been shown to be superior to ALC in supporting brain function, where the incorporation of arginine into the molecule provides additional support.

A) BRAIN FUNCTION ENHANCEMENT

ALCA is a patented type of carnitine, which appears to offer advantages over traditional acetyl 1-carnitine (ALC) . In one study acetyl-1-carnitine arginate demonstrated potential support for maintaining healthy central nervous system function by promoting healthy neurite function. Neurites are the hair-like projections of neurons, or nervous system cells, responsible for proper signal transmission. The acetyl group from acetyl-1-carnitine (ALC) is also responsible for production of acetylcholine, an important neurotransmitter for optimal mental functioning. The efficacy of long-term acetyl-1-carnitine supplementation was investigated in a doubleblind,

placebo-controlled, randomized trial, in which acetyl-L-carnitine demonstrated the ability to slow negative cognitive changes and supported memory and attention'. A randomised double-blind study and a multi-centre trial suggested that acetyl-L-carnitine supplementation provided statistically significant support for mental function, including memory and attention, and behavioural and emotional support. Researchers have theorised that ALC can mimic acetyl-choline in the brains of Alzheimer's patients. In fact studies suggest that ALC may also act as an antioxidant in the brain, stabilise cell membranes, aid the removal of cellular waste, improve energy production in brain cells, as well as mimicking acetyl-choline. Studies report- that early-onset Alzheimer's disease may respond most effectively to ALC.

B) AGEING

Carnitine levels have been shown to decline with age, which is thought to be responsible for age related alterations in mitochondrial function (mitochondria are cell components responsible for making energy). Recent preliminary studies have suggested a role for ALC in preventing these changes. Indeed one study suggests that supplementation along with nutrient co-factors, alpha lipoic acid and antioxidants can improve mitochondrial energy metabolism, decrease oxidative stress (a major cause of ageing in it's own right) and improve memory. However, further long-term studies are required before these results can be confirmed.

C) MALE SEXUAL FUNCTION

Acetyl-L-carnitine and arginine also play roles in healthy male reproductive function. Acetyl-L-carnitine is present in human sperm and seminal fluid and plays an important part in energy metabolism, which may support healthy sperm motility and spermatogenesis, or sperm production. As a nitric oxide precursor, L-arginine may support healthy sexual function in men with low urinary nitric oxide values.

Potential Applications of ALCA:

- Improved memory and mental alertness (especially in older adults)
- Senile dementia and Alzheimer's Disease
- Memory
- Depression
- Ageing
- Male sexual function

Please note:

In the case of enhancing brain function, ALC and ALCA are preferred to L-carnitine. When using to support cardiovascular health, L-carnitine/gPLC is considered more appropriate.

Typical intake range of ALCA:

250-1000 mg per day (taken on an empty stomach)

Drug interactions/contraindications:

Certain reports have suggested that ALC and ALCA should be avoided if pregnant or breastfeeding unless under supervision by a qualified medical health practitioner. Carnitine deficiency may arise from use of various drugs, including valproic acid, phenobarbitol, didanosine, zalcitabine, stavudine, and pivalic acid containing antibiotics.

ALCA

Spagnoli A, Lucca U, Menasce G, et al. Long-term acetyl-L-carnitine treatment in Alzheimer's disease. *Neurology*. 1991;41(11):1726-1732

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Liu J, Head E, Gharib AM, et al. Memory loss in old rats is associated with brain mitochondrial decay and RNA/DNA oxidation: partial reversal by feeding acetyl-L-carnitine and/or R-alpha -lipoic acid. *Proc Natl Acad Sci USA*. 2002;99(4):2356-2361

Adenosine S'-triphosphate (ATP)

ATP is most well known for its role in energy production inside the cell, where the process of removing one of the three phosphate groups yields energy to power cellular functions.

However, it has recently become clear that ATP also plays a crucial role outside the cell and scientists are now beginning to understand the importance of extracellular ATP levels, and their role in determining the health of all tissues in the body.

Levels of ATP in the blood plasma decline by a massive 50% between the ages of 20 and 70 years and researchers now believe that extracellular ATP levels could be a causal factor in the ageing process. ATP acts as an important cell signaler and has the effect of relaxing blood vessels, which in turn has the effect of stimulating blood flow. Ultimately this ensures more efficient transport of nutrients and oxygen into the tissues, and more efficient removal of metabolic waste products from them. In other words, extracellular ATP not only impacts positively on vascular health, it impacts on the function of every cell in the body.

A) VASCULAR HEALTH

Studies in humans show that factors such as age and disease states cause intracellular levels of ATP to drop significantly. It now appears that there is also a significant decline in extracellular levels of ATP, which negatively affects blood pressure and the health of the blood vessels. Recent preclinical studies have demonstrated that oral administration of ATP produces significant improvements in the health of the blood vessels and arterial oxygen pressure—without any adverse effects on blood pressure or heart rate.

Extracellular ATP circulates in the blood and acts upon ATP receptors on the lining of the blood vessels. This triggers the release of nitric oxide which improves the tone of the blood vessels and relaxes the vessel walls so that more blood can get through to the heart, lungs and peripheries, especially skeletal muscles. As well as the obvious benefits to the vascular system, this improvement in blood flow also facilitates the delivery of oxygen, glucose and other nutrients to all tissues of the body, and ensures efficient removal of metabolic wastes, thereby improving cellular efficiency through all tissues of the body.

B) ATHLETIC PERFORMANCE

Studies have shown increases in muscular strength among athletes supplementing ATP. These effects are thought to be because of the increase in blood flow brought about by extracellular ATP, which allows more nutrients to accumulate near the exercising muscle, supplementing it with the oxygen, glucose and other essential nutrients it needs to keep working. The stimulation of blood flow also enhances the removal of waste products such as lactic acid and ammonia from the muscles. This speeds recovery, which may enable athletes to train harder. In a randomised, double-blind, placebocontrolled trial, the effects of oral ATP administration on 27 male bodybuilders aged 18-45 was assessed. Men who took a high dose (225 mg) of the supplement daily for two weeks were able to do 18.5% more reps than before they started the supplementation and total lifting volume increased by 704kg compared to an increase of 429kg in the placebo group.

C) MENTAL FUNCTION

ATP administration increases cerebral blood flow, which may result in boosted mental acuity and may lessen the perception of fatigue and exercise-associated pain.

Potential Applications of ATP:

Fatigue

Athletic performance

Muscle strength/recovery

Ageing

Mental acuity
Vascular health
Circulatory problems
Cellular health
Energy production

Typical intake range of ATP

125 - 300mg per day

Contraindications/drug interactions

None reported, but caution is advised for people taking Warfarin.

Adenosine 5'-triphosphate

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Alfalfa

medicago saliva »

A) NUTRITIVE

Alfalfa is a rich source of chlorophyll, protein, minerals, vitamins (especially vitamin K) and enzymes.

B) ANTI-ARTHRITIC

Alfalfa is reported to reduce arthritic symptoms, most likely due to mild antiinflammatory and diuretic actions.

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C) DIGESTIVE HEALER AND 'FRESHENER'

Traditionally alfalfa has been noted for its beneficial effects in gastric conditions such as gas pains and ulcerous conditions. Alfalfa is a rich source of chlorophyll, which has been shown to kill certain harmful (and odour causing) bacteria in the digestive tract. It also accelerates the rate of healing of damaged tissue - a factor that may be very useful in digestive ulcers or irritation. p>

D) DIURETIC

Alfalfa possesses significant diuretic activity, which may be of value in local oedema and excessive fluid retention in general.

Potential Applications of Alfalfa •

- arthritic conditions
- fluid retention
- nutritional support during convalescence »
- minor stomach and digestive disorders

Contraindications/Drug Interactions •*

Reports suggest that alfalfa should be avoided in individuals with Systemic Lupus Erythematosus (SLE). *

Alfalfa

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Cookson F and Federoff S, British Journal of Experimental Pathology, 49, 1968, pp348-355.

Malinow M, et al. 4* International Symposium on Atherosclerosis, Tokyo, Japan, 1976.

Malinow M, et al, Science 1982;216:415

Algae

A) NUTRITIVE

Algae are rich in chlorophyll, amino acids (as highly digestible protein), vitamins, minerals, carotenoids, fatty acids, nucleic acids (RNA/DNA) and enzymes.

B) BLOOD BUILDING

Fat-soluble chlorophyll has been found to enhance haemoglobin and red blood cell production, in addition to iron, B12 and folic acid, which are also present in algae. This may make fat-soluble chlorophyll particularly suitable for those prone to anaemia and women who experience excessively heavy menstrual flow.

C) WOUND HEALING

Chlorophyll is useful for stimulating healing internally and for healing external wounds (with topical administration).

D) INTESTINAL REPAIR

Because of its healing ability, chlorophyll is particularly suitable in digestive conditions such as inflammatory bowel diseases and conditions of excessive intestinal permeability (i.e. leaky gut disorder). Chlorophyll also possesses anti-bacterial properties, which may further enhance its wound-healing potential.

E) DEODORISING

It is common for chlorophyll or chlorophyll rich plant foods to be used to reduce or eliminate odours (e.g. breath, intestinal, etc.). Chlorophyll appears to bind to various odour-causing compounds, and may kill bacteria associated with causing certain human odours.

F) ANTI-BACTERIAL

As mentioned, chlorophyll possesses anti-bacterial effects. Not only do these help with odours produced in the digestive tract, but may also account for at least some of the promotion of wound healing.

G) DETOXIFICATION

Besides helping to protect cells from toxic influences, chlorophyll, and particularly certain enzymes and amino acids are beneficial in helping the body to detoxify. According to scientific studies, algae, particularly chlorella, can help to detoxify such toxins as lead, mercury, cadmium, arsenic, pesticides, insecticides and PCB's from the body.

Main types of algae available

SPIRULINA (BLUE GREEN)

Although its chlorophyll content is substantially lower than chlorella, spirulina is still one of the best sources of chlorophyll. It is also 65 to 71% complete protein and remarkably rich in essential nutrients. Research suggests that the protein in spirulina is more digestible than other sources, eg., beef protein, is only 20% digestible whereas spirulina protein is as much as 95% digestible.

CHLORELLA (GREEN)

Chlorella is a single-celled fresh water algae, rich in chlorophyll, but also an excellent source of other nutritional factors and one of the most powerful detoxifiers of all foods. It does not contain as much protein or beta-carotene as spirulina, but has higher levels of chlorophyll and twice the levels of nucleic acid. Because of these high levels of nucleic acid, chlorella can help to speed up the renewal and healing of damaged tissue internally and in external use, this is called the chlorella growth factor or CGF. The CGF also strengthens immunity by improving the activity of T and B cells, which protect the body against viruses and other invading microorganisms. There have also been reports that the CGF has increased the growth rate of children.

KLAMATH (BLUE-GREEN)

Aphanizomenon Flos-Aquae algae found in the Klamath Lake in Oregon, USA, is the richest known supplemental source of chlorophyll and is also rich in essential nutrients.

Potential health applications and research on Algae chlorella spirulina

- general nutritional support * *
- nutritional support on calorie restricted diets *
- digestive ulcers or irritation *
- immune support * *
- liver support &: detoxification, incl heavy metals *
- fatigue * *

- blood building * *
- digestive disorders *
- intestinal gas *
- foul smelling stools *
- nutritional support in convalescence *
- childrens nutrition * *
- radiation exposure *
- cholesterol and mild hypertension . * *
- kidney detoxification *
- fibromyalgia *

Contraindications/Drug Interactions

None noted.

Algae

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Walsh D, Research News, (1981)

Laquerbe B, et al, CR Acad Sci, 270 (17), (1970) pp 2130-2132

Aloe Vera

aloe barbadensis

A) INTERNAL HEALING

Results show that compounds found in aloe vera help regulate pepsin levels, reduce hydrochloric acid production and provide a demulcent effect - all helpful in healing digestive ulcerations. Reports suggest that aloe vera can improve digestion through enhancing protein breakdown and assimilation and/or reducing bacterial putrefaction.

B) EXTERNAL HEALING

Studies suggest that polysaccharides present in aloe vera may stimulate the epidermal growth and repair process. Also, nutrients including zinc, vitamins C and E found in aloe would contribute to the healing effects.

C) LAXATIVE

An active constituent, aloin found in the whole leaf of aloe vera acts as a tonic to the digestive system, increasing colonic secretions and peristaltic contractions. At higher levels, aloin becomes a powerful purgative.

(Best used in moderation as excessive use of laxatives can be irritating and cause diarrhoea and prolonged use of laxatives may cause dependency in some individuals.

D) IMMUNE SYSTEM ENHANCEMENT

A key polysaccharide acemannan acts as a powerful immune system stimulant. This compound has been shown to raise both white blood cell and interferon production.

Potential Applications of Aloe Vera

- digestive ulceration (juice or gel)
- burns, cuts and skin ulcers (juice or gel)
- bowel irritation (juice or gel)
- constipation (leaves, juice or gel)
- viral/bacterial/fungal infections (leaves, juice or gel)

Principle actives

Polysaccharides (e.g. acemannan) aloin

Contraindications/Drug Interactions

Do NOT use when pregnant.

Caution with heart medication or steroids - check with doctor.

Aloe Vera

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Alpha Lipoic Acid

Also known as thioctic acid, lipoic acid is a sulphur-containing, vitamin-like substance. It is both fat and water-soluble, which means that it has a wide range of uses.

A) ANTIOXIDANT

Lipoic acid acts as an antioxidant by recycling other antioxidants such as glutathione (a major detoxifier in the liver), vitamin C and Co Q10, as well as vitamin E.

B) HEAVY/EXCESS METAL REMOVAL

Heavy metals like lead, mercury and cadmium can be chelated to lipoic acid for harmless removal from the body. It is also thought to have an effect on other conditions of excess metals, eg. iron in haemochromatosis.

C) LIPID PROTECTION

Lipoic acid directly and indirectly protects fats. It helps to recycle vitamin E to its tocopherol form and protects LDL cholesterol from oxidative damage. Research suggests that it also may even revert oxidised LDL cholesterol into its non-oxidised form. Lipoic acid facilitates glutathione production, one of the body's most important antioxidant and detoxification compounds.

D) BLOOD SUGAR CONTROL

Lipoic acid assists a better utilisation of glucose by muscles, therefore reducing blood sugar levels, and acts as a cofactor in the production of cellular energy (ATP). It is known that low levels of lipoic acid often occur in diabetics, which increases the chance of glycation (cellular damage triggered by glucose) - this can lead to common problems in diabetes such as diabetic neuropathy (nerve damage).

E) CELL PROTECTION

Lipoic acid protects the cell membranes. Because of its relatively small molecular size, lipoic acid can protect both outside and inside cell membranes, including the membrane around the nucleus, which houses the DNA.

F) ANTI-AGEING

Free radical damage and a process called glycation are perhaps the two major factors in the ageing process and body degeneration in general. Glycation occurs when proteins react with excess glucose causing damage to tissues, collagen is one of the proteins most susceptible to this process. Glycation happens spontaneously, it doesn't require enzymes and is as destructive as oxidative damage. In part, due to its impact on blood sugar metabolism and subsequent reduction of blood sugar levels, lipoic acid has been shown to inhibit glycation.

G) NERVE FUNCTION

Studies suggest that lipoic acid may aid in nervous system repair in those with damage caused by excessive blood sugar. Reduced pain and numbness have been reported with no adverse effects using high doses (up to 600mg per day). It has also been shown to be beneficial for other types of nerve damage by improving nerve cell membrane fluidity and blood flow in nerve tissues, resulting in regeneration of new nerve fibres.

H) SPORT AND EXERCISE

Lipoic acid is a coenzyme essential for the metabolism of fats and carbohydrates to produce ATP, the energy molecule found in cells. For fats and carbohydrates to enter the cellular energy (Krebs) cycle, they must be influenced by lipoic acid. Lipoic acid improves the uptake of glucose by muscle cells (which then use it to produce energy) and decreases the glucose uptake by fat cells (so less fat is stored by the body). Because there is an increase in ATP production and an improved recovery time, theoretically more exercise or physical activity can be tolerated.

I) LIVER PROTECTION

Lipoic acid has demonstrated liver protective properties in Amanita mushroom poisoning. 67 out of 75 patients recovered, compared with an expected rate of between 10 and 50%.

Part of this may be due to the mechanism by which lipoic acid increases cysteine, which is then taken up by the neutral amino acid transport system and utilized for glutathione synthesis - glutathione is a powerful antioxidant and detoxifier in the liver.

Potential health application of Alpha Lipoic acid

- antioxidant protection
- excessive blood sugar
- cardiovascular health
- heavy and excess metal removal
- and ageing
- sports nutrition
- nerve damage/pain
- liver protective

Contraindications/Drug Interactions

If taking insulin, consult a doctor before taking alpha lipoic acid.

Alpha Lipoic Acid

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L-Arginine

A) ATHLETIC PERFORMANCE

Numerous studies appear to support the value of L-arginine for athletes. It is necessary for production of various compounds needed for muscular energy production including creatine phosphate, guanidophosphate and phosphoarginine. Arginine is also required for the transport, storage and elimination of nitrogen, an action that is thought to be key in promoting efficient muscle metabolism.

B) MUSCLE GROWTH AND REPAIR

In addition to the athletic benefits of arginine outlined above, some studies also suggest it may enhance growth hormone release, an action that has made it popular amongst body builders and athletes looking to increase muscle mass. However, positive studies generally use intravenously administered arginine at relatively high doses (30-40g) and studies using orally administered arginine are less convincing. Claims that oral arginine can increase growth hormone release may therefore be unwarranted.

C) CIRCULATION

Arginine is a precursor of nitric oxide, a compound that is produced by the endothelial cells that line the band of smooth muscle surrounding blood vessels. Nitric oxide signals the smooth muscle fibres to relax, which improves circulation. This action may be especially relevant in preventing conditions such as hypertension and congestive heart failure (CHF), where peripheral blood flow becomes reduced. In one placebo controlled, double-blind trial, six weeks of arginine supplementation was found to significantly improve blood flow in patients with CHF compared to placebo.

D) CARDIOVASCULAR HEALTH

Impairment of nitric oxide synthesis is thought to be an early trigger for the development of atherosclerosis, and therefore heart disease. Preliminary research

suggests a role for arginine in the prevention of CVD, although as yet high arginine diets have not consistently been associated with reduced CVD mortality. However, studies have shown that supplementation with arginine may normalise platelet aggregation (the tendency for the blood to clot) in people with high cholesterol and the benefits to circulation described above would also be relevant to overall cardiovascular health.

E) MALE SEXUAL FUNCTION

As a precursor of nitric oxide, arginine may be involved in facilitating penile erection and may be useful in cases of erectile dysfunction (ED). Studies have reported improvements in erectile dysfunction following arginine supplementation among men with abnormal nitric oxide metabolism. In one specific study 40% of men taking 2.8g per day of arginine experienced an improvement in ED compared to none in the placebo group.

F) MALE INFERTILITY

Arginine is required for the formation of sperm. Indeed studies have shown that men fed arginine deficient diets for as little as nine days reduce sperm count by as much as 90%, and that sperm motility is reduced dramatically. Research suggests that arginine supplementation may be helpful in maintaining normal sperm counts and motility. In fact in some studies in infertile men supplementation has resulted in pregnancies. However, where sperm counts are very low, arginine appears to be less effective.

G) WOUND HEALING/IMMUNE SYSTEM SUPPORT

Research shows that arginine supplementation enhances collagen synthesis and speeds repair time of tissue injury from surgery. Arginine also appears to increase immune function, thereby reducing the risk of post-operative infection. Arginine is also

conditionally essential in patients with burns injuries and studies have demonstrated reduced length of hospital stay, fewer infections and improved immune function in burns patients given arginine supplementation.

H) LIVER PROTECTION

Ammonia, a major toxin to the liver, is converted into urea by arginine

Potential Applications of L-arginine

- Weight training and sports nutrition in general
- Infection
- Cirrhosis
- Healing of injuries and burns
- Infertility (male)
- Impotence
- Angina
- Hypertension (high blood pressure)
- Cardiovascular health
- Post-operative wound healing
- Poor circulation

Typical intake range

500-5,000 mg per day (taken on an empty stomach)

Food Sources

Soybeans, beef, pork, turkey, walnuts, sesame, pecan, peanuts, linseed, hazelnut, chocolate, cashews, buckwheat, brazil nut, almonds, mackerel

Contraindications/Drug Interactions

- Arginine may stimulate the production of gastrin, a hormone that increases the secretion of stomach acid. Arginine is therefore not advised with drugs that are also hard on the stomach, including NSAIDs, platelet inhibitors, alendronate, theophylline products, oral or injectable corticosteroids.
- High doses may alter potassium levels. Caution should be exercised with potassium sparing diuretics and ACE inhibitors.
- May counteract Cyclosporine, may increase absorption of Ibuprofen, may

potentiate effect of impotence drugs such as sildenafil citrate.

- Not to be taken by schizophrenics, pregnant or nursing women and those suffering renal or hepatic failure.

L-Arginine

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Ashwagandha

withania somnifera

A) ANTI-INFLAMMATORY

Researchers have shown in animal studies that ashwagandha exerts potent antiinflammatory properties comparable to or greater than that seen with aspirin or hydrocortisone therapy (as potent as corticosteroids in acute inflammation, half as potent in chronic inflammation). This action seems to warrant its use in arthritic and other inflammatory conditions.

B) ADAPTOGENIC (ANTI-STRESS) AND ANTI-FATIGUE

Ashwaganda increases tolerance to various stressors (e.g. mental, physical, environmental). Numerous studies show ashwagandha to be superior to even panax ginseng as an anti-stress adaptogen. Patients suffering from chronic fatigue syndrome reported a 45% improvement in symptom scores when using ashwagandha.

C) REGULATION OF IMMUNE SYSTEM

Evidence suggests that ashwagandha may be able to both boost a weakened immune system and suppress an overactive one. The latter action would theoretically offer great potential in auto-immune disorders such as rheumatoid arthritis, multiple sclerosis, lupus, etc.

D) ANTI-MICROBIAL

Researchers have shown the herb's active withanolides to possess significant antimicrobial (e.g. anti-bacterial, anti-viral, anti-fungal) activity. Numerous studies also refer to the cell-protective properties of withanolides.

E) CARDIOVASCULAR TONIC

Withanolides have been shown to influence cardiac muscle contractility and to possess blood pressure lowering properties.

Potential Applications of Ashwagandha:

- arthritis and other inflammatory conditions
- anti-stress
- auto-immune conditions
- viral/bacterial/fungal infections
- cardiovascular health
- chronic fatigue syndrome (ME)

Principle actives:

Withanolides

Contraindications/Drug Interactions:

Do not use when pregnant

Ashwagandha

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Astaxanthin

A pinkish-red carotenoid that is responsible for the pink colouration of salmon and flamingos, astaxanthin comes from marine sources, primarily micro-algae. It is able to operate in lipid and aqueous environments, meaning that it has far-reaching potential.

A) ANTIOXIDANT/FREE RADICAL SCAVENGER

Astaxanthin has been shown to be typically 10 times more potent than other common carotenoids such as beta carotene in terms of its antioxidant activity and between 80 and 550 times greater than vitamin E. Astaxanthin has demonstrated powerful protection for cell membranes against free radical damage and is thought to be particularly effective at scavenging singlet oxygen and nitrogen reactive species of radicals. Of particular interest is the ability of astaxanthin to enter the central nervous system where the concentration of unsaturated fatty acids provides the potential for significant free radical damage. Some researchers have suggested that astaxanthin may possess great potential in the prevention of diseases of the nervous system.

B) CARDIOVASCULAR HEALTH

Oxidised LDL cholesterol is a risk factor for the development of atherosclerosis. As a potent fat-soluble antioxidant, astaxanthin has been shown in studies to prevent oxidation and has therefore been proposed as a protective factor in cardiovascular disease. Preliminary studies also suggest that astaxanthin may be helpful in increasing levels of HDL (good) cholesterol while reducing potentially harmful LDL cholesterol. A high ratio of HDL to LDL is associated with a lower risk of heart disease. A blood pressure lowering effect has also been noted in research, possibly due to an influence on nitric oxide - which is smooth muscle relaxing.

C) CELL PROTECTION

Astaxanthin has been shown to improve cell to cell communication and cell stability therefore increasing the likelihood of maintaining cellular homeostasis and thus normal function and integrity. Astaxanthin also appears to promote cell membrane health, a vital requirement for proper cell function and stability.

D) PROSTATE SUPPORT

Although research on this aspect is in its infancy, preliminary test tube studies suggest that astaxanthin can inhibit the enzyme 5-alpha-reductase, which is responsible for the formation of dihydrotestosterone and subsequent prostate enlargement.

E) MALE INFERTILITY

Free radical activity is a major factor in male infertility, affecting both sperm count and motility. Studies suggest that astaxanthin can improve sperm motility and improve conception rates among infertile men.

F) SKIN HEALTH

Astaxanthin has been shown to provide some protection against damaging UV light exposure that can result in premature ageing of the skin.

G) VISUAL HEALTH

Many studies have demonstrated that dietary carotenoids help protect the retina against oxidative damage. The centre of the retina is called the macula and this area is responsible for the sharpest vision and has the greatest potential for damage by free radicals. Certain carotenoids appear to offer protection to the retina and macula by absorbing light energy and quenching free radicals. Studies have reported a significant protective effect of astaxanthin in preventing damage to the visual system. Other research suggests a role for carotenoids such as astaxanthin in the prevention of cataracts and macular degeneration.

Potential health applications of astaxanthin

- cardiovascular health
- antioxidant protection
- cell protection
- general eye health
- cataracts and macular degeneration
- cholesterol regulation

- nervous system protection

Contraindications/Drug Interactions

None noted.

Astaxanthin

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Astragalus

astragalus membranaceus

A) IMMUNE STIMULANT

Clinical studies show that astragalus reduces the incidence and shortens the duration of the common cold. Astragalus has also been shown to increase interferon production and secretion and increase white blood cell activity. Published research found it to protect against numerous viruses.

B) ADAPTOGENIC (ANTI-STRESS)

Astragalus may increase tolerance to various stressors (e.g. physical, mental, environmental). Improvement in endurance during exercise was also noted in research.

C) CARDIOVASCULAR TONIC

Astragalus has a vasodilatory action and has been shown to significantly lower blood pressure. The cardiotonic effect provides an increase in heart muscle contraction, which is particularly useful in cases of fatigue, exhaustion and convalescence.

D) DIURETIC

Studies show astragalus to be a gentle diuretic and is particularly beneficial in conditions such as nephritis or inflammation of the kidneys.

Potential Applications of Astragalus:

- immune enhancement
- anti-viral
- increasing endurance
- anti-stress
- cardiovascular health
- water retention

Principle actives:

Polysaccharides

Contraindications/Drug Interactions:

Best avoided in pregnancy.

Astragalus

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Vitamin B1

Thiamin

A) ESSENTIAL COENZYME

Vitamin B1 is an essential coenzyme (non-protein portion of an enzyme) of the enzyme thiamin pyrophosphate (TPP), which is required for the production of energy, metabolism of carbohydrates and proper nerve function. A severe deficiency in B1 leads to beriberi (manifested in symptoms such as confusion, oedema, emaciation, muscle atrophy, cardiovascular dysfunction (e.g. hypertension) and walking

difficulties), while other signs and symptoms are associated with less severe deficiencies (see below). Other than lack of intake, B1 deficiency can be caused or severely worsened by alcohol abuse or excessive carbohydrate intake.

B) NERVE FUNCTION

Vitamin B1 is needed for the synthesis, and possibly the release, of the neurotransmitter acetylcholine (a chemical messenger required for memory and proper mental function, as well as nerve and muscle function). This association with acetylcholine may explain many of the mental and neuromuscular symptoms caused by B1 deficiency. Supplementing B1 is not only valuable in preventing impairment of mental and nervous dysfunction, but also has shown therapeutic effectiveness in certain disorders linked to acetylcholine abnormalities.

C) MEMORY / MENTAL ENHANCEMENT

As mentioned, the neurotransmitter acetylcholine (which is dependent on B1) is required for proper mental function and memory. In outpatient studies, B1 deficiency was cited in 33-57% of geriatric individuals, and significant depletion of brain acetylcholine is a common feature of certain mental/cognitive disorders. In such cases, supplementation with B1 may significantly enhance mental performance. For example, more than one study has found B1 supplementation (in a range between 3 and 8 grams per day) to be effective in improving cognitive function in those with senility and Alzheimer's Disease.

D) LIVER PROTECTION

Vitamin B1 is required (along with the amino acid l-cysteine and vitamin C) to metabolise alcohol and to neutralise the liver toxin produced by alcohol metabolism called acetaldehyde. Acetaldehyde toxicity can damage liver tissue and causes certain alcohol-related side effects linked with hangovers.

Potential Applications

- Age-related memory loss
- Alzheimer's Disease
- Alcohol-related side effects and alcoholism
- Multiple sclerosis
- Fatigue
- Stress (as a component of B-complex supplementation)

Typical Supplemental Dosage Range

10-100mg per day

Common Food Sources

- Brewer's yeast
- Whole wheat
- Nuts
- Sunflower seeds
- Beans (especially soy)

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised.

Vitamin B2

Riboflavin

A) ESSENTIAL COENZYME

Vitamin B2 is an essential coenzyme (non-protein portion of an enzyme) of the enzymes flavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD). Both FMN and FAD are required for the formation of adenosine triphosphate (ATP), and thus, the production of energy. These coenzymes are also needed to regenerate certain vital compounds in the body, such as glutathione - the body's primary detoxification substance. Vitamin B2 is also needed for the body's manufacture of amino acids and

fatty acids, and cells cannot grow or develop without this nutrient. Although there is no specific deficiency disease identified by lack of B2, various symptoms are associated with inadequate intake (see below).

B) EYE HEALTH

Inadequate intake of vitamin B2 can trigger symptoms such as itchy, red, tired and/or light-sensitive eyes. Deficiencies are also associated with an increased risk of developing cataracts. The powerful antioxidant glutathione is one of the major protectors of eye tissue from free radical damage (which otherwise can trigger cataract formation), and vitamin B2 is required for the regeneration of glutathione from its oxidised state.

Please note: In doses less than 10 mg, B2 may help prevent the formation of cataracts due to its effects on glutathione regeneration. However, in patients who already suffer with cataracts, doses higher than 10mg per day may *accelerate* cataract formation due to increased optical photosensitivity (however, there is no evidence that supplementation with higher doses of B2 will cause human cataract formation in the first place). If one with pre-existing cataracts chooses to take more than 10mg of B2 per day in spite of this risk, it is advisable that they increase intake of eye-protective antioxidants (such as vitamins C and E, selenium, lutein, glutathione, taurine and anthocyanosides from bilberry fruit).

C) MIGRAINE THERAPY

Research suggests that vitamin B2 supplementation may be useful in reducing the severity of migraine headache attacks. The research was carried out based on the theory that migraine headaches may be associated with a decline in mitochondrial energy levels within cerebral blood vessels. The results of the research showed a nearly 70% reduction in migraine severity in those pre-treated with 400mg per day of vitamin B2.

Potential Applications

- Eye irritation (sore, red, tired, light-sensitive)
- Cataract prevention (not to exceed 10mg per day) - *see contraindications below*
- Migraine headaches
- Sickle cell anaemia
- Stress (as a component of B-complex supplementation)

Typical Supplemental Dosage Range

- 5-100mg per day

Common Food Sources

- Brewer's yeast
- Liver
- Whole wheat
- Almonds
- Mushrooms

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- Although B2 deficiency may increase the risk of cataracts, in patients who already suffer with cataracts, doses exceeding 10mg per day may *accelerate* cataract formation due to increased optical photosensitivity (however, there is no evidence that supplementation of higher doses of B2 will cause human cataract formation in the first place). If one with pre-existing cataracts chooses to take more than 10mg of B2 per day in spite of this risk, it is advisable that they increase intake of eye-protective antioxidants (such as vitamins C and E, selenium, lutein, glutathione, taurine and anthocyanosides from bilberry fruit).

- High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised.

Please note: Intake in excess of the body's requirement is excreted via the kidneys and may cause a harmless change in the colour of one's urine to fluorescent yellow/green.

Vitamin B6

Pyridoxine

A) ESSENTIAL COENZYME

The active form of B6 (pyridoxal-5-phosphate/P-5-P) is an essential coenzyme (nonprotein portion of an enzyme) in many bodily processes including: metabolism of amino acids, fatty acids, carbohydrates, hormones and cholesterol; synthesis of neurotransmitters, haemoglobin and fatty acids; various methylation and transport reactions; and many others. Due to its wide-ranging roles, a B6 deficiency can adversely impact on countless aspects of health, producing numerous signs and symptoms (see below). Conversion of B6 into pyridoxal-5-phosphate requires adequate levels of vitamin B2 and magnesium, thus warranting the use of a multivitamin/mineral supplement when B6 is being taken separately.

B) HORMONAL HEALTH

B6 is needed to maintain hormone balance, with female reproductive hormones (e.g. oestrogen) being particularly studied in this respect. For example, B6 has been shown to reduce blood levels of oestrogen and enhances the detoxification of reproductive hormones such as oestrogen within the liver. Because of the fact that 70-75% of women suffering with premenstrual tension (PMT) have excessive oestrogen levels during the premenstrual phase, the above-mentioned actions of B6 are considered particularly significant with regard to its success in the treatment of PMT. In clinical trials designed to assess the effect of B6 on PMT, the vast majority of women experienced improvement in symptoms (particularly irritability, depression, bloating, breast discomfort and acne). Supplementation may also be useful in reducing the side effects of oral contraceptives, which are known to deplete B6 levels.

C) CARDIOVASCULAR HEALTH

When B6 intake is inadequate, homocysteine, a by-product of methionine metabolism, becomes elevated in the blood. Homocysteine has been shown to accelerate free radical damage to the blood vessel walls. This damage would significantly increase the risk of heart disease due to the development of atherosclerosis. This is backed up by studies which confirm that elevated homocysteine is one of the major risk factors in heart disease. Furthermore, studies show that those with lower blood levels of the active form of B6 are at 5 times greater risk of heart attack than those with higher levels. Supplementation of B6 not only reduces homocysteine levels, but also reduces platelet aggregation. B6 is also needed for the proper integrity and elasticity of vascular tissues.

D) BRAIN HEALTH

B6 is required for many brain functions, including the manufacture of neurotransmitters such as serotonin, dopamine and noradrenaline. Among other things, inadequate neurotransmitter activity can lead to emotional disturbances (e.g. depression, anxiety), behavioural disorders (e.g. hyperactivity, autism), lack of mental clarity and alertness and general reduction in cognitive performance. B6 also reduces elevated blood levels of homocysteine, a compound known to trigger damage associated with Alzheimer's Disease.

E) NERVE HEALTH

The peripheral nervous system also relies on B6 for its proper function. In addition to preventing certain nervous conditions by avoiding deficiency, research shows that supplementation can be used therapeutically to relieve symptoms of certain nerve disorders such as diabetic neuropathy and Carpel Tunnel Syndrome (often linked to repetitive strain injury [RSI]).

Please note: In spite of the potential neurological benefits of B6 supplementation, it is important to note that long-term daily intake (several months to years) of 500mg or more, or shorter-term daily intake (more than a few months) of 2000mg or more have been shown to cause nerve toxicity (nerve degeneration, tingling or numbness in the extremities, lack of muscle coordination) in some people. Although there are reports suggesting that this can occur with long-term use as low as 150-200mg, these results

have been questioned by many experts for their lack of scientific reliability and/or consistency with the research at large. In fact, after a review of B6 research, the leading toxicologists in the US have set the LOAEL (lowest observed adverse effect level) at 500mg. Some experts suggest that in mega-dose therapy this risk of toxicity might be reduced by using the co-enzyme form (P-5-P) instead of standard pyridoxine (see contraindications below).

Potential Applications

- Premenstrual tension (PMT)
- Cardiovascular disease (i.e. atherosclerosis, hypertension)
- Fluid retention
- Pregnancy-related sickness (nausea, vomiting) [*see contraindications below*]
- Carpal Tunnel Syndrome / repetitive strain injury (RSI)
- Autism
- Hyperactivity
- Depression
- Diabetic neuropathy
- Asthma
- Hypochlorhydria (low stomach acid)
- MSG (monosodium glutamate) sensitivity
- Stress (as a component of B-complex supplementation)

Typical Supplemental Dosage Range

- 10-200mg per day

Common Food Sources

- Brewer's yeast
- Wheat germ
- Sunflower seeds
- Beans (especially soy)
- Poultry
- Brown rice

Contraindications/Drug Interactions

• Long-term daily intake (several months to years) of 500mg or more, or shorter-term daily intake (more than a few months) of 2000mg or more has been shown to *cause* nerve toxicity (nerve degeneration, tingling or numbness in the extremities, lack of muscle coordination) in some people. Although there are reports suggesting that this can occur with long-term use as low as 150-200mg, these results have been questioned by many experts for their lack of scientific reliability and/or consistency with the research at large. In fact, after a review of B6 research, the leading toxicologists in the US have set the LOAEL (lowest observed adverse effect level) at 500mg.

Please note: Some experts suggest that in mega-dose B6 therapy the risk of toxicity might be reduced by using the co-enzyme form pyridoxal-5-phosphate (P-5-P) instead of standard pyridoxine. Interestingly, the neurological symptoms associated with B6 toxicity are similar to those caused by B6 deficiency. There are various theories on why such neuro-toxicity may occur; for example; a) an excess of pyridoxine may impair the formation of P-5-P in the liver; b) an excess of pyridoxine may impair the ability of P-5-P to bind to its cell receptors; and/or c) an excess of pyridoxine may, itself, be toxic to the nerves.

- Separate supplementation of B6 should be avoided in those taking the drug levodopa for Parkinson's disease, unless under doctor's supervision.
- In order to avoid reducing breast milk production it is important to avoid high doses of B6 during the last trimester of pregnancy and while breast-feeding. This is due to the fact that B6 reduces secretion of prolactin, a hormone involved in breast milk production. Although it is unclear as to what level may be problematic in this respect, some experts suggest not to exceed 50mg per day during this time.

- High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised.

Vitamin B12

Cobalamin

A) ESSENTIAL COENZYME AND METHYL DONOR

In its active coenzyme forms, methylcobalamin and dibenzoyl (adenosylcobalamin), B12 is needed for the metabolism of proteins, fats and carbohydrates. Active B12 is one of the most effective donors of methyl, a compound required for the manufacture and recycling of numerous essential substances in the body, including the brain's chemical messengers (neurotransmitters) and the amino acid methionine (recycling of methionine leads to lowering of the destructive compound homocysteine). Replication of DNA, and thus proper cell multiplication, is also dependent on B12.

B) BLOOD BUILDING

The role of B12 in the DNA replication is especially important in the production of healthy red blood cells (which carry oxygen throughout the body) and haemoglobin. Without adequate B12, the red blood cells enlarge and do not mature properly, leading to the potentially dangerous condition known as pernicious (megaloblastic) anaemia.

C) NERVE FUNCTION

B12 is needed for the manufacture of the phospholipids in cell membranes (required for proper nerve transmission) and the myelin sheath (which covers and protects nerve cells and enhances conduction of nerve messages). The adverse neurological implications of a B12 deficiency are vast and range from isolated symptoms (e.g. numbness and tingling sensations) to degenerative diseases such as multiple sclerosis (MS), which is associated with nerve de-myelination. High-dose B12 (especially in the coenzyme form) may be of some use in treating certain degenerative processes seen in MS and diabetic neuropathy.

Please note: Neurological damage caused by long-term B12 deficiency can be irreversible. It is vital to ensure adequate consistent intake, especially as deficiency signs may not manifest symptomatically for several years.

D) MENTAL FUNCTION AND EMOTIONAL HEALTH

The beneficial impact of B12 on mental function and emotional health is greatly dependent on its role in fatty acid synthesis, nerve cell health and methyl donation. As mentioned, B12 donates methyl groups, thus facilitating the manufacture and recycling of the brain's neurotransmitters, which are responsible for memory, mental clarity and alertness, mood and many other processes. B12 deficiency can cause depression and many symptoms of cognitive decline (manifesting similarly to Alzheimer's Disease). In fact, elevated homocysteine, which can be reduced by B12 supplementation, has been shown to be a causative factor in Alzheimer's Disease. Research on elderly patients with mental impairment caused by inadequate B12 intake highlights the urgency of early detection of a deficiency. For example, one study showed that only those who had been suffering such impairment for less than one year experienced improvement after B12 supplementation.

E) CARDIOVASCULAR HEALTH

Elevated homocysteine is also a major risk factor in the development of atherosclerosis, the primary trigger for cardiovascular disease. B12, especially along with folic acid (also a methyl donor) and vitamin B6 can help protect blood vessel walls by facilitating the recycling of homocysteine back into the amino acid methionine (B12 and folic acid) and the metabolism of homocysteine into cystathionine and cysteine (B6).

Potential Applications

- Pernicious (megaloblastic) anaemia
- Nervous system disorders (e.g. diabetic neuropathy, multiple sclerosis [MS])
- Depression (especially in the elderly)
- Insomnia (especially in the elderly)
- Memory loss/reduced cognitive function (i.e. Alzheimer's Disease and senile

dementia)

- Cardiovascular disease (when associated with elevated homocysteine levels)
- Hives (urticaria)
- Asthma (especially when associated with sulfite sensitivity)
- Male infertility (low sperm count)
- Tinnitus
- Fatigue

Typical Supplemental Dosage Range

- 10-1000ugper day

Common Food Sources

- Liver and kidney
- Clams
- Fish
- Cheese
- Eggs

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
 - High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised.
- Please note: Folic acid can mask the signs of B12 deficiency. If high levels of folic acid are used it is recommended to supplement with B12 as well. Vegan and vegetarian diets are often high in folic acid and low in B12, which may warrant B12 supplementation.*

Beta 1,3 Glucans

Beta 1,6 Glucans carries many of the same benefits and may be present in many Beta 1,3 supplements, however, most of the research has centred on Beta 1,3, which is derived from the cell wall of the *s.cerevisiae* yeast.

A) IMMUNE BOOSTING

Macrophage activation by Beta 1,3 Glucans stimulates the immune system in general to act against foreign invaders - viruses, fungi, parasites and radiation by-products, it also boosts bone marrow production.

B) ANTIOXIDANT EFFECTS

Free radicals are unstable and highly reactive molecules that cause oxidative damage in the body. Beta 1,3 Glucans is an effective free radical scavenger and antioxidant.

C) ANTIBIOTIC and ANTI-VIRAL PROPERTIES

Beta 1,3 Glucans has been shown to help reduce the amount of antibiotics needed to cope with infection. The combination was used successfully in trials against several different bacteria and viruses, including E Coli and the Herpes virus.

D) ANTI-FUNGAL

Beta 1,3 Glucans has been shown to have an anti-fungal effect, despite being derived from yeast. As a pure isolate from yeast, it is unlikely to provoke a reaction, but the possibility exists in those who are particularly sensitive.

E) ANTI-CHOLESTEROL

Research has shown Beta 1,3 Glucans to increase the effectiveness of cholesterol preparations such as niacin and Lopid. The mechanism is not well understood, but it is thought that macrophage activation may help to mediate lipid accumulation and prevent further plaque formation on the arterial walls.

Potential health applications of Beta 1,3 Glucans

- immune boosting
- cell protective
- antibiotic
- antiviral
- Candida
- anti-cholesterol

Contraindications/Drug Interactions

Pregnant and nursing mothers should avoid Beta 1,3 Glucans

Perhaps best avoided at first in cases of severe candidiasis

Beta 1,3 Glucans

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Czop JK and Kay J. *J Exp Med* 173:1511-1520,1991.

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Betaine Hydrochloride

A) HYPOCHLORHYDRIA

Hypochlorhydria, or low stomach acid, is a condition that may be implicated in a variety of digestive system complaints. Sufficient stomach acid is necessary for the proper digestion of proteins, the hydrochloric acid effectively 'straightening out' the long lines of amino acids that form each protein. This facilitates the action of protein splitting enzymes that can then easily break the protein into its component parts (amino acids). In a low acid environment this crucial first step may be inefficient and protein-splitting enzymes become ineffective. The improper break down of proteins may eventually lead to digestive problems including indigestion and allergies. Stomach acid levels decline with age and may also be reduced by stress and antacid use.

Betaine hydrochloride supplementation may help to increase stomach acid levels.

B) PANCREATIC INSUFFICIENCY

The mixture of food and gastric juice known as chyme leaves the stomach and enters the first part of the small intestine, the duodenum. Here the acidity of the chyme acts as a trigger for pancreatic enzymes and the release of bile from the gall bladder.

Hypochlorhydria may lead to the production of chyme that is not sufficiently acidic to trigger these secretions, leading to improper digestion of proteins, carbohydrates and lipids. The result could be insufficient breakdown of food resulting in digestive problems, allergies and malabsorption.

C) IMMUNE ENHANCEMENT

Hydrochloric acid will kill parasites, bacteria and viruses that enter the body via food and is therefore a first line of defense for the immune system. Betaine hydrochloride may be of benefit in preventing infectious agents from entering the body from the digestive system e.g. food poisoning.

D) MINERAL DEFICIENCY

Hydrochloric acid is necessary to liberate minerals from food. Signs of mineral deficiency such as anaemia and poor condition of hair, skin and nails may be indicative of low stomach acid.

Potential health applications of betaine hydrochloride

- indigestion
- flatulence or bloating
- IBS
- malabsorption
- leaky gut disorder
- allergy
- incomplete digestion
- mineral deficiency

Contraindications/Drug Interactions

Do NOT use in cases of stomach or duodenal ulcer. Extra stomach acid created by betaine hydrochloride supplementation may exacerbate symptoms. Do NOT chew.

Betaine Hydrochloride

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Bilberry Berries

vaccinium myrtillus

A) EYE TONIC

Bilberry extracts have been used successfully in many clinical and experimental studies for various eye dysfunctions. The active anthocyanoside (anthocyanidin) flavonoids in bilberry extract have proven eye tonic properties, and scientific investigation points to potential benefits in preventing or treating poor vision (especially due to age-related degeneration), macular degeneration, cataracts, retinopathy, and glaucoma. Studies show bilberry extract improves circulation to the eyes, and enhances oxygen and energy levels in eye tissue. Additionally, anthocyanosides stabilise collagen (a major factor in maintaining eye integrity) and act as potent antioxidants (free radicals are a major destructive element in eye degeneration).

B) CIRCULATORY TONIC

The flavonoid rich extracts in bilberry aid circulation by increasing the integrity of the vascular system, primarily through stabilising vascular collagen, aiding vasodilation, inhibiting excessive platelet aggregation and inhibiting free radical damage.

C) COLLAGEN STABILISER

Anthocyanosides bind to collagen and maintain its integrity, thus supporting connective tissue structure in eyes, blood vessels, joints, skin, bone, etc.

D) ANTI-INFLAMMATORY

Anthocyanosides inhibit histamine and inflammatory prostaglandins, leukotrienes and enzymes. They have additional value in that they also prevent collagen fibres from being damaged by enzymes released during inflammation, thereby protecting connective tissue.

E) BLOOD SUGAR LOWERING

Myrtillin, an anthocyanoside in bilberries, appears to possess a significant antihyperglycaemic effect. Research has shown it to have remarkably long lasting effects, even from a single dose.

F) ANTIOXIDANT

Anthocyanosides neutralise harmful free radicals due to their powerful antioxidant effect and may support the activity of other antioxidants, especially vitamin C.

Potential Applications of Bilberry

- eye disorders • varicose veins
- atherosclerosis • arthritis
- hyperglycaemia • free radical damage
- general cardiovascular and cerebrovascular health

Principle actives

Anthocyanoside (anthocyanidin) flavonoids

Contraindications/Drug Interactions

Caution if using diabetic medication, regularly monitor blood glucose. May increase action of anticoagulant & antiplatelet drugs.

Bilberry

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Allen F, Journal of the American Medical Association, 89, 1927, pp1577-1581.

Biotin

Vitamin H

A) ESSENTIAL COENZYME

Biotin is an essential coenzyme of four different enzymes required for various functions, such as the conversion of glucose from dietary carbohydrates into energy; the building and metabolism of proteins; nucleic acid synthesis (thus influencing cell

replication); the production and metabolism of fatty acids; and the activation of folic acid. Although biotin is manufactured in the body by intestinal bacteria, dietary intake is still required in order to achieve sufficient levels to maintain health.

B) HAIR, SKIN AND NAIL HEALTH

Biotin supplementation shows great promise in maintaining or improving the health of the hair, skin and nails. Earlier scientific research uncovered the fact that biotin deficiency causes the scalp disorder seborrheic dermatitis. This condition occurs in babies (where it is known as 'cradle cap') as well as adults, and manifests as symptoms such as scaly build-up of dead skin and rash around the scalp, excessive scalp oiliness and dandruff (often followed by hair loss). Although biotin supplementation is often beneficial in treatment of cradle cap, it is less likely to be effective in adults with seborrheic dermatitis unless combined with a B-complex. Biotin deficiency may also lead to brittle nails, and research shows that high dose supplementation of 2500ug (2.5mg) per day can lead to dramatic benefits in the vast majority of sufferers, increasing nail thickness by up to 25%. Along with its benefits in general scalp health, biotin's role in protein utilisation and fatty acid synthesis and metabolism help to justify its popularity as a supplement for general hair quality and growth.

C) BLOOD SUGAR REGULATION

As mentioned, proper glucose metabolism is dependent on adequate biotin intake. Studies show that supplementation with high doses of biotin can improve blood sugar control in those with hyperglycaemia, as well as being helpful in treating nerve damage caused by chronically elevated blood sugar (diabetic neuropathy).

Potential Applications

- Seborrheic dermatitis (including 'cradle cap')
- Dandruff
- Alopecia [hair loss] (when associated with seborrheic dermatitis)
- General hair and scalp health
- Brittle nails
- General nail health
- General skin health
- Hyperglycaemia
- Diabetic neuropathy

Typical Supplemental Dosage Range

- 100-1000ug per day

Common Food Sources

- Brewer's yeast
- Liver
- Cheese
- Whole wheat
- Brown rice
- Nuts
- Soybeans
- Mushrooms
- Cauliflower

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
 - High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised.
- Please note: Especially in babies, intestinal defects in absorption or cell binding can lead to deficiencies even where intake and production by intestinal bacteria are sufficient. Both adults and children are at greater risk of deficiency in cases of longterm therapy with prescribed antibiotics.*

Black Cohosh

cimifuga racemosa

A) FEMALE HORMONAL TONIC

The herb's major active compound 27-deoxyactein possesses oestrogen-like activity, and the ability of black cohosh to selectively reduce serum concentrations of luteinising hormone (LH) even further enhance its oestrogenic effect. The phytoestrogenic and a LH reducing action are primarily responsible for the dramatic, and clinically proven, ability of black cohosh to relieve common menopausal symptoms such as hot flushes, depression, vaginal dryness, etc. In fact, comparison studies have shown black cohosh to be far superior to HRT in reducing menopausal complaints. Although research into the effect of black cohosh on bone density is currently lacking, there is justification for its use in combination with bone-building nutrients in prevention of osteoporosis. This herb may also benefit certain symptoms of premenstrual tension.

B) BLOOD PRESSURE LOWERING

Evidence shows that black cohosh exerts a significant hypotensive effect - an action that is further complemented by a calming effect on the nervous system.

C) NERVE CALMING

Anti-anxiety and general calming effects on the nervous system have been observed. This action of black cohosh is independent of the herb's reproductive hormone effects and would further enhance any reduction in nervous tension and anxiety reported in menopausal or PMT research.

Potential Applications of Black Cohosh

- menopausal symptoms
- PMT
- possible enhancement of bone density
- hypertension
- dysmenorrhoea
- uterine spasm

Principle actives

27-deoxyactein

Contraindications/Drug Interactions

Do NOT use during pregnancy.

Caution with anti-hypertensives - check with doctor.

Black Cohosh

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Stoll W. *Therapeutikon*, 1,1987, pg23.

Blueberry Leaf

vaccinium angustifolium

A) ANTI-VIRAL

The leaves of the blueberry plant are a rich source of chlorogenic acid, which has been shown to be effective against viruses such as herpes simplex. Research has also shown chlorogenic acid to inhibit RNA-dependent DNA polymerase, an enzyme needed for viral replication.

B) ANTI-FUNGAL

Chlorogenic acid also inhibits fungal growth, suggesting potential benefits in conditions such as candidiasis.

:-

C) ANTI-BACTERIAL

Studies have shown chlorogenic acid to be effective against various pathogenic bacteria including *E. coli*.

D) BLOOD SUGAR LOWERING

Animal studies have consistently shown a reduction in plasma glucose levels at different stages of hyperglycaemia. It is speculated that chlorogenic acid inhibits the action of the enzyme(s) responsible for hepatic glucose output, which is often elevated in non-insulin-dependent diabetics.

Potential Applications of Blueberry Leaf

- colds and flu
- herpes virus
- Candida albicans infection
- hyperglycaemia
- urinary tract infections

Principle actives

Chlorogenic acid

Contraindications/Drug Interactions

Caution with anti-diabetic medication - check with doctor.

Blueberry leaf

Maher E, et al, Proc Natl Acad Sci 1994, 91, 16, pp7802-6.

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Boron

A) FEMALE HORMONAL HEALTH

Research suggests that boron supplementation significantly influences oestrogenic activity. One clinical trial involving postmenopausal women taking 3mg of boron per day demonstrated a substantial increase in 17 beta-oestradiol, the most active form of oestrogen. Although research currently appears to be lacking with respect an influence of supplementation on menopausal symptoms, there is evidence for an beneficial impact on calcium levels in the body.

B) SKELETAL HEALTH AND BONE DENSITY

The skeletal system is likely to be a primary recipient of boron's nutritional benefits. As mentioned, boron supplementation significantly elevates oestrogenic activity, which more than likely will have a positive influence on bone density in women. Particularly relevant to skeletal health are the data showing a 44% decrease in calcium excretion in postmenopausal women taking 3mg of boron per day. Aside from any effect on oestrogen, it has been suggested by scientists that boron may be needed in order for the kidneys to convert 25-cholecalciferol into the most active form of vitamin D (1,25-dihydroxycholecalciferol). The latter is required in order for calcium to be absorbed in the intestines.

C) JOINT HEALTH

Although the method of action has yet to be determined for certain, there are a couple of studies showing that boron supplementation has a beneficial effect on the joints in those with osteo, rheumatoid and juvenile forms of arthritis. The results of both studies indicated a measurable improvement in the vast majority of those receiving boron supplementation.

Potential Applications

- osteoporosis
- fractures
- skeletal health (general)
- menopause
- osteoarthritis
- rheumatoid arthritis
- Juvenile arthritis

Typical Supplemental Dosage Range

1-9mg per day

Common Food Sources

- Leafy green vegetables
- Fruit
- Whole grains
- Nuts

Contraindications/Drug interactions

- Doses exceeding 100mg per day may cause side effects such as dermatitis, diarrhoea, nausea, vomiting and fatigue.
- Very high doses may cause an increased excretion of vitamin B2.

Boron

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Boswellia

boswellia serrata

A) ANTI-ARTHRITIC / ANTI-INFLAMMATORY

Boswellic acid, the key active constituent in boswellia, exerts a powerful antiinflammatory and anti-arthritis activity. Research suggests that the anti-arthritis activity of this herb is even more effective than phenylbutazone (a non-steroidal antiinflammatory drug). Interestingly, boswellia also improved blood supply to arthritisdamaged joints and improved the integrity of the blood vessels in the area. Boswellic acid appears to open up collaterals (alternate blood delivery routes to specific regions of the body) to provide adequate blood supply to the joints damaged by arthritis.

B) VASCULAR TONIC

The beneficial vascular effects of boswellia may also aid other disorders where circulatory routes may be compromised, such as in cases of local oedema and vascular dysfunction in the lower limbs.

Potential Applications of Boswellia:

- arthritis
- sports injuries
- lower limb circulatory disorders
- oedema

Principle actives:

Boswellic acid

Contraindications/Drug Interactions:

Caution with anticoagulants - check with doctor.

Boswellia

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 Sa'fahi H, et al, J Pharmacol Exp Ther, 261(3): 1143-6 1992.
 Ammon, H.T et al. (1993). J. Ethnopharmacology, 38, 113-119.

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Branched Chain Amino Acids (BCAAs)

leucine, isoleucine, valine

A) ATHLETIC PERFORMANCE

BCAAs are needed for the maintenance of muscle tissue and appear to preserve muscle stores of glycogen (a storage form of carbohydrate that can be converted into energy). BCAAs also help prevent muscle protein breakdown during exercise. Research suggests that a fall in the plasma concentration of branched-chain amino acids (BCAAs) contributes to fatigue in endurance events. BCAAs are used by muscles for energy metabolism during endurance exercise. As plasma levels of BCAAs decline, tryptophan, which uses the same carrier protein as BCAAs, is more readily transported into the brain. An exercise-induced imbalance in the ratio of free tryptophan to BCAAs has been implicated as a possible cause of acute physiological and psychological fatigue.

In one study, results indicated a 3-4% enhancement in marathon performance following consumption of a sports drink containing BCAAs. In addition, the study showed that cognitive ability at the conclusion of a 30km cross-country run was improved or maintained following supplementation with the same drink.

B) MUSCLE GROWTH/REPAIR

BCAAs have been shown to prevent muscle protein breakdown and stimulate muscle protein synthesis. This anabolic effect is especially useful in athletes undertaking intense weight training. BCAAs comprise approximately a third of muscle tissue, but levels are reduced by intense physical stress suggesting significantly increased need in muscle stress (such as weight training and other intense exercise). Theoretically, BCAA supplementation during intense training may help minimise muscle protein degradation and lead to faster repair promoting greater gains in muscle-mass.

C) NEUROMUSCULAR PROTECTION

Research suggests that BCAAs may be supportive in neuromuscular disorders, especially amyotrophic lateral sclerosis (ALS), by activating the glutamate dehydrogenase enzyme that is deficient in that disease, thereby improving muscle strength and slowing progression of the loss of motor function. In one double-blind trial, 26 grams per day of BCAA supplements helped those with ALS maintain muscle strength. Other studies, however, have provided mixed results, so further research is necessary before this link can be confirmed.

D) MUSCLE LOSS

Low insulin levels are thought to result in poor BCAA absorption, which can lead to a loss of muscle mass. This can be a particular problem for many diabetics, as well as the elderly. These groups may therefore benefit from a diet that has a higher proportion of BCAAs.

E) LIVER FUNCTION

People with certain liver conditions, including alcoholic cirrhosis and hepatic encephalopathy, have been shown to have decreased levels of BCAAs, whilst also having increased levels of phenylalanine, tyrosine and tryptophan. This imbalance is thought to be a factor in preventing recovery from these conditions, and although research in this area has provided rather mixed results, their use does appear warranted. The use of BCAAs in serious liver conditions requires medical supervision.

Potential Applications of BCAAs:

- Endurance exercise
- Intense weight training
- Speeding muscle repair and growth
- Chronic muscle fatigue and weakness
- Muscle wasting (especially in diabetics)
- Enhanced exercise recovery
- Neuromuscular degeneration (e.g. ALS, multiple sclerosis)
- Alcohol-induced liver damage (e.g. cirrhosis)

Typical intake range:

Isoleucine 150-600 mg

Leucine 250-1000 mg

Valine 150-600 mg per day (taken on an empty stomach)

Food Sources:

Leucine/Isoleucine:

Beef, chicken, pork, soya beans, fish, cheese, eggs, baked beans, liver, whole wheat, brown rice, almonds, brazil nuts, lentils

Valine:

Cottage cheese, fish, beef, lamb, chicken, almonds, brazil nuts, cashews, peanuts, sesame seeds, lentils, chickpeas, mushrooms, soya beans

Contraindications/Drug Interactions

- May interfere with levodopa and other anti-Parkinsons medications.
- Theoretically very high doses of BCAAs could interfere with the uptake of 1-phenylalanine and 1-tyrosine into the brain.

- Pregnant women and nursing mothers should avoid BCAA supplementation.

Branched Chain Amino Acids

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Broccoli

A) PHYTONUTRIENT SOURCE

Broccoli is a rich source of phytonutrients, including fibre, beta-carotene and other carotenoids, vitamin C, vitamin K, polyphenols and anthocyanidins.

B) ANTIOXIDANT

In 1997, a study examining the antioxidant properties of six polyphenol compounds in broccoli found that most were very effective at preventing free radical damage to fats (free radicals are unstable and highly reactive molecules that cause oxidative damage in the body).

C) BACTERIAL INHIBITOR

Another class of compounds called isothiocyanates are also present in broccoli and have been shown to strongly inhibit the growth of E Coli and other microbes.

D) CELL PROTECTIVE

Isothiocyanates, including the most powerful, sulforaphane, have been shown to be effective at protecting and switching on phase II enzymes such as glutathione Stransferase, within body cells. These enzymes are known to detoxify free radicals and damaging chemicals, allowing them to be excreted from the body before they can harm cells.

E) OESTROGEN DETOXIFICATION

Another beneficial class of compounds, indoles have been shown to have a binding/detoxification effect on the sex hormone oestrogen, which may help to prevent some oestrogen dominant diseases.

Potential health applications of Broccoli

- rich source of beneficial nutrients
- antioxidant
- cell protective
- oestrogen reduction
- helping prevent food poisoning

Contraindications/Drug Interactions

None noted

Broccoli

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 Zeligs MA., *J Med Food.* 1998, 1:67-82

Bromelain

A) DIGESTIVE AID

Enzymes are chemical catalysts that trigger all processes of metabolism within the body. Digestion is a process where some of the greatest enzymatic activity must take place. Proteolytic (protein digesting) enzymes such as bromelain (derived from pineapple) can assist the enzymes that the body naturally produces to carry out digestion. Among other things, undigested food proteins can otherwise lead to the development of intestinal disorders, toxic build-up and food allergies.

B) ANTI-BIOTIC

Bromelain has been shown to possess significant anti-biotic properties in the case of respiratory infections, as well as enhancing the effectiveness of prescribed antibiotics.

C) ANTI-INFLAMMATORY

Proteolytic enzymes have been shown to inhibit various inflammatory processes, such as those that occur in arthritis, sports injuries and so on. Bromelain, the enzyme from pineapple, has been the subject of considerable clinical research highlighting its effectiveness in inhibiting inflammation and facilitating healing of injuries. The effect is usually quicker than that of herbs, making it particularly useful for short-term inflammation, such as sports injuries or muscle strain.

D) AUTOIMMUNE CONDITIONS

Protease enzymes have been shown to have a benefit in autoimmune conditions such as rheumatoid arthritis and scleroderma by digesting circulating immune complexes.

E) IMMUNE REGULATION

White blood cells of the immune system often use enzymes to digest invading viruses and bacteria as well as undigested food components, which can cause allergies.

Additional enzymes from foods may reduce the work load on the immune system, allowing it to work more efficiently on viruses, bacteria, etc. This may also reduce immune system hyperactivity, which is especially a concern in those with both allergic and auto-immune tendencies.

Potential health applications of Bromelain

- protein digestion
- inflammation
- joint health
- pain relief
- bacterial infections

empty

- cardiovascular health

food

- respiratory infections incl. coughs
- autoimmune conditions

Please note that for these applications bromelain should be taken on an stomach, at least half an hour before

Contraindications/Drug Interactions

May increase the effectiveness of the drug warfarin, check with doctor.

Do not use on an empty stomach where a stomach ulcer is present.

Bromelain

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Burdock Root

arctium lappa

A) ANTI-MICROBIAL

Active compounds found in burdock exert anti-microbial activity, especially against pathogenic bacteria and fungi. The ability to rid the body of harmful microorganisms

(both through direct anti-microbial and immune stimulating effects) seems to justify the use of burdock in traditional Chinese medicine as a general 'blood purifier'.

B) IMMUNE ENHANCEMENT

Burdock is a rich source of inulin, a polysaccharide that is known to enhance white blood cell activity. This would further enhance the direct anti-microbial action of burdock.

C) SKIN TONIC

Burdock is often used in traditional Chinese medicine to resolve rashes, red swellings, carbuncles, etc. The apparent ability of burdock to reduce inflammation and inhibit staphylococcus aureas (the main infective bacteria in certain skin problems) warrants its use in inflammatory skin disorders, especially eczema.

Potential Applications of Burdock Root

- bacterial, fungal, viral infections
- general immune boosting
- skin disorders (e.g. eczema, psoriasis)
- chronic inflammatory conditions

Principle actives

Polysaccharides (e.g. inulin)

Contraindications/Drug Interactions

Caution if taking, anti-diabetic, anti-hypertensives or calcium channel blockers as burdock may increase their effects - check with doctor.

Burdock Root

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Butcher's Broom

ruscus aculeatus

A) VEINTONIFIER

Studies show that the active ruscogenins possess vasoconstricting effects on veins, which aids their stabilisation. In addition, butcher's broom appears to reduce inflammation in areas affected by venous dysfunction.

B) CIRCULATORY TONIC IN LOWER LIMBS

Clinical trials demonstrate significant improvement in varicose veins and the symptoms of lower limb circulatory dysfunction. Benefits are due to above-mentioned vein tonifying properties.

Potential Applications of Butchers Broom

- varicose veins
- poor lower limb circulation
- 'heavy' legs
- haemorrhoids
- lower limb oedema

Principle actives

Ruscogenins

Contraindications/Drug Interactions

Caution with MAOI antidepressants and alpha-adrenergic blockers - check with doctor.

Butcher's Broom

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Vitamin C

Ascorbic acid

A) ESSENTIAL CO-FACTOR

Vitamin C is required for the production of numerous essential compounds in the body including collagen, various enzymes and adrenal hormones (thus explaining its antistress association). It is also needed for the metabolism of amino acids, neurotransmitters (the brain's chemical messengers), cholesterol, folic acid and iron. A severe deficiency in vitamin C can lead to scurvy, which has symptoms that are primarily associated with the defective formation of collagen.

B) ANTIOXIDANT / FREE RADICAL SCAVENGER

Vitamin C, the primary antioxidant within the watery areas of the body, neutralises destructive free radicals such as hydroxyl radicals (considered the most potent oxidant affecting the body) and hydroperoxide radicals (which damage lipids). Though watersoluble, vitamin C also protects blood fat and cholesterol from oxidative damage, and recycles oxidised vitamin E back into its active form. Vitamin C functions with, and is protective of, antioxidant enzymes i.e. glutathione peroxidase, superoxide dismutase (SOD) and catalase, and helps prevent oxidation of free (unbound) iron and copper (which otherwise can oxidise blood fat and cholesterol and may damage DNA). Supplementation significantly elevates levels of the potent antioxidant glutathione (GSH).

C) CARDIOVASCULAR SUPPORT

The ability of vitamin C to recycle oxidised vitamin E and to help neutralise hydroperoxide radicals afford great protection against cardiovascular disease. Hydroperoxide radicals deplete vitamin E and oxidise LDL (bad) cholesterol and blood fats (potentially triggering atherosclerotic processes). Vitamin C also inhibits the accumulation in damaged arterial tissue of the compound lipoprotein A (which carries and deposits cholesterol into damaged areas in the arteries and impedes the breakdown of clots). Plaque formation is accelerated when LDL cholesterol congregates with lipoprotein A. Fortunately vitamin C raises HDL (good) cholesterol, which facilitates removal of LDL from arteries. Supplementation also can reduce total cholesterol and blood pressure, and higher intake is associated with lower triglycerides. Diabetics are at a greater risk of cardiovascular disease due to an increased rate of glycation (glycolysation), the damage caused when sugar binds to body proteins. Among other things, glycation can damage vascular integrity and impair a mechanism that controls cholesterol production in the liver. Supplementation with vitamin C significantly inhibits glycation.

D) IMMUNE SUPPORT

Vitamin C supplementation has been shown to boost white blood cell function, interferon production (an immune protein which defends cells from invasion) and antibody production and response. Levels are significantly depleted during infection. Not surprisingly, a great deal of research has investigated its influence on viruses (such as in the common cold). Although research results have been inconsistent regarding the ability of regular supplementation to *prevent* colds, there is overwhelming evidence that taking vitamin C reduces the severity and duration of cold symptoms. In addition to its more direct immunological effects, vitamin C antagonises viruses by inhibiting the action of the enzyme hyaluronidase (produced by viruses to help them spread through body tissues) and by improving the stability of the connective tissue through which a virus must spread.

In general, viruses cannot survive within a high vitamin C environment. These properties help explain its popularity in fighting infection and the proliferation of abnormal cells.

E) PROTECTION FROM TOXINS

Vitamin C aids detoxification and/or neutralisation of many harmful agents. For example, it appears that this nutrient keeps certain heavy metals in solution, thus allowing them to be more easily eliminated in urine. In addition to being industrial and

automobile pollutants, heavy metals such as lead, cadmium, arsenic and radioactive polonium are prominent in cigarette smoke, helping to explain one of the reasons vitamin C is used up so rapidly in smokers. Though not a heavy metal, it's also worth noting that vitamin C can treat vanadium poisoning. In addition, it inhibits conversion of nitrates and nitrites (found in cigarette smoke, air pollution, and processed/cured meats) into cell-damaging nitrosamines, and (with other antioxidant nutrients) helps neutralise harmful effects of certain pesticides and carbon monoxide (from car exhaust, industrial fumes and cigarette smoke).

F) CELL PROTECTION

High vitamin C intake is associated with lower incidence of abnormal cells and cellular damage within several areas of the body. When levels are insufficient - relative to one's exposure to oxidative stress/free radicals and certain toxins - chromosomes are at greater risk of damage. In addition to cell-protection from the antioxidant and detoxification activity, vitamin C prevents the conversion of nitrates and nitrites (found in cigarette smoke, air pollution and processed meats) into cell-damaging nitrosamines. When cells do become damaged, the immune benefits may help protect against abnormal proliferation.

G) EYE PROTECTION

Due mostly to its role in collagen synthesis, vitamin C is essential to the integrity of the connective tissue of the eyes. Eye tissue is very susceptible to free radical damage and oxidation, potentially leading to disorders such as cataracts or macular degeneration. Many studies confirm vitamin C's benefits in cataracts; one trial reported that the majority of cataract patients on a health programme including 1000mg of vitamin C per day had no further cataract development, even after more than 10 years. Some of this benefit was undoubtedly associated with enhanced production of glutathione, a powerful antioxidant in eye tissue. Vitamin C may also protect against diabetic eye damage (retinopathy), both by inhibiting glycation (sugar-induced damage) of eye tissue, and by lowering levels of sorbitol, which accumulates in diabetics, causing loss of protective nutrients from the lens. It is thought that at least 1000mg of vitamin C per day is needed in order to boost vitamin C levels in the lens.

H) CONNECTIVE TISSUE HEALTH

Vitamin C is important to the health of all the body's connective tissue (i.e. within skin, blood vessels, joints, digestive and respiratory tracts and eyes), primarily through its role in collagen synthesis, free radical scavenging, detoxification, immunity and inhibition of inflammatory processes. These attributes warrant its use for promoting healing of tissue throughout the body. For example, post-operative supplementation with vitamin C has been shown to improve recovery time due to accelerated tissue healing and reduction of infection.

I) ANTI-ALLERGIC

The ability of vitamin C to lower histamine (an inflammatory chemical associated with many allergic symptoms) makes it a useful tool in prevention and treatment of allergic conditions such as hayfever, asthma, eczema, hives (urticaria), etc. The respiratory tract appears to be especially benefited in this respect (it's worth noting that vitamin C also protects against lung damage from nitrous oxide found in pollution). For example, several studies have shown significant benefits from supplementing 1000-2000mg per day in treatment of asthma.

Potential Applications

- Antioxidant
- Cardiovascular disease (atherosclerosis, high blood pressure, etc)
- Peripheral vascular disease
- Viral, bacterial, fungal infections (common cold, flu, herpes, candidiasis, etc)
- General immune support
- Allergic reactions (eczema, asthma, hayfever, hives, etc)

- Cell protection
- Degenerative eye disease (cataracts, macular degeneration, diabetic retinopathy)
- Detoxification
- Poor wound healing
- Skin ulcers
- General skin health
- Arthritis
- Bone health
- Digestive ulcers
- Pre-eclampsia
- Stress
- Gum disease
- Longevity
- Male infertility

Typical Supplemental Dosage Range

250-3000mg per day

Common Food Sources

- Peppers
- Broccoli
- Currants
- Brussels sprouts
- Citrus fruit
- Strawberries
- Greens
- Papaya

Please note: Aldonic acids (e.g. threonic, lyxonic and xylonic acid) are active metabolites of vitamin C. In addition to being non-acidic (and thus better tolerated in the digestive system than ascorbic acid when taken in higher doses), there is evidence to suggest that ascorbates containing significant concentrations of aldonic acids (especially threonic acid) are better absorbed and retained than both ascorbic acid and standard mineral ascorbates.

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Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- High doses of standard ascorbic acid may temporarily cause loose stools or stomach irritation due to the reaction of the digestive system to the nutrient's acidity. If so, the dosage should be reduced to a level where this does not occur. The dosage can then be increased gradually, allowing the digestive tract to adjust to the acidity (and therefore allowing higher doses to be tolerated without a reaction). Alternatively, non-acidic ascorbates can be used, as these are unlikely to cause a digestive reaction at any dose.
- High doses should be avoided in sickle cell anaemia, severe kidney disease and gout and in those receiving haemodialysis or those with a history of kidney stones, unless under medical supervision.
- Although there is no scientific evidence of 'rebound scurvy', many experts recommend that people intending to either significantly reduce their vitamin C dosage or cease supplementation completely, should do so gradually, rather than immediately.
- High doses of vitamin C may reduce copper absorption and increase iron absorption.
- High doses of vitamin C may increase levels of oestrogen in those taking oral contraceptives or hormone replacement treatment (HRT), although there is no evidence that this vitamin C interaction is associated with any side effects or risks.
- High doses may reduce effectiveness of certain anticoagulants (e.g. warfarin), anticholinergics and quinidine and increase the effect of barbiturates.

- High doses may interfere with accurate serum B12 testing.

Calcium

A) SKELETAL HEALTH AND BONE DENSITY

The importance of calcium in skeletal health is well established in the scientific literature, and the nutrient's popularity as a supplement is justifiable. More than 99% of the calcium in the body is contained in bones and teeth and hard bone is comprised of around 90% calcium. It is worth noting that calcium helps maintain bone density by more than just its role in the structural composition of bone tissue. Healthy bone tissue is not inert - it is constantly being built up and broken down in order to ensure a balance between proper skeletal integrity and blood calcium levels. Calcium stimulates the release of the thyroid hormone calcitonin, which causes calcium to be taken from the blood to replenish levels in bone tissue. This action is intended to work in balance with phosphorus, a mineral that stimulates parathyroid hormone release, which in turn causes calcium to be taken from the bone in order to elevate blood calcium levels. Rickets (involving impaired growth and bone malformation in children) and osteomalacia (soft bones in adults) are a direct consequence of a long-term deficiency of calcium in the diet. Calcium supplementation affords considerable protection to bone health, as demonstrated in numerous studies. For example, in postmenopausal women, a review of the research indicates that supplementation-with 1000-1700mg per day significantly reduces the rate of bone loss and is associated with a reduced incidence of osteoporotic fractures.

B) MUSCULAR HEALTH AND FUNCTION

Calcium also plays an essential part in the proper function of the muscular system. In particular, calcium is needed for the contraction phase of muscle function, while the mineral magnesium facilitates the relaxation phase. Calcium is required in order for ATP (adenosine triphosphate) to be hydrolysed into a form that can be used as energy to fuel the contraction of muscle tissue. Also relevant to muscle function is the influence of calcium in neurotransmitter activity and transmission of nerve impulses. Muscle contraction serves many critical purposes in bodily function ranging from the voluntary, such as body movement, to the involuntary, such as pumping of blood and the movement of food through the digestive system.

C) NERVE HEALTH AND FUNCTION

The activation of the nervous system is regulated by chemical messengers known as neurotransmitters. The concentration of calcium in the terminal membrane of the nerve cell will dictate the quantity of certain neurotransmitters to be released. The end result of calcium's neurotransmitter influence is less sensitivity and irritability in the nerves. Tetany (manifesting in muscle spasms and twitches due to hypersensitive nerves) is linked with calcium deficiency.

D) CARDIOVASCULAR HEALTH

There is evidence, albeit inconsistent, that calcium may serve a beneficial purpose in cardiovascular health by reducing the risk of high blood pressure. It appears from epidemiological research that a high level of dietary calcium is associated with a lower risk of hypertension. However, studies suggest that calcium supplementation primarily only lowers blood pressure in black people and individuals who's blood pressure is elevated by increased salt intake. Excessive cellular sodium can lead to increased blood pressure; although the role of magnesium and potassium is more significant, calcium works with these minerals to pump sodium from cells. There is also evidence that calcium can reduce the risk of hypertension in pregnant women. This is particularly relevant to women suffering with the condition known as preeclampsia (in which potentially dangerous elevation of blood pressure is a factor).

E) BLOOD CLOTTING

The proper clotting of blood is also dependent on a sufficient level of calcium in the

body. For example, calcium is required for the formation of blood platelets, which provide "stickiness" or aggregation in the clotting process. Calcium also facilitates the production of fibrin, an insoluble protein that provides a sort of cap over a clot. Finally, calcium helps activate the clotting compound prothrombin.

Potential Applications

- Osteoporosis
- Osteomalacia
- Rickets
- Fractures
- Bone health (general)
- Dental health (general)
- Muscle spasms and twitches
- Leg cramps
- Nervous tension
- Irritability
- Hypertension
- Preeclampsia
- Acid stomach (as and antacid)
- Excessive lead levels
- Histamine detoxification

Typical Supplemental Dosage Range

- 500-1500mg per day

Common Food Sources

Dairy products

Nuts

Carob

Sunflower seeds

Sesame seeds

Greens (mustard, collard, turnip)

Broccoli

Brewer's yeast

Figs (dried)

Kale

Cabbage,

Leafy green vegetables

Contraindications/Drug Interactions

- In order to avoid an increased risk of calcium deposition in the soft tissues (including kidney stones), daily dosages should be lower than 2000mg.
Please note: Certain experts believe that ensuring adequate magnesium intake and using calcium in the citrate form would lower the risk of soft tissue deposition. Research suggests that this is certainly the case for kidney stone formation.
- Cancer patients and people with hyper-parathyroid disorder should not use calcium supplements unless on the advice and under the strict monitoring of a physician.
- Calcium supplements should not be taken with blood pressure lowering drugs unless under medical supervision, as it may compound the effect of the drugs - in the case of calcium channel blocking anti-hypertensives, calcium may interfere with the drug's action.
- Calcium supplements should not be taken with digitalis unless under medical supervision.
- Calcium may decrease the absorption of various drugs such as-bisphosphonates (etidronate), fluoroquinolone antibiotics, 4-quinolones, tetracyclines and fluoride. It is recommended that calcium is taken at least two hours away from administration of the drug.

- Taking calcium with the drug tamoxifen may lead to excessive blood calcium levels.
- Strict medical supervision is required if patients taking cardiac glycosides receive parenteral calcium administration (the combination may increase the risk of heart arrhythmias).
- Unless vitamin C is taken at the same time, high dose calcium may reduce iron absorption.

Calcium

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Caprylic Acid

A fatty acid, this compound is derived from tropical oils such as palm and coconut.

A) ANTI-CANDIDA

Studies on caprylic acid have shown that it appears to be incorporated into the membranes of Candida cells, causing them to rupture and die. Studies have demonstrated significant reduction in Candida colonies in the intestines after consistent supplementation with caprylic acid. One study found that caprylic acid reduced evidence of Candida albicans in stool cultures by 30 - 90% after just 16 days of supplementation. Caprylic acid is normally absorbed very quickly from the gut into the blood stream, and in order for it to have the desired anti-fungal effects in the gut, caprylic acid must be complexed with minerals to ensure a slower release through the digestive tract. Caprylic acid should be introduced gradually in candidiasis to avoid or reduce the 'die off' reaction that results from an increased toxic load as the Candida dies.

B) ANTI-FUNGAL

In addition to Candida, caprylic acid has also been shown to be effective against other gastrointestinal yeast species such as Geotrichium and Rhodotorula.

C) SUGAR CRAVINGS

Anecdotal reports suggest that caprylic acid can help to reduce the sugar cravings associated with Candida.

Potential health applications of Caprylic Acid

- Candida
- yeast overgrowth
- sugar cravings

Contraindications/Drug interactions

As previously mentioned, high doses used in Candida infection may cause a die-off reaction, where the liver is unable to cope with the rate at which Candida albicans is being destroyed. Therefore, supplementation should begin in the lower dosage range

and be slowly increased to take account of this.

Caprvhc Acid

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Caricol (papaya puree)

Caricol is a proprietary patented formula comprising papaya puree prepared to a specific recipe. It is made from the pulp of organic tree-ripened papaya and preserved with lemon juice concentrate. Papaya is well known to support healthy digestion and elimination, however, the specific methods used in the preparation of Caricol, results in a supplement that has been shown to normalise and regulate bowel function.

A) CONSTIPATION

Several well controlled studies have demonstrated the ability of Caricol to reduce the incidence of constipation, even when the condition is chronic. In one study patients diagnosed with chronic constipation were administered Caricol, while the control group were given a regular puree of papaya. Bowel movements were observed over a six week period and the number of laxative required by each group was monitored. In the group given Caricol, laxative-medication could be reduced by 66% compared to the group given papaya puree where medication could be reduced by 9% only. Observational studies have confirmed these findings.

B) DIARRHOEA

Administration of Caricol to patients suffering with diarrhoea has been shown to be effective. In one European study, patients diagnosed with chronic diarrhoea were given Caricol and their bowel movements documented over a 7 week time frame. The patients went from having a normal (properly formed) stool only 2.5 times a week to 5 times a week by the end of the study.

C) IRRITABLE BOWEL SYNDROME

The bowel regulating properties of Caricol has been shown to be of benefit to IBS sufferers who typically have disturbed bowel function. In observation studies, a reduction in flatulence was also reported by IBS sufferers using Caricol. Papaya is a rich source of enzymes (including the protein-digesting enzyme papain), which supports proper digestive function. In studies, IBS sufferers reported improvements in symptoms such as stool consistency, heartburn and abdominal pain.

Potential Applications of Caricol

- Indigestion
- Heartburn
- Flatulence
- Irritable bowel syndrome
- Constipation
- Diarrhoea

Typical Supplemental Intake Range

1 tablespoon a day or diarrhoea

2 tablespoon a day for constipation

Contraindications/Drug interactions

None noted

L-Carnitine

A) ENERGY ENHANCER/ATHLETIC PERFORMANCE

This nutrient is required to carry long chain fatty acids into the mitochondria, the

energy-producing components of cells, so they can be metabolised into energy. This is particularly important in organs such as the heart, which uses fatty acids as a primary source of energy. Although carnitine is not an essential amino acid, and can therefore be synthesised in the body, certain conditions can lead to carnitine deficiency.

Examples include poor absorption, dietary deficiency of essential amino acids (especially lysine and methionine), co factor deficiency (iron, B3, B6, and C), and a high fat diet. Some studies have suggested a role for carnitine in endurance athletes where results suggested an increase in energy producing enzymes and improved cardiovascular function.

B) HEART HEALTH

Fatty acids are the primary source of fuel for the heart. Carnitine is required for the transport of fatty acids into the mitochondria, where they are metabolised into energy. Carnitine is therefore a crucial factor in the maintenance of heart health. Carnitine deficiency has been identified in a number of heart conditions, including angina, arrhythmia and cardiovascular disease. Improved fatty acid metabolism may also benefit the heart by reducing the build-up of toxic fatty acid metabolites, produced during carnitine deficient fatty acid energy production. These toxic fatty acid metabolites are thought to contribute to the decline in heart health.

- **ANGINA** - studies suggest that carnitine supplementation can normalise carnitine levels and improve oxygen utilisation, which translates into improved exercise tolerance and heart function. In one trial patients received either standard drug therapy or 2000mg of l-carnitine for a 6 month period. The carnitine group exhibited improved exercise tolerance and generally improved heart function.
- **CONGESTIVE HEART FAILURE** - Studies suggest that carnitine may improve cardiac function in congestive heart failure - a disease in which the heart is unable to pump enough blood and results in fatigue, shortness of breath and weakness. In one study patients given l-carnitine for 6 months increased their maximum exercise time by an average of 25% and the amount of blood pumped by one stroke by 14%.
- **ARRHYTHMIA** - Studies suggest that l-carnitine may be supportive due to its ability to improve energy production in the heart. In one study patients using l-carnitine were able to reduce the level of their conventional drug treatment (drug reduction should only ever be done under strict supervision by a medical Doctor)

C) LIPID-LOWERING AGENT

Research shows carnitine to reduce cholesterol and triglyceride levels, while improving the ratio between HDL (good) and LDL (bad) cholesterol. Studies have reported up to a 20% reduction in LDL cholesterol, a 28% reduction in triglycerides and a 12% *increase* in HDL cholesterol. Improving the ratio between HDL and LDL cholesterol is thought to be one of the most important factors in preventing cardiovascular disease.

D) MALE FERTILITY

Carnitine is found in high concentrations in the epididymis of the testes, where sperm mature and acquire their motility. Carnitine concentrations in semen appear to correlate positively with both the number of sperm and sperm motility. Studies suggest that carnitine supplementation may be of value in improving sperm count and motility in infertile men.

F) LIVER HEALTH

Carnitine is required for the metabolism and utilisation of fatty acids in the liver and there is some evidence that carnitine deficiency promotes the development of liver complaints associated with abnormal fat handling such as liver congestion. Alcohol impairs carnitine function, which may explain why carnitine appears particularly helpful in alcohol induced fatty liver and cirrhosis.

Potential Applications of l-carnitine:

- Atherosclerosis
- Angina
- Cardiomyopathy
- Heart arrhythmia
- Cholesterol and triglyceride reduction
- Muscle weakness
- Weight control
- Endurance exercise
- Male infertility
- Liver congestion/fatty liver
- Alcoholic cirrhosis

Please note:

In the case of enhancing brain function, ALC is preferred to l-carnitine. When using in improving cardiovascular health, l-carnitine is considered more appropriate.

Typical intake:

500-1000 mg per day (taken on an empty stomach)

Food sources:

Beef, pork, milk, cod, chicken, ice cream, avocado, whole wheat bread, asparagus

Contraindications/Drug Interactions

- Certain reports have suggested that ALC should be avoided if pregnant or breastfeeding unless under supervision by a qualified medical health practitioner.
- Carnitine deficiency may arise from use of various drugs, including valproic acid, phenobarbitol, didanosine, zalcitabine, stavudine, and pivalic acid containing antibiotics.

L-Carnitine

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Carotenoids

A) ANTIOXIDANT AND SINGLET OXYGEN-QUENCHING ACTIVITY

As a general category, carotenoids possess significant antioxidant/free radical scavenging activity. For example, beta carotene has been shown to inhibit the oxidation of cholesterol (thus reducing heart disease risk) and protects the thymus (the master gland of immunity) from free radical-induced damage. The carotenoids lutein and zeaxanthin are potent antioxidants within eye tissues and higher intake is strongly associated with reduced risk of age-related macular degeneration. In particular, certain carotenoids neutralise a toxic form of oxygen known as singlet oxygen (typically associated with cigarette smoke, air pollution, UV and ozone exposure). Although beta carotene is a good singlet oxygen quencher, studies show that among others, capsanthin (from paprika and red peppers), lycopene, gamma carotene and alpha carotene are considerably stronger than beta carotene in this respect.

B) CELL PROTECTIVE

Many studies show that the higher the blood levels or dietary intake of carotenoids, the lower the susceptibility to cellular abnormalities. Although the research has focused on statistics measuring specific carotenoids (especially alpha and beta carotene, lycopene and cryptoxanthin), it should be stressed that the people surveyed in such studies acquired carotenoids from food, rather than supplements. Food-derived carotenoids are never found in isolation (i.e. they are present with various other carotenoids and protective compounds). Thus it is likely that much of the cell protection highlighted in this research was associated with the synergistic effect of a wide range of carotenoids and other dietary antioxidants found in the food they were

eating. Although *in vitro* (test tube/petrie dish) and animal studies have shown benefits in cell protection from single carotenoids, it is not yet possible to draw firm *in vivo* (in the body) conclusions in this respect. The few *in vivo* human studies (involving *synthetic* beta carotene supplementation) have not shown the cell protective effects associated with high carotenoid diets. It is likely that some of this disparity is due to the fact that a *synthetic* form of beta carotene was used* (see below). In any case, diets rich in alpha carotene, lycopene, cryptoxanthin and/or beta carotene are linked to significant cell protection.

C) GAP JUNCTION COMMUNICATION

Gap junctions are a major route by which tissue cells in the body communicate with one another, and a breakdown in gap junctions may lead to cellular damage and/or abnormal cellular function, differentiation and replication. Carotenoids have been found to significantly enhance gap junction communication; it would appear that beta carotene has the greatest gap junction impact, followed by lycopene and lutein.

D) IMMUNE ENHANCEMENT

A high carotenoid intake is strongly associated with a reduced risk of infection and general immune-boosting properties. Although some of the immunological benefits of certain carotenoids are likely to be associated with their vitamin A activity, it appears that a high carotenoid intake may augment immune function irrespective of any influence on vitamin A. For example, beta carotene protects the immune system's master gland, the thymus, from free radical damage, and supplementation has been shown to significantly boost white blood cell activity.

E) VITAMIN A ACTIVITY

Only 10% or less of the naturally-occurring carotenoids currently identified by scientists fall into the provitamin A category (i.e. can be converted into vitamin A in the body). The production in the body of vitamin A from carotenoids requires adequate levels of thyroid hormone, protein, zinc and vitamin C. Provided that this conversion takes place efficiently, provitamin A carotenoids can be used to provide the functions of vitamin A (as retinol), and without the risk of vitamin A toxicity. However, because the conversion does not exceed the body's immediate need for retinol, provitamin A carotenoids will not necessarily provide the therapeutic properties of mega-dose retinol supplementation. Beta carotene has the highest vitamin A (retinol) activity of the carotenoids.

Major Provitamin A Carotenoids

- Beta carotene 100% vit A activity
- Cryptoxanthin 50-60% vit A activity
- Alpha carotene 50-54%vit A activity
- Gamma carotene 42-50% vit A

activity

(% vitamin A activity compared to beta carotene standard)

Major Non-Provitamin A Carotenoids

- Lycopene
- Zeaxanthin
- Lutein
- Capsanthin

Potential Applications

- Antioxidant (*all - especially alpha and beta carotene and lycopene*)
- Singlet oxygen quenching (*especially lycopene, astaxanthin, gamma, alpha and beta carotene*)
- Cell protection (*all - especially lycopene and alpha carotene*)
- Vitamin A precursor (*some - especially alpha, beta and gamma carotene - see above*)
- Skin health (*especially beta carotene and mixed carotenoids*)
- Respiratory [including lung] health (*especially lycopene, alpha carotene, lutein and*

beta carotene [from natural sources only - not synthetic form])

- Eye health (*especially lutein, zeaxanthin and astaxanthin*)
- Prostate health (*especially lycopene*)
- Cardiovascular health (*especially beta carotene and mixed carotenoids*)
- Female reproductive health (*especially alpha and beta carotene and cryptoxanthin*)
- Immune health (*especially beta and alpha carotene*)

Typical Supplemental Dosage Range

- Beta carotene: 5 - 15mg per day
- Alpha carotene: 500ug - 10mg per day
- Lutein: 100ug - 5mg per day
- Lycopene: 50ug - 15mg per day
- Zeaxanthin: 100 - 300ug per day

Common Food Sources

- Carrots (*alpha and beta carotene*)
- Sweet potato (*beta carotene*)
- Red peppers (*lutein, zeaxanthin*)
- Watermelon (*beta carotene, lycopene*)
- Apricots (*beta carotene*)
- Pumpkin (*alpha carotene*)
- Peaches (*cryptoxanthin, beta carotene*)
- Papaya (*cryptoxanthin*)
- Tomato (*lycopene*)
- Spinach (*beta carotene, lutein, zeaxanthin*)
- Broccoli (*lutein, zeaxanthin*)

Natural vs. Synthetic - the beta carotene controversy

Synthetic beta carotene supplements only contain beta carotene itself, while natural beta carotene supplements and food sources contain other naturally-occurring carotenoids as well - some which possess an even greater beneficial and protective effect than beta carotene. Because of this, it is very significant to note that high doses of synthetic beta carotene have been shown to block the absorption of other carotenoids. Also, natural beta carotene contains both the *9-cis* and *all-trans* forms, while synthetic is only the *all-trans* form. This is significant in that the *9-cis* form has a much greater bioavailability than *all-trans* (in fact, palm oil-derived beta carotene is 4 to 10 times better absorbed than synthetic). In addition, *9-cis* beta carotene has been reported to be superior to *all-trans* in its antioxidant activity and synthetic, *all-trans* beta carotene is, itself, prone to damage that leads to the formation of toxic compounds. Although it is possible that adequate intake of other nutritional antioxidants (e.g. vitamins C and E) may help protect against such damage in the body, it is advisable to avoid supplements containing synthetic beta carotene, especially if one is a smoker (or exposed to large amounts of secondary smoke) and/or are a heavy drinker of alcohol.

Contraindications/Drug Interactions

No known toxicity for levels found in supplements.

- The synthetic form of beta carotene should be avoided in heavy smokers (there are no known risks to the use of *natural* beta carotene supplements in smokers) - *see above*.
- Repeated intake of high doses of certain carotenoids, such as beta carotene, can cause a yellow/orange pigmentation of the skin. This is not a sign of toxicity and the pigmentation gradually subsides if supplementation is stopped or reduced to a sufficiently low level.
- Extremely high intake of carrots can cause toxicity, but this is not due to the carrots' beta carotene content.

Please note: Although certain carotenoids (e.g. beta carotene) convert into vitamin A in the body, they are not associated with the same risks/precautions/toxicity as preformed

vitamin A (retinol and its derivatives), as conversion only takes place as the body needs it.

Cat's Claw

uncaria tomentosa

A) IMMUNE STIMULANT

Certain components isolated from this herb, especially the alkaloid isopteropodine, have been found to increase phagocytosis (the ability of various white blood cells to attack and engulf harmful bacteria, viruses, etc.)

B) ANTI-INFLAMMATORY

Research suggests that cat's claw has potent anti-inflammatory actions on the entire digestive tract and joint tissues.

C) ANTIOXIDANT

Several polyphenols found in cat's claw exert a strong antioxidant / free radical scavenging activity.

D) CARDIOVASCULAR TONIC

Cat's claw alkaloids such as mitraphylline, rhynchophylline and hirsutine have demonstrated blood pressure lowering and vasodilating properties. Rhynchophylline has also shown to inhibit platelet aggregation and thrombosis as well as lowering heart rate and blood cholesterol.

Potential Applications of Cat's Claw:

- common cold
- flu
- miscellaneous infections
- arthritis
- intestinal disorders
- cardiovascular disease

Principle actives:

Alkaloids (e.g. mitraphylline), triterpenes, polyphenols, sterols

Contraindications/Drug Interactions:

Do NOT use during pregnancy.

Caution with anti-hypertensives, anti-diabetics and immunostimulants - check with a doctor.

Cat's Claw

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Cayenne

capsicum frutescens

A) CIRCULATORY STIMULANT

Cayenne offers circulatory benefits by significantly reducing excessive blood clotting. It has been shown to regulate blood flow, strengthen the heart, arteries and capillaries.

B) ANTI-BACTERIAL

Compounds in cayenne exert potent anti-bacterial effects. This is further enhanced by the immune boosting properties of the herb's naturally occurring content of carotenoids, flavonoids, etc.

C) PAIN RELIEVING

Studies show that capsaicin may block the feeling of pain by depleting and then blocking the production of 'substance P', which is thought to be the main chemical messenger of pain from the peripheral sensory nerves to the brain. Cayenne's influence on prostaglandin activity may also account for some of its anti-pain properties. *The*

anti-pain effects are especially prominent with topical use.

D) DIGESTIVE STIMULANT

Cayenne can be particularly useful in stimulating digestive secretions and may help support overall digestive function.

Potential Applications of Cayenne:

- poor circulation
- cold extremities
- arthritic pain
- bacterial infections
- gastric insufficiency

Principle actives:

Capsaicin

Contraindications/Drug Interactions:

Do NOT use internally in liberal amounts if taking prescribed anti-coagulant drugs such as warfarin without the consent of a qualified medical practitioner. Cayenne may produce a burning sensation as it is eliminated through the stool, but this effect seems to dissipate when used regularly. Keep powder away from the eyes.

Cayenne

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Celadrin

Celadrin, is a natural matrix of cetylated, esterified fatty acids derived from beef tallow. Esterification is a process where fatty acids are stabilised by combining them with alcohol - in this case cetyl alcohol. The resulting esterified fatty acids are very stable and will not react with oxygen. The specific components of Celadrin are cetyl myristoleate, cetyl myristate, cetyl palmitoleate, cetyl laureate, cetyl palmitate, and cetyl oleate.

A) ANTI-INFLAMMATORY

As a complex molecule consisting of various fatty acids, Celadrin is able to penetrate cell membranes, which enhances membrane health and integrity and cell-to-cell signaling. As a result the production of inflammatory compounds known as prostaglandins are inhibited. It may reduce the production of the negative immune factors like IL-6 that play a central role in inflammation. There is also evidence that Celadrin can inhibit the COX-2 enzyme that is responsible for the conversion of arachidonic acid into pro-inflammatory prostaglandins. Clinical trials suggest a role for Celadrin in the modulation of the inflammatory process in conditions such as arthritis. Based upon currently available data, Celadrin may also be useful for minor aches and pains associated with simple backache, strains, bruises and sprains.

B) ARTHRITIS

Sixty-four patients with chronic osteoarthritis of the knee were given either Celadrin or a placebo and evaluated after 30 and 68 days. Results indicated that compared to placebo, Celadrin improves knee range of motion and overall joint function. It was concluded that Celadrin may be an alternative to the use of non-steroidal antiinflammatory drugs for the treatment of osteoarthritis.

In a study using Celadrin cream, patients with osteoarthritis of the knee were assessed using functional tests that included stair climbing, and getting up out of a chair. After 1 month the subjects using Celadrin demonstrated significant improvements in functional test results compared with the placebo group.

C) PSORIASIS

Preliminary research also suggests a role for Celadrin in psoriasis, an inflammatory condition of the skin, and as more research studies are completed it is likely that

Celadrin will be identified as a beneficial compound in a variety of other inflammatory conditions.

Potential health applications of Celadrin

- osteo/rheumatoid arthritis
- psoriasis
- minor aches/pains
- backache
- sprains and bruises

Contraindications/Drug Interactions

None noted.

Celadrin

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Chamomile

matricaria chamomilla

A) ANTI-SPASMODIC / NERVE RELAXANT

Chamomile inhibits muscle spasms through its calming influence on the nervous system, an action that appears to be especially prominent in the digestive tract. This fact greatly warrants its use in irritable bowel syndrome. This calming action can be manifested as a gentle sedative effect and can also be used to generally reduce nervous tension.

B) ANTI-INFLAMMATORY

Various compounds within chamomile are associated with an anti-inflammatory effect; these include various bioflavonoids, such as apigenin. Chamomile has a long history of use in inflammatory diseases of the gastrointestinal tract.

C) CARMINATIVE

The volatile oils found in chamomile relax the stomach muscles, improve digestive peristalsis and may support overall intestinal function.

D) ANALGESIC

The reported pain reducing activity of chamomile appears to be achieved through the local action of volatile oils acting on prostaglandin release.

Potential health applications of Chamomile

- Irritable bowel syndrome (IBS)
- Abdominal cramping
- Digestive conditions associated with nervous tension
- Peptic ulcer
- Ulcerative colitis
- Gastritis
- Diverticulitis
- Indigestion

Principle actives

Flavonoids (e.g. apigenin), volatile oils, phenols

Contraindications/Drug Interactions

None noted.

Chamomile

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Chlorophyll

A) INTESTINAL REPAIR

Chlorophyll is especially useful for stimulating the healing of wounds with local administration. This characteristic makes the use of chlorophyll particularly suitable in digestive conditions such as inflammatory bowel diseases and conditions of excessive intestinal permeability (i.e. leaky gut disorder). Chlorophyll also possesses antibacterial properties, which may further enhance its wound-healing potential.

B) DEODORISING

It is common for chlorophyll or chlorophyll-rich plants to be used to reduce or eliminate odours, for example from breath or the intestines. Chlorophyll appears to bind to various odour-causing compounds. In addition, chlorophyll has anti-bacterial properties that make it relevant to the treatment of bacterial dysbiosis, where foul smelling gas results from the putrefaction of food by undesirable bacteria in the intestines.

Common supplemental sources of Chlorophyll

BLUE-GREEN ALGAE (*Aphanizomenon flos-aque*)

This algae, found in the Klamath Lake in Oregon, USA, is the richest known supplemental source of chlorophyll. It also possesses a remarkable nutritional profile including highly bioavailable proteins, vitamins, minerals, essential fatty acids, carotenoids, nucleic acids etc. The nutrients in blue-green algae are thought to be approximately 95% assimilable.

CHLORELLA

Chlorella is another algae with high chlorophyll levels. Like blue-green algae, chlorella is also an excellent source of other nutritional factors including proteins, vitamins, minerals, essential fatty acids, carotenoids, nucleic acids etc.

Chlorella

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SPIRULINA

Although its content is considerably lower than that of blue-green algae or chlorella, it is still regarded as an excellent source of both chlorophyll and essential nutrients.

CEREAL GRASSES

Barley grass, wheat grass, alfalfa and kamut grass are among the richest sources of chlorophyll of all non-algae foods. They are also excellent sources of essential nutrients and plant enzymes.

Potential health applications of chlorophyll

- Ulcerative colitis
- Crohn's disease
- Leaky gut disorder
- Intestinal gas
- Foul smelling stools

Contraindications/Drug Interactions

None noted.

Choline

A) LIVER AND GALL BLADDER SUPPORT

Choline is a major component of phosphatidylcholine (PC), found in lecithin. PC acts as a lipotropic agent (i.e. prevents accumulation of fat and cholesterol in the liver). Fat and cholesterol build-up can compromise the liver's capacity to function in detoxification, metabolism, bile production, etc, and can also lead to the development of gall bladder and bile duct disorders (e.g. gallstones). Many studies have shown choline supplementation (particularly as PC) to be effective in treating various liver diseases (e.g. hepatitis, cirrhosis, fatty liver disease), and for protecting the liver from

damage caused by numerous destructive influences, such as alcohol, certain drugs and toxins, viruses and radiation.

B) CARDIOVASCULAR HEALTH

PC increases solubility of cholesterol, thus improving its metabolism and removal from tissues. Studies show that PC also lowers total blood cholesterol and triglyceride levels, while significantly *raising* HDL (good) cholesterol levels. Supplements containing very high elemental PC concentrations have reduced total blood cholesterol and triglycerides by about a third after only one month. PC also reduces blood platelet aggregation (stickiness).

C) MENTAL FUNCTION AND EMOTIONAL HEALTH

Choline is needed to manufacture the neurotransmitter acetylcholine, which among other things, is involved in memory, cognition and mood stabilisation. Low acetylcholine is thought to cause certain symptoms of Alzheimer's Disease. Although PC supplementation has not shown consistent benefits in Alzheimer's trials, there may be some value in its use as a preventative or therapeutic tool in the early stages of cognitive decline and/or memory loss. Reduced acetylcholine is also linked with manic episodes in bipolar (manic) depression, and PC has displayed benefits in clinical studies involving bipolar patients. *Please note: Choline and PC supplements should be avoided in patients with clinical (non-bipolar) depression unless under doctor's supervision, as it may deepen depression in some cases.*

D) NERVE HEALTH

Choline is a component of cell membranes and is needed to manufacture and maintain the myelin sheaths of the nerves (which protect nerve cells and ensure proper conduction of nerve messages). Choline's role in acetylcholine activity also can influence digestive function, in that acetylcholine is required for peristaltic movement of intestinal muscles.

Potential Applications

- General mental function
- Memory enhancement
- Liver support
- Gallstones
- Cardiovascular health (i.e. cholesterol lowering)
- Nerve disorders (e.g. multiple sclerosis [MS])
- Bipolar (manic) depression (*NOT clinical [non-bipolar] depression - see contraindications*)
- Constipation (due to weak intestinal peristalsis)
- Laxative dependence

Typical Supplemental Dosage Range

Choline bitartrate, chloride, citrate

- 50-500mg per day (elemental choline)

Phosphatidylcholine (PC)

- 400-2000mg per day (elemental PC)

CDP choline

- 200-1000mg per day (elemental choline)

Common Food Sources

- Liver
- Eggs
- Cabbage
- Soybeans
- Cauliflower
- Peanuts
- Milk

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- Do not supplement choline and phosphatidylcholine in clinical (non-bipolar) depression unless under doctor's supervision, as it may deepen depression in some

cases.

- High-dose phosphatidylcholine may cause nausea, diarrhoea or reduced appetite.
- Large doses of choline (as choline chloride) may cause 'fishy' body odour

Chondroitin

A) JOINT PROTECTION AND REPAIR

Closely related to glucosamine, chondroitin sulfate is a glycosaminoglycan (GAG), a class of carbohydrate molecule found in connective tissue. As with glucosamine sulfate, oral administration of chondroitin has also displayed clinical benefits in the treatment of degenerative joint disorders. Evidence suggests that chondroitin sulfate protects and aids repair of the joint tissue in many ways, including stimulating the manufacture of the most important compounds in cartilage eg. proteoglycans, collagen and glycoaminoglycans, helping the cartilage to attract and hold onto water (a factor that improves the shock-absorbing properties of cartilage), and inhibiting enzymes which damage joint tissue.

B) CONNECTIVE TISSUE INJURY

Damage to cartilage and soft tissues in and around joints can be due to arthritis, but also sports injury, heavy lifting or manual work. Chondrocytes in the joint use chondroitin to produce tissue rebuilding compounds, as well as helping to prevent further destruction caused by certain enzymes.

C) VASCULAR HEALTH

The arteries, and the aorta in particular, are required to withstand the increase in blood pressure as the heart contracts and pumps blood along the arterial system. The walls of the aorta (the main artery from the heart supplying blood to the body) contain glycosaminoglycans which provide the aorta with support and elasticity as well as protection and aid to repair. The inner membrane in particular needs to be strong enough to avoid tearing or lesions, as this may initiate atherosclerosis. Glycosaminoglycans are also essential for the integrity of the vein walls. If venous tissue is weak and does not provide the proper support, the veins bulge, becoming dysfunctional and also unsightly if in the legs. Studies suggest that chondroitin supplementation may be of value in enhancing vascular integrity, by providing the material needed for repair.

Potential health applications of Chondroitin

- joint health
- sports injuries
- general connective tissue support
- vascular health
- cardiovascular health
- osteoarthritis
- aiding rehydration of cartilage

Contraindications/Drug Interactions

If taking warfarin, please check with a doctor as chondroitin in conjunction may increase bleeding.

Chondroitin

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Chromium

A) BLOOD SUGAR CONTROL

In order for blood sugar (glucose) to be metabolised efficiently it must be transported into the cells via the action of the hormone insulin. A compound called "glucose tolerance factor" (GTF), of which chromium is a primary component, facilitates this action of insulin. Chromium's main function in this respect is to increase the sensitivity of cell receptors to insulin, thereby increasing the efficiency of blood glucose metabolism. In fact, a study involving patients taking chromium observed that the number of insulin receptors increased, presumably as a result of the supplementation. Considering the above information, it is not surprising that chromium has a significant role to play in controlling high blood sugar and treating diabetes. This is especially the case in non-insulin dependent diabetes (NIDDM), whereby insulin is being secreted, but the cells are not sufficiently sensitive to it. NIDDM patients are often chromium deficient and studies confirm that chromium supplementation is often effective in helping to normalise blood sugar and increase glucose tolerance in such individuals. Interestingly, chromium also may play a beneficial part in glucose balance in those with *low* blood sugar (hypoglycaemia). This has been demonstrated in a 3-month trial where hypoglycaemics took 200ug of chromium per day. Supplementation led to both an improvement in both glucose tolerance measurements and subjective symptoms. There are various theories as to how chromium may benefit hypoglycaemia. One of the more frequently discussed is the following: When chromium is deficient, the body becomes insulin resistant and thus cannot efficiently deal with short-term elevations in blood sugar (such as after eating carbohydrates). The insulin that has been released is not being used up, but because the blood sugar remains elevated, the body releases yet more insulin in response. Once the food-derived blood glucose is eventually spent, there continues to be an overabundance of insulin in the body, leading to a crash in blood sugar. (Interestingly, in the studies of diabetics using chromium supplements, it was found that the mineral led to a *reduction* in insulin levels.) A crash in blood sugar leads to a craving for quickly-used carbohydrates in order to raise blood sugar. Sugars are eaten to satisfy the craving, and the blood sugar skyrockets and cannot be dealt with properly due to insulin resistance (perhaps due to chromium deficiency). This describes the vicious cycle of blood sugar elevations and crashes that are common in hypoglycaemic people. Chromium supplementation is thought to be a valuable tool in avoiding these severe fluctuations (see Contraindication/Cautions below).

B) CARDIOVASCULAR HEALTH

It has been observed in those with insulin resistance that the excessive insulin output (in response to the resistance) leads to an increase in blood lipids such as triglycerides, as well the more dangerous forms of LDL (bad) cholesterol. Some experts estimate that insulin resistance is a causal factor in a significant percentage of those with heart disease - especially in women. In the clinical research involving chromium supplementation in non-insulin dependent diabetics, it was observed that the mineral not only aided blood sugar balance, but also reduced levels of cholesterol and triglycerides. In fact, several studies demonstrated that chromium also lowers total cholesterol and triglycerides in those *without* diabetes. Supplementation also led to an increase in HDL (good) cholesterol. The greatest improvements were observed in those who initially had the lowest chromium levels.

Although chromium-induced changes to cholesterol and triglycerides are not typically large, they are still sufficient to provide a tangible health benefit, particularly in those at risk of cardiovascular disease. Optimally, chromium supplementation should be combined with appropriate dietary and lifestyle changes as well as other nutrients, herbs, etc that are relevant to cardiovascular health. In addition to any cardiovascular benefits from the reduction of blood lipids, chromium can also play a critical role in protecting the integrity of the blood vessels. Blood sugar that is not efficiently

metabolised can lead glycosylation (glycation). Glycosylation is the process whereby sugars attach to proteins and damage their structure. This process can lead to significant damage to artery walls. Chromium has been shown to reduce glycosylation.

C) WEIGHT CONTROL

"Syndrome X", which is the name coined to describe insulin resistance, has been a controversial area of investigation with respect to weight control. Some scientific evidence suggests that obese individuals are likely to suffer from "insulin resistance" (lowered sensitivity to the action of insulin). However, there is certain research suggesting that insulin resistance does not cause obesity *per se*, but rather that obesity can cause insulin resistance. Experts in the field of insulin research have observed that high insulin levels (i.e. due to insulin resistance) can cause the body to store fat. However, they state that this only occurs when calorie intake is in excess of immediate energy needs. In spite of the controversies surrounding the role of insulin resistance in obesity, there is clinical evidence that chromium supplementation can increase the rate of fat loss. For example, one clinical trial showed that 2 *Vi* months of supplementation with either 200ug or 400ug of chromium lead to a fat loss of 3.3lbs and 4.6lbs respectively. Men appeared to experience the greatest benefits and the male participants lost approximately 7 times more fat than those receiving the placebo. In addition, lean muscle mass was increased. Undoubtedly, the weight control benefits of chromium supplementation are mainly due to a combination of lower insulin levels, less insulin resistance and the increased fat burning potential afforded by increased lean muscle mass.

D) SPORTS NUTRITION

As well as its influence on transporting sugar into cells, insulin also facilitates the entry of amino acids into muscle cells. This may account, at least in part, for the influence of chromium on lean muscle mass (see WEIGHT CONTROL above). Not surprisingly, the research highlighting the ability of chromium supplementation to increase the rate of lean muscle gain and fat loss has raised a great deal of interest in the sports nutrition field. In the clinical trial mentioned above, the participants receiving 200ug of chromium per day for 2 *Vi* months experienced an increase in lean muscle mass of 1.5lbs. Those taking 400ug per day gained 1.1 lbs of lean muscle mass. These results, combined with the significant fat loss (see above) would be of value to both athletes and those involved in more casual exercise.

E) SKIN HEALTH

In addition to the above influences of insulin resistance, it appears that the skin also is adversely affected. For example, in the case of acne, there is evidence that the glucose tolerance of skin tissue can be significantly impaired, even where the results of standard oral glucose testing methods are normal. Although evidence is limited, chromium supplementation may improve acne in many patients, presumably by helping normalise the glucose tolerance in skin cells.

F) ANTI-AGEING

There has been a great deal of interest and publicity regarding the influence of free radicals in the ageing process, and with great justification. Equally justified, but for the most part unknown outside of the scientific field, is the role of sugar in ageing. As mentioned above, blood sugar that is not efficiently metabolised can lead glycosylation (glycation). Glycosylation is the process whereby sugars attach to proteins (such as collagen) and damage their structure. There is considerable evidence that glycosylation can significantly damage cells and essential bodily compounds, while accelerating the ageing of body tissues and organs. Chromium has been shown to reduce glycosylation by facilitating blood glucose metabolism, thereby reducing the exposure of cells to high sugar concentrations. Although human longevity studies regarding chromium are lacking, supplementation seems warranted, especially considering the worryingly high percentage of people who are chromium deficient.

Potential Applications

- Blood sugar control (general)
- Non-insulin dependent diabetes
- "Borderline" diabetes
- Hypoglycaemia
- Cravings for sugar and refined carbohydrates
- High cholesterol
- High triglycerides
- Cardiovascular disease (general)
- Weight control
- Sports nutrition
- Body building
- Acne
- Slowing the ageing process

Typical Supplemental Dosage Range

- 100-500ugper day

Common Food Sources

- Brewer's yeast
- Whole wheat
- Nuts
- Sunflower seeds
- Beans (especially soy)

Contraindications/Drug Interactions

- Chromium should only be supplemented in the *trivalent* form.
- Insulin dependent diabetics should not take chromium supplements unless on the advice and under the strict monitoring of a physician, as the chromium may compound the drug's effect and lead to difficult management of insulin dosage and even dangerous drops in blood sugar.
- Non-insulin dependent diabetics taking diabetic medication other than insulin should only take chromium supplements on the advice and under the strict monitoring of a physician.
- Non-medicated, non-insulin dependent diabetics patients should only take chromium supplements on the advice and under the monitoring of a physician.

Individuals with hypoglycaemia should only use chromium supplements on the advice and under the monitoring of a qualified healthcare practitioner. Some hypoglycaemics will experience severe drops in blood sugar as a result of chromium supplementation.

Yeast-derived chromium supplements should not be used by patients taking monoamine oxidase (MAO) inhibitors unless on the advice and strict monitoring of a physician. Yeast-free chromium supplements can be used as an alternative.

It has been reported that if taken in the evening, chromium may lead to more vivid and colourful dreams and a reduced need for sleep.

Chromium

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Cinnamon

Cinnamon comprises mainly volatile oils (1-4%) and flavonoids (8%) with the volatile oils mainly comprising cinnamaldehyde (60-80%). The flavonoids are primarily proanthocyanodins and cinnamtannins.

Modern science is only now beginning to reveal the amazing potential of cinnamon in human health, with benefits to digestion, blood lipids and blood sugar now being attributed to this ancient spice.

A) DIGESTIVE SUPPORT

Historically, cinnamon has been used to support digestion, and may be of particular value for people with gastrointestinal problems such as IBS, Candida, dysbiosis, abdominal cramps and indigestion. The *British Herbal Pharmacopoeia* indicates its use for flatulent dyspepsia, flatulent colic, and diarrhea, specifically colic or dyspepsia with flatulent distension and nausea.

The volatile oils in cinnamon appear to provide an anti-spasmodic action and kill a variety of pathogens. Cinnamon has been studied for its ability to help stop the growth of bacteria as well as fungi, including the commonly problematic yeast, *Candida albicans*. In laboratory tests, growth of yeasts that were resistant to the commonly used anti-fungal medication, fluconazole, was often (though not always) stopped by cinnamon extracts. Other studies found that cinnamaldehyde from cinnamon was effective in killing 4 species of *Candida* and a variety of bacterial pathogens, and does not appear to significantly impact on probiotic organisms found in the intestinal tract.

B) BLOOD SUGAR CONTROL

Cinnamon may help people with type II (adult onset) diabetes improve their ability to respond to insulin, thus normalising their blood sugar levels. Both test tube and animal studies have shown that compounds in cinnamon not only stimulate insulin receptors, but also inhibit an enzyme that inactivates them, thus significantly increasing the cells' ability to use glucose.

One study looked at the effect of cinnamon on 60 patients with type II diabetes, and found that there was a significant reduction (18-29%) of mean fasting serum glucose after 40 days of administration of either 1, 3 or 6 grams of cinnamon per day. The study also showed significant reductions in triglycerides, LDL cholesterol and total cholesterol, with no significant change in HDL cholesterol. Cessation of therapy resulted in a return to previous levels. No reductions were reported in the placebo group. A more recent study found that fasting blood glucose levels were reduced by an average of 10% in patients taking cinnamon extract 3 times per day for 4 months.

Cinnamon may also help to reduce or slow the progression of the various complications of diabetes due to its potent antioxidant properties.

C) ANTIOXIDANT

Cinnamon is so powerful an antioxidant, that when compared to six other antioxidant spices (anise, ginger, licorice, mint, nutmeg and vanilla) and two chemical food preservatives, cinnamon prevented oxidation more effectively than all the other spices (except mint) and the chemical antioxidants. Cinnamon was also found to be more effective at scavenging superoxide and hydroxyl radicals than vitamin E.

D) CIRCULATION/ANTI-INFLAMMATORY

Cinnamaldehyde has been well-researched for its effects on blood platelets. Platelets are constituents of blood that aggregate (clump together) under emergency circumstances (like physical injury) as a way to stop bleeding. However, in some people inappropriate aggregation results in inadequate blood flow and increases the

risk of various thrombotic events (e.g. heart attack, DVT). The cinnamaldehyde in cinnamon helps prevent aggregation of blood platelets by inhibiting the release of arachidonic acid from platelet membranes and thereby reducing the formation of an inflammatory messaging molecule called thromboxane A2.

By preventing the release of arachidonic acid from membrane stores, cinnamon may also be helpful in a variety of inflammatory conditions.

Potential Applications of cinnamon:

- Blood sugar control
- Antioxidant
- Circulation
- Inflammatory conditions
- Flatulence
- IBS
- Abdominal distension
- Candidiasis

Typical intake range of cinnamon

1-4 grams of raw bark per day

Contraindications/drug interactions

Should not be taken during pregnancy or lactation. Caution with blood-thinning medication - concomitant use under medical supervision only.

CLA

(Conjugated Linoleic Acid)

Conjugated linoleic acid (CLA) is a slightly altered form of the essential fatty acid linoleic acid and is naturally occurring in meat and dairy products. Intestinal bacteria synthesise CLA from linoleic acid (LA), although there is no evidence that supplementing LA increases levels of CLA in the blood.

WEIGHT CONTROL

Preliminary evidence suggests a role for CLA in weight management programmes. In one double-blind study, volunteers participating in an exercise program received 600 mg of CLA or a placebo three times per day for 12 weeks. Compared with placebo, CLA significantly reduced percent body fat, but did not significantly reduce body weight. Anecdotal evidence for CLA supplementation is strong, however, at this time more research is required before this theory can be widely accepted.

Potential Applications of CLA:

Weight control
Body building

Typical intake range

50-1000mgper day

Contraindications/Drug Interactions

None noted

Conjugated linoleic acid

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Cod Liver Oil

Cod liver is a source of omega 3 fatty acids in the form of EPA and DHA. However the quantities are less concentrated than in oil taken from the whole fish. Cod liver oil is a significant source of the fat soluble vitamins A and D. Achieving therapeutic doses of EPA and DHA may result in an undesirable level of vitamin A and D intake. A fish oil concentrate may therefore be a better choice.

Typical cod liver oil composition: EPA 12%, DHA 9%

A) GROWTH AND DEVELOPMENT

Cod liver oil contains vitamin A, a fat soluble nutrient that influences growth and development due to its effects on the synthesis of glycoproteins, which in turn may maintain proper cellular function and expression of genes. Deficiencies of vitamin A are especially apparent in the lining of the cornea of the eyes, respiratory tract,

intestinal tract, skin, urinary tract and the ducts of secretory glands.

B) SKIN HEALTH

Vitamin A influences the cellular production of mucin and keratin. A deficiency of vitamin A causes an abnormal increase in keratin production, leading to hyperkeratinisation of the skin cells. Vitamin A supplementation from cod liver oil has been shown in research to benefit various skin disorders (e.g. acne, psoriasis).

C) EYE HEALTH

Vitamin A is needed by the rods and cones in the eye's retina, responsible for night and daytime vision respectively. Impaired adaptation to changes in light and poor vision are often found in people with low vitamin A status. A deficiency of vitamin A also causes a 'hardening' of the cornea of the eye due to an abnormal increase in keratin production.

D) BONE HEALTH

Cod liver oil contains vitamin D, an important nutrient that facilitates the uptake of calcium from the gut. Adequate vitamin D is therefore required as part of the complex calcium homeostatic processes that maintain calcium levels in the bones.

E) CARDIOVASCULAR HEALTH

Intervention studies strongly suggest that EPA from fish oils can lower various risk factors for cardiovascular disease (independent of any blood cholesterol-lowering effect). These effects include an antithrombotic effect, lipid (triglyceride) lowering, reduced blood and plasma viscosity, and improvements in endothelial dysfunction. Omega 3 fatty acids have been shown to inhibit the activity of a chemical called thromboxane. Thromboxane is a potent vasoconstrictor and causes platelets to aggregate (stick together). It is therefore implicated in the development of blood clots and other vascular disorders. However, the dose of cod liver oil required to reach the levels of EPA used in most clinical research would result in the intake of undesirable quantities of vitamins A and D, in which case a fish oil concentrate would be preferable.

F) CHOLESTEROL

Studies have consistently made the association between fish oils and cholesterol reduction. Fish oils appear to reduce triglycerides in addition to improving the important relationship between HDL and LDL cholesterol. A 1% rise in HDL cholesterol levels is associated with a 3-4% drop in heart attack risk. A 1% drop in LDL is associated with a 1% reduction of risk.

G) HYPERTENSION

Hypertension is one of the major risk factors for heart attack or stroke. Many clinical studies have demonstrated a significant blood pressure lowering effect when the level of dietary omega 3 fatty acids are increased, especially when taken in the form of fish oils.

H) INFLAMMATORY CONDITIONS

Omega 3 fatty acids produce favourable effects in inflammatory conditions by suppressing the production of inflammatory compounds produced by white blood cells. Fish oils are thought to be especially beneficial in rheumatoid arthritis. However, the dose of cod liver oil required to reach the levels of EPA used in most clinical research would result in the intake of undesirable quantities of vitamins A and D, in which case a fish oil concentrate would be preferable.

Potential Applications of cod liver oil:

- Osteoporosis
- Eye health
- Tissue repair (especially mucous membranes)
- Cardiovascular disease
- Hypertension
- High cholesterol
- Inflammatory conditions (e.g. arthritis)

Typical intake range

500 - 3000mg cod liver oil

(60 - 360mg EPA, 45 - 270mg DHA)

Contraindications/Drug Interactions:

Due to its very high levels of vitamin A and vitamin D, cod liver oil should not be taken by women who are or who could become pregnant before consulting a doctor. Other adults should consult with a practitioner or Doctor before taking cod liver oil (or other supplements) containing more than 25,000IU (7,500 meg) of vitamin A per day or 800 IU of vitamin D per day.

Do not use with warfarin or anti-coagulant medications

Coenzyme Q10

Also known as ubiquinone because it is in every plant and animal cell, (although dietary sources are not likely to be sufficient to make up a deficiency), CoQ10 is an essential component of the mitochondria (the powerhouse of the cells).

A) ANTIOXIDANT

As a fat soluble nutrient, the antioxidant activity of CoQ10 is associated with the protection of lipids in the body e.g. cell membranes, triglycerides, cholesterol, fatty acids, fatty tissues of the brain, and nervous system.

B) CARDIOVASCULAR HEALTH

This heavily researched co-enzyme has been shown to be effective in cases of congestive heart failure, high blood pressure, angina, cardiomyopathy, mitral valve prolapse and recovery from heart by-pass surgery. Heart muscle cells use fats as their primary energy source, CoQ10 is required for the metabolism of fatty acids within the cells' mitochondria. The energy produced is used by the heart muscle for the mechanical pumping action, ensuring effective circulation of the blood through the vascular system. The antioxidant protection of blood lipids helps reduce the risk of atherosclerosis, which would impede circulation and put further pressure on the heart. Unfortunately medications such as beta blockers and statins can impede CoQ10 synthesis, meaning that the people who need it the most are getting less. It is worth considering supplementing CoQ10 alongside these medications, under supervision by a doctor.

C) SPORTS NUTRITION

Studies show that supplementation with CoQ10 improves workout capacity and oxygen transport in sedentary individuals. One study tested sedentary young men supplementing with 60 mg CoQ10 daily and found improvements of 3-12% after 4 weeks. The addition of CoQ10 to any sports programme would be additionally warranted, due to the fact that aerobic exercise accelerates free radical damage.

D) PERIODONTAL HEALTH

Healing and repair of gum tissue requires energy and a strong immune system to prevent infection. Sufferers of periodontal disease have been found to have low CoQ10 levels. In studies on dental surgery, post-operative healing was faster in patients using CoQ10 compared to a group using a placebo.

E) IMMUNE SYSTEM

Studies on age related immune suppression showed an improvement in antibody production with supplementation of CoQ10.

F) WEIGHT CONTROL

CoQ10 facilitates the conversion of stored fat into ATP, thus allowing it to be burned as an energy source. As such, it may aid a weight control programme, especially in combination with aerobic exercise.

Potential health benefits of CoQ10

- cardiovascular health
- hypertension
- angina
- cardiomyopathy

- heart arrhythmia
- fatigue
- weight control
- gum disease
- immune function
- sports nutrition
- antioxidant protection

Contraindications/Drug Interactions

High doses may reduce the effectiveness of the drug warfarin. If taking warfarin, do not take CoQ10 without the advice of a doctor and also consult the doctor if CoQ10 is being used prior to starting warfarin therapy.

Anyone on heart medication should consult their doctor as Coenzyme Q10 may alter/reduce the need for their medication, monitoring is necessary.

CoQ10

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Copper

A) ESSENTIAL COENZYME

Copper is an essential coenzyme (non-protein portion of an enzyme) in several enzyme systems that are involved in numerous bodily functions. Enzymes for which copper is a component include among others; superoxide dismutase, lysyl oxidase, beta hydroxylase, cytochrome oxidase and tryptophan pyrolyase. In its enzymatic capacity, copper facilitates oxidation of numerous compounds, such as monoamines and uric acid. Its enzymatic influence is also important to processes such as haemoglobin formation, skin pigmentation, blood clotting and energy production. The participation of copper in so many catalytic systems means that a deficiency will adversely affect many aspects of biological function.

B) CONNECTIVE TISSUE HEALTH

Lysyl oxidase, an enzyme which is dependent on copper, is needed for the proper integration of collagen and elastin with the body tissues. In this respect, lysyl oxidase allows for the cross-linking of the fibres of both collagen and elastin, thus allowing them to help establish connective tissue structures with the necessary stability and elasticity. Collagen is the most abundant protein in the body and is the major structural component of connective tissue i.e. within the skin, blood vessels, joints, bones, eyes, lungs, intestines and so on. Improper cross-linking can lead to weak blood vessels, osteoporosis, arthritis, skin damage and many other problems.

C) ANTIOXIDANT ACTIVITY

Like zinc and manganese, copper is a component of the enzyme superoxide dismutase (SOD). SOD is a powerful antioxidant produced by the body for protection against free radical damage to cells, tissues and essential bodily compounds. In this manner, SOD neutralises superoxide radicals, which are, among other things, implicated in triggering tissue damage and inflammation. The joints and eyes are thought to be especially susceptible to superoxide radicals. Proper SOD synthesis may be especially important in cases of arthritis, sprains, strains and cataracts.

Potential Applications

- Connective tissue health (general)
- Arthritis

- Sprains
- Strains
- Repetitive strain injury (RSI)
- Anaemia
- Vascular instability
- Cardiovascular disease
- Anaemia
- Cataracts
- Antioxidant protection
- Zinc excess (see Contraindications/Cautions below)

Typical Supplemental Dosage Range

- 1-3mg per day

Common Food Sources

- Oysters
- Shellfish
- Liver
- Nuts
- Soy flour
- Buckwheat
- Dried peas
- Dried chickpeas
- Dried fruit
- Wheat bran

Contraindications/Drug Interactions

CAUTION

With copper supplements there is a risk of a dangerous accidental overdose - as with iron, copper supplements should be kept out of the reach of children. It has been reported that doses as little as 3.5 grams (3500mg) may be lethal.

- Symptoms of copper toxicity include nausea and vomiting, headache, diarrhoea, gastric pain, dizziness, insomnia, weakness, high blood pressure, jaundice and racing heart.

- Excessive copper intake may cause a metallic taste in the mouth.

- Copper accumulation in tissues is a common feature of many health disorders.

Supplementation should not be taken in the event of tissue copper excess unless on the advice and under the monitoring of a qualified healthcare practitioner.

- Individuals suffering from Wilson's Disease should avoid supplements containing copper.

- People who suffer with haemochromatosis should not take copper unless on the advice and under the strict monitoring of a physician.

- High doses of copper can adversely affect zinc status (and *vice versa*).

Although there are differing scientific views on what constitutes an optimal ratio between copper and zinc, it is thought that a ratio for long-term intake between 1:7.5 and 1:10 (copper to zinc) is probably appropriate.

Copper

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Cranberry Berries

vaccinium macrocarpon

A) ANTI-BACTERIAL

Compounds in cranberry such as D-mannose, and to a lesser extent hippuric acid, inhibit pathogenic bacteria (such as streptococcus and E coli) in the urinary tract. At least part of this mechanism involves inhibiting bacterial adherence to the urinary tract's mucosal surface. This action is especially useful in urinary tract infections (e.g. cystitis).

B) NUTRITIVE

Cranberry is naturally a rich source of vitamins, minerals, and flavonoids.

C) ANTIOXIDANT

The very rich flavonoid content, supported by certain vitamins and minerals, offers very potent protection from free radical damage.

Potential Applications of Cranberry Berries:

- urinary tract infections (e.g. cystitis)
- protection against free radicals

Principle actives:

D-mannose, organic acids (e.g. hippuric)

Contraindications/Drug Interactions:

None noted.

Cranberry Berry

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L-Cysteine

A) DETOXIFIER

Research suggests that cysteine is an effective method of increasing glutathione, a compound required for phase II liver detoxification in a process called conjugation. Approximately 60% of all toxins passing through phase II are detoxified via glutathione conjugation, which makes cysteine an important factor in liver detoxification. As a sulphur amino acid, cysteine is abundant in 'smelly' foods such as eggs and garlic.

B) LIVER PROTECTANT

Glutathione is required for the detoxification of numerous substances in the liver and is a compound of three amino acids, cysteine, glutamic acid and glycine. Of these, cysteine is most likely to be rate limiting, in other words the availability of cysteine is the biggest factor in how much glutathione can be synthesised. Additional dietary cysteine is thought to be the most effective method of increasing glutathione synthesis, and thus improving glutathione conjugation - the method in which approximately 60% of all toxins are neutralised during phase II of the liver's detoxification process. Efficient phase II detoxification ensures that harmful toxic compounds are not able to build up in the liver. Cysteine also has antioxidant properties, which further enhances its liver protective abilities. A metabolite of cysteine, known as N-acetyl-L-cysteine (NAC) is often administered in the early stages of paracetamol poisoning, such is the detoxification potential of this amino acid.

C) HEAVY METAL SCAVENGER

In addition to the indirect detoxification potential of cysteine, through the upregulation of glutathione conjugation, it is also able to bind to (chelate) heavy metals, thus aiding their removal from the body.

D) ANTIOXIDANT

Cysteine, both alone and as part of glutathione, is a very effective free radical scavenger. It also forms a part of the potent antioxidant enzyme glutathione peroxidase and is able to quench both reactive oxygen species and peroxide radicals, an action which makes it especially valuable in protecting cell membranes.

E) CARDIOVASCULAR PROTECTANT

Through its antioxidant effects, cysteine can prevent oxidation of LDL cholesterol, a known risk factor in heart disease. The more potent form of cysteine, NAC, also significantly lowers lipoprotein A, which appears to be an even greater risk factor in heart disease than cholesterol.

Potential Applications of l-cysteine:

- Liver protection and liver disorders
- Detoxification
- Heavy metal poisoning
- Free radical-related disorders in general
- Atherosclerosis

Typical intake range:

500-1500 mg per day (taken on an empty stomach)

Food sources:

Soybeans, spirulina, beef, pork, chicken, turkey, spirulina, lentils, adzuki beans, baked beans, chickpeas, kidney beans, peas

Contraindications/Drug Interactions:

- Cysteine may produce a false positive in diabetic tests for ketone bodies.
- Best avoided by children, pregnant women and nursing mothers.
- Vitamin C supplementation is often recommended when taking l-cysteine.

Cysteine/NAC

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Vitamin D3

Cholecalciferol

There has been renewed interest in vitamin D recently, with new research showing that the health benefits of this nutrient stretch way beyond bone health.

Vitamin D is a fat-soluble nutrient required for the absorption and utilisation of calcium and phosphorus. Two forms are available from foods - ergocalciferol (D2) and cholecalciferol (D3).

A) BONE HEALTH.

Vitamin D is necessary for growth, development and maintenance of bones and teeth in children and adults. In its most active form, vitamin D works with calcium to control bone formation.

B) OSTEOARTHRITIS

Arthritis and similar joint conditions occur in part, due to breakdown of cartilage in the joints. Just as vitamin D is required for bone health, it is also needed to maintain healthy cartilage. Research suggests that inadequate intakes of vitamin D may be linked to an increased risk of arthritis of the hip in older women and to joint changes seen on x-rays of both men and women. Studies assessing vitamin D's role in osteoarthritis have found that it prevents the breakdown of cartilage.

C) ABNORMALITIES OF THE PARATHYROID HORMONES

The parathyroid glands are four glands located in the neck, which produce parathyroid hormone- responsible for regulating the metabolism of calcium and

phosphorous. This mechanism is dependant on vitamin D and vitamin D supplements have been prescribed for parathyroid imbalances.

D) HIGH BLOOD PRESSURE

In those with kidney disease and/or hyperparathyroidism, low levels of vitamin D may be a factor in the development of high blood pressure. One study suggested that supplementation with vitamin D and calcium helped to lower blood pressure in older women with low levels of vitamin D and high levels of parathyroid hormone.

E) SEASONAL AFFECTIVE DISORDER (SAD)

SAD is a form of depression that occurs during the winter months due to the lack of day/sunlight. A few studies suggest that taking vitamin D supplements can improve the mood of those with SAD.

F) BLOOD SUGAR MANAGEMENT

Vitamin D has been linked to a reduced risk of developing type 1 diabetes.

A Finnish study following over 12,000 babies born in 1966 found those who were given the recommended amounts of vitamin D supplement had an 80% reduced risk of developing diabetes.

G) ANTIMICROBIAL

According to a recent study, vitamin D mediates a key antimicrobial response against *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis (TB). In addition, low levels of vitamin D may make a person more susceptible to contracting tuberculosis.

H) MULTIPLE SCLEROSIS (MS)

Scientists have observed that MS rates are significantly lower in areas that receive a lot of sunlight and where people eat a lot of fish, which is rich in vitamin D. Recent research has discovered that women who had the highest vitamin D intakes from supplements, were 40 per cent less likely to develop multiple sclerosis than those who used no supplements.

I) IMMUNE HEALTH

Vitamin D is a potent immune system modulator. There is considerable scientific evidence that vitamin D has a variety of effects on immune system function and may enhance innate immunity and inhibit the development of autoimmune diseases.

J) INFLUENZA

There is preliminary evidence that vitamin D deficiency may be linked to the incidence of influenza. Also, it has been proposed that low levels of vitamin D predispose a person to the influenza viruses. This is possibly corresponding to the relationship between vitamin D and immune health.

Potential Applications of Vitamin D3

- Aid to calcium absorption
- Bone health
- High blood pressure
- Blood sugar imbalances
- Weight management
- Mood disorders (eg depression)
- Immune health

Typical intake range for vitamin D3:

200 to 1200IU per day

Contraindications/drug interactions:

Unless medically supervised, vitamin D supplements should not be taken with the drugs digitalis (combined use may cause arrhythmia), thiazide diuretics (combined use may cause hypercalcaemia) or calcitonin (vitamin D may reduce the drug's effect).

Dandelion

taraxacum officinale

A) LIVER AND GALLBLADDER TONIC

Dandelion has a long history of use as a tonic to the liver. It has been shown to enhance bile flow, thus improving conditions such as liver congestion, bile duct

inflammation, hepatitis, gallstones, and jaundice. Dandelion increases bile flow by affecting the liver directly to cause an increase in bile production and flow to the gallbladder, and by causing contraction of the gallbladder resulting in the release of stored bile. In this manner it acts as a lipotropic agent (reduces the accumulation of cholesterol and fat in the liver). The high choline content of dandelion combined with various bitter principles are thought to be the primary reasons for this action.

B) DIGESTIVE STIMULANT

In addition to the stimulation of bile, dandelion contains various bitter principles that are thought to promote the release of other digestive secretions including saliva, hydrochloric acid and pancreatic enzymes. This suggests a use for dandelion in conditions where low levels of digestive secretions are implicated, including indigestion, flatulence and bloating.

C) DIURETIC

Dandelion has been confirmed as having diuretic activity. Conventional diuretic treatments have a negative side effect of eliminating potassium from the body, however, dandelion's rich content of this mineral addresses this concern.

D) NUTRITIVE

Dandelion is a relatively rich source of nutrients containing vitamins A, C, D, B complex (particularly choline, which aids liver function) and a variety of minerals. Its leaves have the highest potential vitamin A activity of all greens.

E) ANTI-BACTERIAL / IMMUNE SUPPORTIVE

Inulin, a polysaccharide abundant in dandelion, is one of nature's most potent immune stimulants. This action of inulin would be greatly supported by the herb's rich content of carotenoids, vitamin C, etc. There is also evidence of anti-bacterial properties of certain constituents in dandelion.

F) WEIGHT CONTROL

Dandelion may be a useful addition to weight control programmes due to its positive influence on fat metabolism and the ability to eliminate excess body fluids.

Potential health applications of dandelion

- Gallstones
- Elevated cholesterol
- Poor fat digestion
- Liver congestion
- Bile duct inflammation
- Indigestion
- Insufficiency of digestive secretions

/~v

Principle Actives

Bitter principles (lactucopicrin, triterpenoids and phytosterol), Vitamins (including choline), inulin

Contraindications/Drug Interactions

Do NOT use during pregnancy.

Do not use concurrently with diuretic medication.

May increase the effect of insulin and anti-hypertensives - check with doctor

Dandelion

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Deglycyrrhised Licorice Root

glycyrrhiza glabra

A) ANTI-ULCER

The deglycyrrhised form of licorice (DGL) is clinically proven to treat ulcers in the upper digestive tract, primarily due to its ability to stimulate the normal defence mechanisms that prevent ulcer formation. DGL improves the integrity of the mucosal surfaces of the intestinal tract, increasing the life span of intestinal cells and improving the blood supply to the intestinal mucosa. DGL may also inhibit ulcer-triggering micro-organism *helicobacter pylori*. Studies have shown deglycyrrhised licorice to be as effective as common anti-ulcer drugs, but without the associated side effects.

B) STOMACH PROTECTION

It is well known that non-steroidal anti-inflammatory drugs (NSAID's) are associated with certain side effects, including damage to the structural integrity of the stomach. Scientific research has shown deglycyrrhised licorice to be effective in protecting the stomach from damage that may occur during long term treatment with NSAID's.

Potential health applications of Licorice Root

- ulcers (stomach and duodenal)
- inflammatory bowel diseases
- digestive damage caused by NSAIDs

Principle actives

flavonoids, isoflavones (DGL), also glycyrrhetic acid in non-deglycyrrhised form)

Contraindications/Drug Interactions

Chronic high dose usage of non-deglycyrrhised licorice may cause an accelerated excretion of potassium and retention of sodium, and thus should be avoided if suffering with high blood pressure or oedema unless under medical supervision. Increase in the intake of potassium-rich foods is recommended if using nondeglycyrrhised licorice regularly.

Devil's Claw

harpagophytum procumbens

A) ANTI-INFLAMMATORY

The anti-inflammatory effects of devil's claw would appear to be primarily due to the active compound harpagoside. Although not all studies of the anti-inflammatory effect of devil's claw have been conclusively positive, questions were raised as to the validity of the procedures used in the inconclusive research.

B) URIC ACID REMOVAL

Uric acid is a potentially damaging by-product of metabolism, which particularly collects around joint tissue, causing pain and inflammation. Devil's claw appears to aid the removal of this compound and thus may reduce the associated symptoms of gout.

C) PAIN RELIEVING

Analgesic properties have been reported in research, which at least in part may be associated with the herb's potential anti-inflammatory effect.

Potential Applications of Devil's Claw:

- osteo- and rheumatoid arthritis
- rheumatism
- gout
- sports injuries

Principle actives:

Harpagosides

Contraindications/Drug Interactions:

Do NOT use during pregnancy

.Devil's Claw

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DHA

(*docosahexaenoic acid*)

Overview

A long chain polyunsaturated fatty acid derived from dietary alpha linolenic acid (ALA) and found preformed in oily fish such as sardines, mackerel and salmon. DHA is an omega 3 fatty acid and is found in high concentrations in the brain and retina.

A) BRAIN DEVELOPMENT

DHA, or docosahexaenoic acid, is one of the critical nutrients required by the brain and the eyes during the crucial early stages of development. An ongoing adequate supply of DHA is also necessary to properly care for the brain throughout life. This omega-3 fatty acid is the primary building block of the brain and the retina of the eye. DHA is vital throughout pregnancy. The brain is 60% fat, and DHA is the most abundant fatty acid in the brain. In the first few weeks of embryonic development when brain cell division is most active, a mother's blood needs to supply the foetus with large amounts of DHA. A continual supply of DHA is needed for the full-term of the pregnancy, as the DHA content of the cerebrum and cerebellum increases 3-fold during the last trimester. Premature babies, born without the benefit of maternal delivery of DHA during the rapid brain growth phase of the last trimester of pregnancy, scored an average of 15 points lower on IQ tests than average full-term infants when tested later in life.

B) EYE DEVELOPMENT

DHA is also required for visual development as it comprises about 60% of the rod outer segments of the retina. The percentage of DHA in retinal tissue increases rapidly in the last half of pregnancy. Cell membranes of the retina and visual cortex, highly enriched in DHA, form rapidly during the last trimester, which is the period of most rapid eye development.

C) LACTATION

DHA is the most predominant omega-3 fatty acid in breast-milk. After birth, infants receive DHA from their mother's breast-milk at a time when significant brain and eye development is continuing. Studies suggest that babies with adequate DHA from their mother during pregnancy and lactation have better vision and a higher IQ than those with DHA deficiency. The levels of DHA in the blood and in breast-milk depend on the mother's diet. The fewer foods eaten that are rich in DHA, the lower the levels of DHA in the blood during pregnancy and in breast-milk during lactation.

D) MENTAL PERFORMANCE

Low levels of DHA have been correlated with changes in disposition, memory loss, and visual and other neurological conditions. One researcher has found suboptimal DHA levels in dyslexia, a learning disorder marked by impairment of the ability to recognise and comprehend written words. DHA supplementation in adult dyslexics improved night vision. Anecdotal observations in the study showed improvements in reading ability and behaviour as well.

E) ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD)

These children generally have low essential fatty acid levels and exhibit symptoms of fatty acid deficiency including hyperactivity and short attention span. Studies to determine if DHA supplementation is helpful are now underway.

Potential Applications of DHA:

- Retinal health
- ADHD
- Brain development
- Mental health
- Learning difficulties

Typical intake range

50-200mg per day

Contraindications/Drug Interactions

None noted

Digestive enzymes

A) PANCREATIC INSUFFICIENCY

If the pancreas is unable to secrete sufficient enzymes into the duodenum, the result will be inefficient and improper digestion of food particles. There are three main consequences of pancreatic enzyme insufficiency. Firstly, as food must be broken into its component parts in order for it to be absorbed, failure to achieve this results in malabsorption. Secondly, the undigested food particles travel through the small and large intestine and promote putrefactive bacteria. This may lead to flatulence, bloating and a host of other digestive conditions. Thirdly, certain amino acids contained in undigested proteins can be converted by undesirable bacteria into toxic substances known to damage the gut, trigger joint inflammation, psoriasis, etc.

B) FOOD ALLERGY

Undigested proteins have the potential to become allergens when they come in contact with the immune system (which treat them as an invader). On the other hand, individual amino acids, the components of proteins, are not treated as invaders, and thus cannot themselves trigger allergic reactions. Absorption of whole or partially digested proteins into the blood stream may be indicative of excessive intestinal permeability (leaky gut disorder).

C) FOOD INTOLERANCE

Intolerances are often confused with allergies. Although both can cause an adverse reaction, the difference is that intolerances are not triggered by an immune system response. Intolerances may occur when a particular element within food remains undigested because of a particular enzyme deficiency. An example of this is lactose intolerance where deficiency of the enzyme lactase leads to inadequate breakdown of lactose, a milk sugar, resulting in bloating, flatulence, diarrhoea and abdominal cramping.

D) INFLAMMATION

Proteases (e.g. trypsin, chymotrypsin) are important in the prevention of fibrin clots that are formed during the process of inflammation. Fibrin formation around the area of inflammation blocks lymph and blood vessels, causing swelling. Fibrin is also involved in the formation of blood clots that develop in veins, arteries and capillaries, potentially leading to thrombosis, heart attack and stroke. Proteases have been shown to promote the breakdown of fibrin and therefore have great potential in the treatment of many inflammatory conditions and vascular occlusions.

Potential health applications of digestive enzymes

- Pancreatic insufficiency
- Bloating & Flatulence
- Diarrhoea
- Indigestion
- Abdominal cramping
- IBS
- Food allergy
- Food intolerance
- Inflammation

Contraindications/Drug Interactions

Some digestive enzyme supplements may also contain betaine hydrochloride, which may aggravate peptic (stomach or duodenal) ulcers.

Digestive enzymes commonly found in supplements

Digestive enzymes facilitate the breakdown of food in the digestive tract. Specific enzymes are required to break down specific food elements into their component parts to facilitate their absorption. There are enzymes to break down carbohydrates, proteins and fats. Some supplements offer a broad spectrum of enzymes, where as others offer a specific, single type of enzyme.

AMYLASE

In the normal human diet there are several major sources of carbohydrates. These include, among others, sucrose, lactose and starches. Amylase enzymes break down carbohydrates into smaller units known as monosaccharides. In the body amylase is found in saliva and in digestive secretions from the pancreas.

ALPHA GALACTOSIDASE

Alpha galactosidase is an enzyme with the ability to break down the chemical bonds known as alpha 1-6 bonds that are found in carbohydrates such as melibiose, raffinose and stachyose. These carbohydrates are commonly found in beans, legumes, seeds, soy products and underground stems and are generally poorly digested. These carbohydrates are not absorbed and are often associated with bloating, flatulence and digestive discomfort.

PROTEASE

Proteases, or proteolytic enzymes, facilitate the breakdown of proteins into amino acids. Proteases are found in the stomach as pepsin, and in the digestive secretions from the pancreas. In order for proteases to work efficiently proteins must first be denatured by the action hydrochloric acid in the stomach.

LIPASE

Lipase is an enzyme that breaks down lipids, or fats, into their component parts, namely fatty acids and glycerol. Lipases are reliant on the action of lecithin in bile (secreted by the gall bladder) which has the effect of emulsifying fats (breaking down fat into smaller globules) thereby allowing more of the lipid to be exposed to the enzymes.

LACTASE

The enzyme necessary for digestion of the milk sugar lactose.

PANCREATIN

Pancreatin refers to preparations of pancreatic enzymes, typically isolated from fresh hog pancreas, which is a source of lipase, amylase and protease enzymes.

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Dong Quai

angelica sinensis, angelica polymorpha

A) FEMALE HORMONAL TONIC

Dong quai's use in Chinese medicine dates back to ancient times. Today it is one of the most heavily used female tonics throughout the world. It contains phytoestrogenic components which possess an activity that is approximately 1/400 that of human oestrogen. These phytoestrogens are frequently employed to modify oestrogenic activity in the body due to their ability to bind to oestrogen receptors in cells. If the levels of oestrogen are too high, the herb's comparatively weak phytoestrogens can occupy receptors that otherwise could have been occupied by the much stronger hormone. If the oestrogenic activity in the body is too low, phytoestrogens can exert a mild positive oestrogenic effect. Research also suggests that dong quai may regulate uterine function and may be of value in normalising menstruation.

B) PAIN RELIEVER

Research has shown dong quai to be an effective analgesic. This combined with its muscle-relaxing qualities enhances its benefits in conditions such as menstrual cramps, headache, arthritis, etc.

C) MUSCLE RELAXANT

Dong quai appears to act as a general smooth muscle relaxant, with a special focus on the uterus. This influence on other muscle tissue may partly account for the use of dong quai in blood pressure regulation and bronchial asthma.

D) CIRCULATORY STIMULANT

This herb is shown to dilate blood vessels, and has been reported to possess a vitamin E-like effect on the circulatory system.

E) ANTI-ALLERGIC

The anti-allergy effect of dong quai would appear to be due to its ability to selectively inhibit the production of allergy-related antibodies (such as IgE). IgE levels in highly allergic individuals are often three to ten times greater than normal.

Potential Applications of Dong Quai:

- premenstrual syndrome
- irregular menstruation
- menstrual cramps
- menopausal symptoms (e.g. hot flushes)

Principle actives:

Ligustilides, essential oils
food and environmental allergies
chronic pain
muscle cramps
poor circulation

Contraindications/Drug Interactions:

Do NOT use during pregnancy without consent of a qualified medical practitioner. Although rare, high doses may cause some women to experience abdominal bloating, diarrhoea or a change in the typical timing of menstruation and/or menstrual flow rate.

Caution with anticoagulants - check with a doctor.

Dong Quai

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Vitamin E

Incl: alpha, beta, delta & gamma tocopherol; alpha, beta, delta & gamma tocotrienol

A) ANTIOXIDANT / FREE RADICAL SCAVENGER

As the body's major lipid (fat) antioxidant, vitamin E (through neutralisation of hydroperoxide free radicals) inhibits oxidation of fat components in cell membranes, blood fat, cholesterol and other fatty compounds found in important molecules in the body. Vitamin E protects fats from many agents that damage the body through their lipid -oxidising influence (e.g. heat, light, heavy metals, free [unbound] iron or copper and certain medications and industrial solvents). Oxidation of blood lipids and LDL (bad) cholesterol is a primary trigger of atherosclerosis, and therefore the development of cardiovascular disease. Rapid quenching of hydroperoxide radicals is especially important in that if unchecked, they trigger oxidative chain reactions that spread quickly through fatty environments. To avoid these risks, vitamin E intake must meet or exceed what is necessary to protect the fats within the body - thus the more fat one

consumes, the more vitamin E required (especially polyunsaturated fat, the type most susceptible to oxidation). Although all tissues in the body require sufficient vitamin E, the cardiovascular, nervous (including brain), reproductive and immune systems and the eyes, joints and skin are especially susceptible to problems due to excessively low concentrations.

B) CARDIOVASCULAR SUPPORT

As mentioned, vitamin E neutralises hydroperoxide radicals, which oxidise LDL [bad] cholesterol and blood fats, increasing the risk of atherosclerosis, and thus heart disease. This nutrient also elevates HDL (good) cholesterol when levels are low; increases breakdown rate of LDL and fibrin (a protein involved in clotting); inhibits aggregation (stickiness) of blood platelets (thereby preventing excessive clotting); and helps restore normal heart rhythm (regulating heart muscle response to calcium). Many large-scale studies confirm that vitamin E offers significant protection against cardiovascular disease. For example, two 1993 studies (involving 87,245 female nurses and 39,910 male health workers respectively) showed that those taking vitamin E supplements had a significantly lower heart disease risk. The nurses taking at least 67mg (100iu) per day for more than two years had a 41% lower risk than those not supplementing, while the male health workers taking at least 20mg (30iu) per day had a 37% lower risk than those not taking supplements. Interestingly, a statistically significant risk reduction was only found in those taking supplements (irrespective of the dietary vitamin E intake of those not supplementing). The 1996 Cambridge Heart Antioxidant Study showed that vitamin E can also provide dramatic *therapeutic* benefits; patients previously diagnosed with heart disease were given a vitamin E supplement (268mg [400iu] or 536mg [800iu] per day) or placebo. Those taking vitamin E had a 77% lower risk of having a heart attack than those receiving a placebo (beneficial effects were apparent after 1 year of treatment).

C) CIRCULATORY SUPPORT

The properties of vitamin E may significantly benefit artery, vein and capillary circulation. Research has highlighted therapeutic and/or preventive benefits with vitamin E supplementation in numerous conditions associated with circulatory dysfunction i.e. atherosclerosis, cerebrovascular disease (i.e. stroke), Raynaud's Disease (excessive sensitivity to cold in fingers and toes), vasculitis, intermittent claudication (walking-induced cramping caused by depleted oxygen in the lower extremities), hot flushes, oedema and purpura (capillary haemorrhage).

D) BLOOD SUGAR REGULATION

Vitamin E has been shown to enhance both insulin sensitivity and glucose tolerance, possibly due to the protection of fatty components involved in the cellular mechanisms of glucose metabolism. Supplementation also lowers triglycerides and improves the ratio between HDL and LDL cholesterol in diabetic patients. The dosage typically employed in such research has been 906mg (1350iu) per day. High blood sugar predisposes one to high blood lipids, and thus increased cardiovascular risks associated with fat oxidation. This fact further warrants increased vitamin E intake in hyperglycaemia (*see contraindications*).

E) CELL PROTECTION

Oxidative damage to fatty components within cell membranes can lead to abnormalities and/or damage in cells. Considering the role of vitamin E in membrane protection, it is not surprising that numerous studies report that a deficiency in this nutrient is linked to an increased risk of cellular abnormalities in certain parts of the body.

F) BRAIN AND NERVOUS SYSTEM SUPPORT

The high concentration of fats in the brain, spinal and peripheral nerve tissue makes the entire nervous system highly susceptible to dysfunction caused by oxidative stress. Many brain and nerve disorders have oxidative damage as a causal factor and vitamin E deficiencies have been scientifically linked with many such diseases. For example,

studies have reported therapeutic benefits from vitamin E supplementation in conditions such as: Alzheimer's Disease, Parkinson's Disease, tardive dyskinesia (involuntary facial movements often associated with drug-induced nerve damage), neuromuscular degenerative disorders (i.e. amyotrophic lateral sclerosis [ALS] and Charcot-Marie-Tooth Disease) and neuritis (i.e. leprosy-related).

G) FEMALE HEALTH

Vitamin E's traditional popularity as a therapy for relieving menopausal hot flushes is presumably linked to research from the 1940s and 50s that showed benefits from supplemental intake between 30mg (45iu) and 75mg (112iu) per day (improvement is thought to be due to improved vascular function). In addition, evidence from menopause studies reports that vitamin E helps reverse vaginal atrophy and reduces susceptibility to vaginal infections. There is also evidence that in some sufferers of premenstrual fibrocystic (or benign) breast disease, supplementation of 268mg (400iu) to 402mg (600iu) per day can improve or even eliminate the pain, swelling and hormone imbalance associated with the condition. Additionally, premenstrual tension (PMT) symptoms such as headaches, nervousness and depression have been relieved with vitamin E therapy. Vitamin E status has been found to measurably decline in pregnancy, which is especially of concern as a deficiency during this period has been linked with an increased risk of premature birth, low birth weights and pre-eclampsia (potentially hazardous elevation of blood pressure in late pregnancy).

H) SKIN HEALING

Scientific evidence supports the use of vitamin E in skin disorders, with benefits reported in conditions such as skin ulcers, seborrheic dermatitis, acne (combined with selenium), scleroderma and systemic lupus erythematosus, and prevention of sunburn (combined with vitamin C). Thus far research has focused on internal use, however, topical administration may also be of value. It is likely that vitamin E's healing properties are mostly due to prevention of oxidative damage in tissue cells and its mild anti-inflammatory properties.

Potential Applications

- Antioxidant
- Cardiovascular disease (atherosclerosis, arrhythmias, etc) - *see contraindications*
- Circulatory disorders (intermittent claudication, 'restless legs', Raynaud's Disease, etc.)
- Cell protection - *see contraindications*
- Skin disorders (e.g. eczema, seborrheic dermatitis)
- Poor wound healing
- Menopausal symptoms (hot flushes, vaginal atrophy)
- Premenstrual tension
- Fibrocystic breast disease
- Degenerative eye disease (cataracts, macular degeneration)
- Pre-eclampsia
- Diabetes - *see contraindications*
- Digestive ulcers
- Male infertility
- Nervous system disorders
- Dementia (i.e. Alzheimer's Disease)
- Parkinson's Disease
- Tardive dyskinesia
- Arthritis
- Muscle cramps

Typical Supplemental Dosage Range 67-536mg (100-800iu) per day

(To convert iu (international units) to mg (milligrams) for natural vitamin E: d-alpha tocopherol (oil form) - divide iu potency by 1.49 I d-alpha tocopheryl (dry form) - divide iu potency by 1.21)

Common Food Sources

- Unrefined polyunsaturated vegetable oils (especially wheat germ and soy)
- Almonds
- Peanuts
- Seeds
- Avocados
- Whole grains
- Spinach
- Recent scientific investigation indicates that natural vitamin E may be up to twice the activity of synthetic (as opposed to earlier calculations of 36% greater activity).
- ** All of the tocopherols naturally occur in oil-based natural vitamin E, however, beta, delta and gamma are only found in small quantities. Extra beta, delta and gamma have been added to certain commercial raw materials. Although alpha has, by far, the highest vitamin E activity, beta, delta and gamma may possess a greater antioxidant activity, by weight, than alpha.
- *** Although dry forms of natural vitamin E (e.g. succinate and acetate) are originally derived from vegetable oil (e.g. soy or wheat germ), unlike the natural oil form they only contain alpha tocopherol.
- **** Tocotrienols occur where tocopherols are found in nature, but only in trace amounts. Alpha and beta tocotrienol have 30% and 5% of the vitamin E activity of d-alpha tocopherol respectively - % is unknown for delta and gamma tocotrienol.
- ***** Both the oil and dry forms of synthetic vitamin E contain only alpha tocopherol

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- High doses of vitamin E should not be taken with anti-coagulant drugs (e.g. warfarin, heparin, aspirin, etc), unless medically supervised (as it may compound the drugs' effect).

Please note: Although a relatively low daily dose of vitamin E is associated with a decreased risk of ischaemic strokes (caused by vascular obstruction in brain), the same dose is associated with an increased risk of the less common fatal haemorrhagic strokes (caused by bleeding in the brain).

- Due to its anti-clotting effects, high doses of vitamin E should be avoided prior to going into labour or undergoing surgery, unless under strict medical supervision.
- If receiving chemotherapy, consult physician before using high doses.
- Vitamin E supplementation may reduce insulin requirement, therefore insulin-independent diabetics should only use high doses under strict medical supervision. It is advisable to begin with lower doses (i.e. 67mg/100iu or less), with any increase being made slowly, allowing for greater accuracy in adjusting insulin intake. High doses may falsely exaggerate the effect on blood sugar control of sulfonylurea drugs.
- Do not use high doses of vitamin E in either rheumatic or ischaemic heart disease unless under strict medical supervision.
- Although there appears to be no research to support this concern, there have been reports that beginning a vitamin E regime on high doses may cause a temporary elevation in blood pressure in some already hypertensive patients. This may warrant starting with lower doses (i.e. 67mg/100iu) and gradually increasing to the indicated level.

Echinacea

echinacea purpurea, echinacea angustifolia

A) IMMUNE STIMULANT

A number of immuno-stimulatory compounds have been isolated from echinacea; including echinacin, echinacosides and inulin. Echinacea elevates white blood cell count, and activity, enhances antibody activity, speeds migration of white blood cells to areas of infection, boosts interferon activity and inhibits hyaluronidase (an enzyme that allows pathogenic organisms to become more invasive).

B) ANTI-BACTERIAL

Echinacea exerts a mild anti-bacterial effect on the body. For example, two compounds found in echinacea, echinacoside and caffeic acid, inhibit the growth of *staphylococcus aureus*, *corynebacterium diphtheria*, and *proteus vulgaris*.

C) ANTI-VIRAL

The various components of echinacea appear to block viral receptor sites on cell surfaces as well as having an inhibiting effect on hyaluronidase, which increases connective tissue permeability and allows the organism to become more invasive.

D) ANTI-FUNGAL

Studies have shown that echinacea specifically enhances the ability of macrophages (pathogen engulfing white blood cells) to destroy fungal organisms such as *Candida albicans*.

E) ANTI-INFLAMMATORY

Studies suggest that polysaccharides in echinacea exert anti-inflammatory activity, primarily due to what has been reported as a 'cortisone-like' effect.

F) WOUND HEALING

It has been reported that echinacea speeds the healing of damaged tissue - an action that appears to be associated with an ability to promote connective tissue regeneration and the herb's anti-inflammatory properties.

Potential Applications of Echinacea:

- viral infections (e.g. colds, influenza, herpes, etc.)
- bacterial infections
- *Candida albicans* infections
- arthritis and other inflammatory conditions
- eczema, acne and other bacterially-related and/or inflammatory skin conditions
- wound healing

Principle actives:

Echinacosides, polysaccharides

Contraindications/Drug Interactions:

Echinacea is best avoided in those suffering with an auto-immune disease. It has been reported that in terms of immune boosting effects long term use at high doses may become less effective over time, although the scientific evidence is still rather inconclusive. This may warrant taking short breaks, or rotating the use of echinacea with other immune stimulants if the duration of treatment requires more than a few weeks in a row.

Ecfainacea

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Elderberry Berries

sambucus nigra

A) ANTI-VIRAL

Studies show that oral administration of elderberry extract reduces the duration of influenza symptoms from an average of 6 days to 48 hours. It would also appear beneficial against non-flu viruses such as herpes and Epstein-Barr (associated with chronic fatigue syndrome or ME). This property of elderberry seems to primarily stem from an ability to inhibit a mechanism required for viral replication.

B) ANTIOXIDANT

Elderberry contains a broad range of nutrients possessing significant antioxidant/free radical scavenging activity, including polyphenols (e.g. flavonoids), carotenoids and vitamin C.

C) NUTRITIVE

The elderberries themselves are rich in several beneficial nutrients such as vitamin C, B vitamins, flavonoids, carotenoids, etc.

Potential Applications of Elderberry Berries:

- Influenza
- common cold
- herpes
- chronic fatigue syndrome (ME)
- protection against free radical damage

Principle actives:

Polyphenols (e.g. flavonoids), carotenoids, vitamin C

Contraindications/Drug Interactions:

None noted.

Elderberry Berry

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Evening Primrose oil

Evening primrose oils is a direct source of Gamma Linolenic Acid (GLA). The conversion of linoleic acid to GLA is reliant on the delta-6-desaturase enzyme and may therefore be inefficient in some individuals. Evening primrose therefore offers a reliable source of GLA where linoleic acid metabolism may be impaired. Evening primrose provides approximately 10% GLA (e.g. 1000mg EPO provides 100mg GLA). Borage oil is an alternative source of GLA.

A) INFLAMMATION

Theoretically the use of omega 6 fatty acids in inflammatory conditions makes sense. Linoleic acid can be converted into the powerful anti-inflammatory chemicals known as prostaglandin series 1. However, research in this field is mixed, indeed some studies have shown that omega 6 supplementation actually increases tissue levels of arachidonic acid, a precursor chemical of the series 2 prostaglandins that have proinflammatory properties. In reality using omega 6 in balance with omega 3 is likely to provide the best results.

B) PRE-MENSTRUAL SYNDROME (PMS)

Deficiency of essential fatty acids has been reported in women with PMS. Omega 6 fatty acids in the form of linoleic acid, is converted into gamma linolenic acid (GLA) and eventually into prostaglandins - hormone like substances - that control a variety of physiological functions including hormone production and nerve transmission, both particularly relevant in prevention of PMS. GLA from evening primrose oil has been shown to improve many symptoms including pre-menstrual headaches, depression, irritability, and bloating

C) MENORRHAGIA (HEAVY PERIODS)

Fatty acid imbalance may play a significant role in heavy menstruation. High levels of arachidonic acid from animal products such as meat and dairy foods is known to increase the levels of prostaglandin series 2 - the so-called 'bad' prostaglandins - that may increase blood flow and prevent blood clotting in those with heavy menstruation. Reducing levels of meat and dairy products and increasing intake of essential fatty acids may be supportive in cases of heavy menstrual bleeding.

D) BREAST HEALTH

Scientific studies have demonstrated that omega 6 fatty acids in the form of GLA from evening primrose oil may be helpful in reducing the pain and tenderness associated with pre-menstrual breast pain and fibrocystic breasts. In one study almost half of 92 women with cyclic breast pain experienced improvement with evening primrose oil compared with one-fifth of the patients who received the placebo.

E) HORMONE BALANCE

The hormone modulating effects of prostaglandins derived from essential fatty acids

makes them particularly important if optimal hormonal health is to be achieved.

F) DIABETIC NEUROPATHY

Clinical research has discovered that GLA may be an important factor contributing to prevention of neuropathy - nerve damage that affects between 60% and 70% of all diabetics. In fact, a recent review article concluded that GLA supplementation is one of the most effective treatments available today for diabetic neuropathy. Anyone with diabetes may consider supplementing with a good source of GLA such as borage oil or evening primrose oil as a preventive measure against neuropathy.

G) SKIN HEALTH

GLA may be one of the most important nutrients for the promotion of skin health. In studies various skin conditions including eczema and dry skin have respond well to additional GLA intake from both borage and evening primrose oils. In the last 20 years, researchers have discovered that eczema may be linked to a deficiency of GLA. In 1997, during a 12-week study conducted at the University of Italy, patients taking GLA, in the form of borage oil, saw itching decrease by 90%. These patients also saw improvements in the patches of red skin and oozing of wounds. Anecdotal reports indicate that GLA supplementation also improves symptoms of psoriasis.

Potential Applications of evening primrose oil:

- Inflammatory conditions (with omega 3)
- PMS
- Dysmenorrhoea (painful periods)
- Fibrocystic breast disease
- Endometriosis
- Ovarian cysts
- Dry skin, eczema and other skin conditions
- Diabetic neuropathy

Typical intake range:

500 - 6000mg per day

(50 - 600mg GLA per day)

Contraindications/Drug Interactions:

Some reports suggest that GLA may worsen epilepsy. It is therefore advisable for epileptics to avoid supplementation with GLA.

Eyebright

euphrasia parthenium

A) ASTRINGENT

As an astringent, eyebright is often used for reducing excessive discharges of the eyes and sinuses.

B) EYE TONIC

Eyebright is probably the best known of all herbal eye tonics and is reported to be supportive to the associated mucous membranes. The astringent compounds in eyebright are used to provide a tonic effect for the eyes and reduce sinus congestion, stinging, sensitivity to light, weeping eyes and catarrhal conditions.

Potential Applications of Eyebright:

- eye strain or fatigue
- conjunctivitis
- general eye irritation
- catarrhal conditions

Principle actives:

Tannins, glycosides, essential oils

Contraindications/Drug Interactions:

None noted.

Eyebright

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Mowrey D, *The Scientific Validation of Herbal Medicine*, Keat, New Canaan, Conn, 1986.

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Fennel

Foeniculum vulgare

A) DIGESTIVE TONIC

Traditionally fennel has been used for the treatment of a variety of digestive disorders. It is used in several cultures, after meals, to prevent gas and upset stomach. The main active constituents of fennel include the terpenoid anethole, which has been shown to be effective in reducing smooth muscle spasm in the digestive tract. These actions suggesting significant potential in relieving indigestion, gas, bloating and irritable bowel syndrome.

B) ANTIMICROBIAL

Several studies have identified fennel as having powerful effects against various human pathogens including bacterial, fungal and yeast infections. Fennel has been found to be particularly effective against *Candida albicans*.

Potential Applications

- Bloating
- Indigestion
- Flatulence
- Irritable Bowel Syndrome
- *Candida albicans* infection
- Bacterial infection of the gut

Principal actives

Anethole, chavicol

Contraindications/Drug Interactions

Do NOT use during pregnancy.

Fenugreek

trigonella foenum-graecum

A) CHOLESTEROL AND LIPID LOWERING

Research suggests that fenugreek can lower total cholesterol and triglyceride levels, and can increase levels of HDL (good) cholesterol.

B) DIGESTIVE TONIC

As one of the classic bitter herbs, fenugreek exerts a tonic effect on digestion increasing gastric secretions. Fenugreek also possesses a demulcent effect i.e. soothes irritated or inflamed mucous membranes. Fenugreek has been shown to be helpful in conditions of abdominal bloating and distension.

C) BLOOD SUGAR LOWERING

Fenugreek seeds have demonstrated significant blood sugar lowering effects in experimental and clinical studies.

D) EXPECTORANT

One of the most common uses of fenugreek in traditional herbal medicine is as an expectorant, or an aid for removing catarrh from the respiratory tract.

Potential Applications of Fenugreek:

- atherosclerosis
- high cholesterol and triglycerides
- catarrh
- diabetes
- digestive discomfort

Principle actives:

Saponins, flavonoids

Contraindications/Drug Interactions:

Do NOT use in pregnancy.

Caution with anti-coagulants and insulin - check with doctor.

Fenugreek

Ribes G, et al, Ann Nutr Metab. 28 1984, pp37-43.

Ribes G, et al, Phytotherapy Research 1, 1, p40.

Feverfew

tanacetum parthenium

A) PAIN RELIEVER

Feverfew's well established pain-relieving effects appear to be primarily associated with its anti-inflammatory activity, inhibition of platelet aggregation and regulation of smooth muscle function. Feverfew has been used both traditionally and in scientific research as an effective remedy for migraine headaches. It also shows benefit in helping reduce arthritis pain.

B) ANTI-INFLAMMATORY

Extracts of feverfew have the ability to inhibit the manufacture of compounds that promote inflammation, including inflammatory prostaglandins and leukotrienes. Scientific evidence points to a measurable benefit in treating arthritic inflammation.

C) FEVER REDUCING

As the name suggests, feverfew has been used as a traditional remedy for lowering fevers - an effect primarily due to inhibiting the activity of certain prostaglandins.

Potential Applications of Feverfew:

- migraine headaches
- headaches (general)
- arthritis
- fever reduction
- chronic pain

Principle actives:

Parthenolides

Contraindications/Drug Interactions:

Some people experience minor gastric irritation if high doses are taken on an empty stomach, this warrants extra caution if also on NSAIDS.

Best avoided in pregnancy.

Caution with anticoagulants — check with doctor.

Feverfew

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Fibre

A) CONSTIPATION

It has long been accepted that a lack of both insoluble and soluble dietary fibre can result in constipation. Supplementation with psyllium seed husks or flaxseed meal (which are rich in both soluble and insoluble fibre) and soluble fibre-rich oat bran may be helpful because they help to promote bulky, soft stools and improved transit time. These soluble fibre sources do not possess the same intestine-irritating risk associated with the insoluble fibre in wheat bran.

B) IRRITABLE BOWEL SYNDROME

IBS is typically characterised by alternating bouts of constipation and diarrhoea.

Psyllium seed husks aid intestinal cleansing and detoxification through their content of both soluble and insoluble fibres. The gel-forming soluble fibre portion may help to alleviate diarrhoea due to its water absorbing characteristics. This gel may also have the potential to reduce the irritation caused by allergens and other irritants often present in IBS. In bouts of constipation psyllium offers bulking and softening characteristics that may help to improve transit times.

C) BACTERIAL DYSBIOSIS

Dysbiosis of the gut occurs when levels of 'unfriendly' bacteria proliferate in the gut. Levels of beneficial bacteria known as probiotics can become compromised through the use of antibiotics, improper diet, stress and certain medicinal drugs, allowing levels of unfriendly bacteria to increase. Fibre is a primary source of food for beneficial bacteria, and is helpful in promoting a healthy environment in the gut.

D) CHOLESTEROL LOWERING

Numerous studies have identified the potential cholesterol lowering effects of soluble fibres such as psyllium, apple pectin and oat bran. In one study researchers noted an 11 to 15 percent reduction in serum cholesterol in 140 men eating 75 grams of oat bran per day for six weeks. Soluble fibres appear to increase the level of faecal excretion of cholesterol.

E) DETOXIFICATION

In order to detoxify the body many toxins and hormones are excreted into the gut from the liver via the gall bladder. Soluble fibre facilitates the efficient removal of these components in the faeces.

F) ENERGY PRODUCTION

Fermentation of fibre by intestinal flora produces various short chain fatty acids including acetic, propionic and butyric acids. Acetic and propionic acids are transported to the liver for use in energy production. Butyric acid is used as a direct source of fuel by the cells lining the colon.

Potential health applications of soluble fibre

- Constipation
- Diarrhoea
- Elevated cholesterol
- Hyper-oestrogenism
- Digestive bacterial imbalance (dysbiosis)
- IBS
- Diverticular disease

Contraindications/Drug Interactions

None noted.

Common supplemental sources of fibre

The term fibre refers to elements within the plant foods that are indigestible by the secretions of the digestive tract. Fibres include components of plant cell walls such as cellulose, lignins and gums. They are broadly categorised as being either soluble or insoluble.

PSYLLIUM SEED HUSKS

Psyllium husks provide a natural source of dietary fibre that contains both soluble and insoluble fibres. Psyllium will swell in water and as a result may be helpful in promoting the formation of soft, hydrated faeces.

APPLE PECTIN

Pectins are found in the outer skin and rind of fruits and vegetables. Apple peel contains approximately 15% pectins. Pectins have gel-forming characteristics that are responsible for the cholesterol lowering effect associated with soluble fibres.

OAT BRAN

Classified as a source of hemicelluloses that offer the benefits of both soluble and insoluble fibres. Oat bran may therefore increase stool weight and promote regular bowel motion.

FLAXSEED MEAL

Another source of both soluble and insoluble fibres.

Note

Soluble fibres should be taken with an adequate amount of water, preferably in between meals.

Fish oil

Provides omega 3 fatty acids comprising EPA and DHA. The conversion of linolenic

acid to EPA and DHA is reliant on enzymes and may be an inefficient process in some individuals. As a direct source of EPA and DHA, fish oils may offer some advantages over indirect sources such as Flax.

Typical fish oil concentrate composition: EPA 18%, DHA 12%

A) CARDIOVASCULAR HEALTH

Intervention studies strongly suggest that EPA from fish oils can lower various risk factors for cardiovascular disease (independent of any blood cholesterol-lowering effect). These effects include an antithrombotic effect, lipid (triglyceride) lowering, reduced blood and plasma viscosity, and improvements in endothelial dysfunction. Omega 3 fatty acids have been shown to inhibit the activity of a chemical called thromboxane. Thromboxane is a potent vasoconstrictor and causes platelets to aggregate (stick together). It is therefore implicated in the development of blood clots and other vascular disorders. The favourable influence of omega 3 fatty acids is attributed, among other things, to the fact that these nutrients have an inhibiting influence on the biological activity of thromboxane. This decrease in thromboxane activity is due to the fact that thromboxane A3, (derived from omega-3 fatty acids), is physiologically less active than the thromboxane A2, (derived from omega-6 fatty acids). Therefore a diet where consumption of omega 3 is higher than omega 6 will tend to reduce vasoconstriction and the tendency for the blood to clot. This type of diet has been advocated in the prevention of cardiovascular disorders, preeclampsia and other conditions relating to vascular health. An American case-control study determined that people who consume monthly quantities of seafood containing a total of 5.5 grams of long-chain omega 3 polyunsaturated fatty acids, (corresponding with one meal of fatty fish a week), have 50% less chance of a primary cardiac arrest than people whose daily menu does not contain these fatty acids.

B) CHOLESTEROL

Studies have consistently made the association between fish oils and cholesterol reduction. Fish oils appear to reduce triglycerides in addition to improving the important relationship between HDL and LDL cholesterol. A 1% rise in HDL cholesterol levels is associated with a 3-4% drop in heart attack risk. A 1% drop in LDL is associated with a 1% reduction of risk.

C) HYPERTENSION

Hypertension is one of the major risk factors for heart attack or stroke. Many clinical studies have demonstrated a significant blood pressure lowering effect when the level of dietary omega 3 fatty acids are increased, especially when taken in the form of fish oils.

D) CROHN'S

Studies suggest a role for omega 3 fatty acids in various inflammatory conditions. One study attributed an improvement in Crohn's symptoms to the inflammation-inhibiting properties of fish oils. The study established that the laboratory tests for inflammatory processes, such as an increased erythrocyte sedimentation rate (ESR), had been significantly reduced in the fish-oil group in comparison with the placebo group.

It is further important to note that because of a beneficial influence on intestinal cell growth, the fish-oil supplementation may lead to an increase of the intestinal mucosal surface area, thereby increasing the absorption of nutrients and improving the nutritional status of the patient.

E) MULTIPLE SCLEROSIS

Populations eating diets high in animal and dairy products appear to be at greater risk of developing MS than people eating a marine-based diet. Essential fatty acids appear to positively influence the myelin sheath, the protective covering around nerves that becomes damaged in MS. Diets that are rich in fish oils and low in saturated fats from animal produce are therefore recommended for MS sufferers.

F) INFLAMMATORY CONDITIONS

Omega 3 fatty acids produce favourable effects in inflammatory conditions by suppressing the production of inflammatory compounds produced by white blood cells. Fish oils are thought to be especially beneficial in rheumatoid arthritis. In a double blind, placebo controlled study patients using 1.8 grams of EPA per day reported less morning stiffness and tender joints. In a more recent 1 year study, 2.6 grams per day of

omega 3 fatty acids from fish oil also resulted in significant improvement in symptoms in a group of rheumatoid arthritis patients, reducing their need for drug therapy.

G) MENTAL HEALTH

Fish oils contain DHA, one of the structural fatty acids of the brain. Fish oils are therefore associated with brain development and improved mental performance. *See DHA section for more detail.*

H) EYE HEALTH

DHA, an omega 3 fatty acid derived from fish oils, is required for development of the retina. *See DHA section for more detail.*

Potential Applications of fish oils:

- Arthritis
- High cholesterol
- Brain health
- Cardiovascular disease
- Crohn's disease
- Eye health

Hypertension

Multiple sclerosis

Rheumatoid arthritis

Typical intake range

500 - 6000mg fish oil concentrate

(90 - 1080mg EPA, 60 - 720mg DHA)

Contra-indications/Drug Interactions:

Do not use with warfarin or anti-coagulant medications

Flax Seed Oil (Linseed Oil)

Flax seeds and their oil are an excellent source of essential fatty acids, providing omega 3, 6 and 9 fatty acids in desirable ratios. However, whilst alpha linolenic acid and linoleic acid have the potential to provide the *important Prostaglandin series 1 and 3* it should be noted that their production is reliant on adequate enzyme function (see metabolic pathway diagrams). This means that in some people where enzyme function is inefficient the benefits of flax oil may be limited. In these cases the use of separate omega 3 and 6 fatty acids from fish and seed oils may be desirable.

Omega 3:Omega 6:Omega 9 ratio = 3.5:1:1

57% Omega 3 fatty acids (Alpha Linolenic Acid)

16% Omega 6 fatty acids (Linoleic acid)

18% Omega 9 fatty acids

A) BRAIN HEALTH

Alpha linolenic acid (ALA) is a major source of the omega 3 fatty acid DHA, which is a major component of the brain. Studies have shown that ALA deficiency can lead to low DHA formation in the brain and low DHA levels may be cause a predisposition to early senility and poor cognitive function. However, the enzymes that allow ALA to be converted to DHA also decline with age so flax oil may not be the best option in this instance. Preformed DHA from algae or fish provide an alternative. Flax also contains linoleic acid, a potential precursor of arachidonic acid, another major structural fatty acid of the brain.

B) SKIN HEALTH

Essential fatty acid deficiency is common in a variety of skin disorders including eczema. Essential fats contribute to the overall health of skin as well as ensuring a balance between inflammatory and anti-inflammatory prostaglandins - an especially important factor in inflammatory skin conditions such as eczema.

C) CHOLESTEROL

Omega 3 fatty acids have been shown to lower cholesterol and triglyceride levels in countless studies using fish oils. However, the high dosage, and therefore high cost, of fish oil supplementation may make the high concentrations of omega 3 fatty acids in flax oil more desirable. ALA, when metabolised into series 3 prostaglandins, has potent

cholesterol lowering effects as well as preventing platelet aggregation (sticking together). This is an additional benefit when considering individuals with cardiovascular disease.

D) INFLAMMATION

As flax oil contains both omega 3 and 6 fatty acids there is the potential for the anti inflammatory prostaglandin series 1 and 3 to be produced. Imbalance between these inflammatory prostaglandins and the pro inflammatory series 2 prostaglandins is one of the major factors in chronic inflammatory conditions. Research suggests that omega 6 supplementation in the form of GLA may be helpful in inflammatory conditions. However supplementing with GLA only may result in further imbalance due to the possibility of synthesising inflammatory arachidonic acid from omega 6 fatty acids. By providing both types of fatty acids, with a bias towards omega 3, flax oil negates this issue.

E) IMMUNE SUPPORT

The high concentrations of omega 3 fatty acids as alpha linolenic acid in flax oil may be supportive in auto immune conditions such as rheumatoid arthritis. Although there is limited research the fact that omega 3 fatty acids in the form of EPA and DHA from fish oils are have been used successfully in people with RA has lead many researchers to theorise about the use of flax in this condition. However, RA sufferers may also be zinc deficient and therefore the Delta-6-desaturase enzyme required to convert ALA into EPA and DHA may be inefficient, limiting the effectiveness of flax oil supplementation. A zinc supplement may be advisable in these cases.

F) CELL SUPPORT

The cell membrane is a critical component of the cell that facilitates its proper functioning. It allows nutrients to pass into and wastes to pass out of the cell whilst inhibiting the passage of undesirable compounds and invaders. Poor cell membrane integrity is associated with essential fatty acid deficiency and may result in inefficient cellular function, cell dehydration or even cell death. Studies have demonstrated that diets rich in omega 3 fatty acids may be beneficial in preventing inappropriate cell proliferation.

Potential Applications of Flax Oil

- Skin problems
- Cardiovascular disease
- Hypercholesterolaemia
- Cellular support
- Rheumatoid arthritis
- Auto-immune diseases generally
- Chronic inflammatory conditions
- Immune support

Typical intake range

Maintenance - 1 tablespoon daily

Therapeutically - 1.5 to 2 tablespoons per day

Contraindications/Drug Interactions

None noted.

Folic acid

Folate, foladn, monopteroylglutamic add

A) FOETAL DEVELOPMENT

Folic acid is essential for proper cell replication and thus for the development and maintenance of body tissues and systems (especially the nervous system). There is considerable scientific evidence confirming the neurological risks to an unborn foetus if the mother is folic acid-deficient during the pregnancy. Such a deficiency may manifest in the foetus as a neural tube defect such as spina bifida (a condition where the bone encasement that protects the spinal cord is not fully developed). Numerous studies confirm the protective effect of folic acid supplementation in the prevention of neural tube defects. The preventive dose recommended by most experts is typically 400ug per day. This applies not only to use during pregnancy, but also as a daily dose pre-conceptually for women of childbearing age who are trying to become pregnant.

In part due to the unreliability and/or inconsistency of the folic acid content in foods, certain governments have taken the unprecedented step of recommending that all women in these circumstances take folic acid supplements, irrespective of their dietary intake.

For women who have had a previous birth resulting in a neural tube defect, the Expert Advisory Group for the UK Department of Health recommended that the daily dosage of folic acid for preventing a recurrence should be 5mg (5000ug). This recommendation is in line with the 1991 Medical Research Council Vitamin Study, which showed that a daily supplement of 4mg (4000ug) of folic acid provided approximately 70% protection against a woman having another neural tube defect pregnancy. (Evidently, the lack of availability of 4mg folic acid preparations is the reason for the 5mg recommendation made by the Expert Advisory Group.)

Please note: A 5mg dosage of folic acid is only available on prescription and should only be used under a doctor's supervision (see contraindications).

B) MENTAL FUNCTION AND EMOTIONAL HEALTH

In its active form, folic acid is a potent donor of methyl, a compound required for the manufacture and recycling of numerous bodily substances, including neurotransmitters (the brain's chemical messengers). As neurotransmitters (such as serotonin, dopamine and acetylcholine) are responsible for various functions such as memory, mental clarity and alertness and mood stabilisation, it is not surprising that folic acid deficiency can lead to depression and a decline in cognitive performance (i.e. senile dementia). As a methyl donor, folic acid also lowers levels of the destructive compound homocysteine by facilitating its conversion back into the amino acid methionine. An elevated level of homocysteine has been shown to be a causative factor in the development of Alzheimer's Disease.

C) CARDIOVASCULAR HEALTH

An elevated level of homocysteine is also known to be a major risk factor in the development of atherosclerosis, the primary trigger for cardiovascular disease. Folic acid, especially in combination with vitamin B12 (also a methyl donor) and vitamin B6, can help protect the blood vessel walls by facilitating the recycling of homocysteine back into the amino acid methionine (folic acid and B12) and the metabolism of homocysteine into cystathionine and cysteine (B6). Homocysteine damages the blood vessels primarily by accelerating the destruction caused by free radicals.

D) GYNAECOLOGICAL HEALTH

Studies show that folic acid deficiency is a major risk factor in the development of cervical dysplasia, a condition that is characterised by the abnormal development of the cervix cells. Supplementation with high doses of folic acid has yielded very impressive results in clinical trials, consistently halting the progression of the condition and often leading to the normalisation of the cervical cells.

Please note: The typical dosage level in such research has been 10mg per day. Such levels are only available on prescription and should only be used under a doctor's supervision (see contraindications).

Potential Applications

- Prevention of neurological birth defects (neural tube defects, e.g. spina bifida)
- Cardiovascular disease (i.e. atherosclerosis)
- Depression
- Senility (i.e. Alzheimer's Disease)
- Anaemia (see contraindications)
- Cervical dysplasia
- Osteoporosis
- Periodontal (gum) disease (preferably as a mouth rinse)
- Histapnaemia (abnormally low histamine levels)

Typical Supplemental Dosage Range

- 200-800ug per day

(Dosages of 5mg [5000ug] to 10mg [10,000ug] are used under certain circumstances, but such levels are only available on prescription and should only be used under a

doctor's supervision - see contraindications.)

Common Food Sources

- Brewer's yeast
- Beans
- Asparagus
- Whole grains
- Nuts
- Beet root
- Calves' liver
- Green leafy vegetables

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- Folic acid supplementation can obscure the signs of B12 deficiency, and therefore it is recommended to supplement with B12 when folic acid is being used. Vegan and vegetarian diets are often high in folic acid and low in B12, which may warrant B12 supplementation.

Please note: Neurological damage caused by long-term B12 deficiency can be irreversible. It is vital to ensure adequate, consistent B12 intake, especially as deficiency signs may not manifest symptomatically for several years.

- High doses should only be used under medical supervision in epileptics as it may increase seizure activity in some people.
- Supplementation may reduce effectiveness of the anti-convulsant drug phenytoin.

Folic acid supplementation should not be used concurrently with the drug methotrexate unless under the supervision of prescribing physician.

In schizophrenics, supplementation should be used only under medical supervision. High-doses should be avoided in those with abnormally high levels of histamine (histadelia), unless under medical supervision.

Extended use of high doses may cause crystallisation of folacin in kidneys and may cause increased uric acid excretion in the urine.

Very high doses may cause bloating, appetite loss, flatulence and nausea.

High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised.

Garlic

allium sativum

A) ANTI-MICROBIAL

Garlic exerts broad-spectrum anti-microbial activity against a variety of pathogens including; viruses, bacteria, fungi e.g. Candida species, and parasites. It has been shown to be more potent than many commonly used anti-fungal agents and research has demonstrated garlic's potent anti-fungal activity against cryptococcal meningitis, one of the most harmful fungal infections.

B) ANTI-BACTERIAL

Studies as long ago as 1944, showed that garlic inhibited the growth of Staphylococcus, Streptococcus, Bacillus, Brucella and Vibrio. More recently, research has shown an effect against E Coli, Proteus vulgaris, Salmonella, Citrobacter species, Klebsiella and mycobacteria. Studies have even demonstrated garlic's efficacy in inhibiting the growth of some bacteria that had become resistant to one or more antibiotics.

C) ANTI-VIRAL

Herpes simplex types 1 & 2, parainfluenza virus type 3, vaccinia virus, vesicular stomatitis virus and human rhinovirus type 2 have all been destroyed by the application of garlic.

D) ANTI-PARASITIC

Garlic has been shown to expel or destroy common intestinal parasites such as roundworm and hookworm.

E) ANTI-FUNGAL

Garlic has demonstrated significant antifungal activity in many studies, but perhaps most importantly against *Candida albicans* and cryptococcal meningitis.

F) IMMUNE ENHANCEMENT AND CELL PROTECTION

Population studies have clearly demonstrated the cell-protective properties of garlic consumption in areas where the garlic intake was high. Human studies show that garlic inhibits the formation of nitrosamines (the powerful cell damaging compounds formed in the digestive process).

G) CARDIOVASCULAR TONIC

Garlic exerts a wide range of benefits on the cardiovascular system, for the most part due to sulphur compounds such as allicin and allicin by-products (e.g. ajoenes). Research indicates that garlic supplementation lowers total serum cholesterol and improves the ratio between HDL and LDL. There is also evidence that garlic possesses a blood pressure lowering effect, an attribute that is mostly linked to the herb's ability to reduce platelet aggregation.

H) BLOOD SUGAR LOWERING

Allicin has been shown to have significant hypoglycaemic action, which is thought to be due to the ability of certain sulphur compounds to reduce the destruction of insulin in the liver.

I) ANTI-INFLAMMATORY

The various sulphur compounds present in garlic have been shown to inhibit the release of inflammatory compounds, and action which is complemented by the herb's antioxidant properties.

J) ANTI-CATARRHAL

The high concentration of sulphur compounds and mustard oils in garlic lead to a very potent ability to reduce mucous congestion. This action, combined with the significant anti-microbial activity accounts for the herb's great popularity in treatment of respiratory infections.

K) NUTRITIVE

It has been used throughout the centuries and is one of the oldest of cultivated plants, being a member of the lily family along with onions and chives. In addition to its medicinal actions, garlic is also rich in nutritional content, containing 33 sulphur compounds, 17 amino acids, germanium, calcium, copper, iron, potassium, magnesium, selenium, zinc, and vitamins A, B and C.

Potential Applications of Garlic

- viral infections (e.g. colds, flu, herpes)
- bacterial infections
- fungal infections (e.g. *Candida albicans*)
- parasitic infections
- respiratory congestion
- cardiovascular disorders (high cholesterol and triglycerides, atherosclerosis, high blood pressure, thrombosis)
- food poisoning
- general infections
- MRSA

Principle actives

Allicin, ajoene, vinyl dithiins, diallyl disulfide, gamma-glutamylcysteines, thiosulfinates

Contraindications/Drug Interactions

Regularly eating large amounts of fresh garlic may be irritating to the digestive system of some people.

Not recommended in large quantities if taking the prescribed anticoagulant drug Warfarin.

Best avoided during pregnancy or lactation.

Caution with insulin - check with doctor.

Garlic

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Gentian Root

Gentiana lutea

A) DIGESTIVE STIMULANT

Gentian Root (*Gentiana lutea*) is a bitter herb that is as one of the most effective gastric stimulants. This herb has traditionally been used to improve digestion and stimulate appetite, as well as for a variety of gastrointestinal disorders including dyspepsia, gastritis, heartburn, and nausea. Gentian contains the glycosides gentiopicrin and amarogentin (the intensely bitter taste of these can be detected even when diluted 50,000 times). These compounds have been shown to stimulate the gustatory receptors in the taste buds, causing a reflex increase in the secretion of saliva, gastric juice and bile.

B) APPETITE STIMULANT

Research indicates that gentian may be capable of inhibiting the feeling of fullness after eating. Feeling excessively full after eating may be a primary mechanism for poor appetite, and therefore gentian may be helpful in improving appetite.

Potential health applications of gentian root

Indigestion

Gastritis

Feeling of fullness

Flatulence and bloating

Incomplete digestion of food

Principal actives

gentiopicrin and amarogentin.

Contraindications/Drug Interactions

Do NOT use during pregnancy or lactation. The stimulation of digestive secretions by this herb make it unsuitable for those suffering from peptic (stomach or duodenal) ulcers.

Ginger

zingiber officinalis

A) DIGESTIVE TONIC

Ginger has the ability to simultaneously improve gastric motility and exert antispasmodic effects on smooth muscle of the digestive tract, suggesting a significant potential in relieving indigestion, gas, bloating and the general symptoms of irritable bowel syndrome.

B) DIGESTIVE STIMULANT

Ginger is classified as an aromatic bitter, so in addition to its digestive toning properties ginger has been traditionally used for stimulating the release of gastric secretions including stomach acid, bile and pancreatic enzymes. Insufficiency of these digestive secretions can lead to incomplete break down of food into its component parts, resulting in a variety of digestive conditions including indigestion, flatulence, bloating and bacterial dysbiosis. Ginger also contains proteases that are thought to be

as effective as other proteolytic extracts (e.g. bromelain) for the breakdown of proteins.

C) ANTI-EMETIC

Several studies show ginger to relieve nausea, accounting for its common use in the prevention and treatment of motion sickness and morning sickness in pregnancy.

D) STOMACH PROTECTIVE

Research suggests that compounds within ginger may be helpful in preventing ulcer formation caused by the administration of various drugs including non-steroidal antiinflammatory drugs. However, pre-existing ulcers may be aggravated by ginger due to its bitter characteristics (which stimulate stomach acid activity).

E) CHOLESTEROL LOWERING

After having been excreted into the intestines from the liver (via the gallbladder), removal of cholesterol from the body occurs via the faeces. Ginger has been shown to reduce serum and hepatic cholesterol levels and increase bile secretion.

Potential Applications of Ginger

- Indigestion, gas, abdominal bloating and discomfort
- Irritable bowel syndrome
- Nausea
- Bile insufficiency
- Stomach acid insufficiency
- Pancreatic insufficiency
- Hypochlorhydria (low stomach acid)
- Cholesterol reduction
- Stomach protection (due to NSAID side effects)

Principle actives

Gingerols

Contraindications/Drug Interactions

Not recommended in patients with pre-existing gastric (stomach or duodenal) ulcers, unless directed by a medical practitioner.

Ginger

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Ginkgo

ginkgo biloba

A) GENERAL CIRCULATORY TONIC

Ginkgo exerts a general tonic effect on the vascular system helping improve circulation, to the extremities in particular. Research suggests that ginkgo is effective in cases of peripheral arterial disease where there is arterial obstruction or narrowing, causing a reduction in blood flow during exercise or at rest. The herb's capillarydilatating effect is especially prominent.

B) COGNITIVE ENHANCEMENT

This herb has been shown to increase cerebral blood flow, and therefore oxygen and glucose utilisation in the brain. As well as improving vascular function in the brain, studies have shown that GBE increases the rate at which information is transmitted at the nerve cell level, an ability that is thought to be primarily due to a positive influence on neurotransmitter function. Clinical trials confirm that ginkgo extract improves short term memory, mental alertness and overall cognitive performance.

C) ANTI-ALLERGIC

Ginkgo inhibits platelet-activating factor (PAF) - a major chemical trigger in asthma, inflammation and allergies.

D) ANTIOXIDANT

The flavoglycosides exhibit powerful antioxidant capabilities, a factor which is especially valuable considering the damaging effect of free radicals on brain function.

Potential Applications of Ginkgo Biloba:

cerebrovascular disease
poor memory
lack of alertness
senility
Alzheimer's disease
age related depression
tinnitus (when associated with circulatory dysfunction)
cold extremities
oedema
allergies
asthma
antioxidant

Principle actives:

Ginkgoflavoglycosides

Contraindications/Drug Interactions:

Not recommended for those taking the prescribed anti-coagulant Warfarin for cerebrovascular disease unless monitored by a qualified medical practitioner.
Caution with platelet inhibitors - check with doctor.

Ginkgo

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Vorberg, *Clinical Trials Journal*, 22, 1985, p149-157.

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Ginseng (American)

panax quinquefolium

A) ADAPTOGENIC

American ginseng, as with all forms of ginseng, increases tolerance to various stressors (e.g. mental, physical, environmental). This herb helps normalise the way in which the body responds to stress triggers and acts to regulate the manufacture and secretion of adrenal hormones. It also strengthens the adrenal glands themselves, which is especially important to those suffering from chronic stress.

B) CENTRAL NERVOUS SYSTEM STRENGTHENING EFFECT

Its adaptogenic activity provides non-specific support for the central nervous system, which may help restore proper neurological function after long term stress.

C) IMMUNE TONIC

Studies show that ginseng enhances white blood cell activity, thus providing support to a compromised immune system. In addition, as stress suppresses immune function, the adaptogenic properties of this herb would even further promote resistance to infection.

D) CALMING AGENT

American ginseng provides a calming effect, which is in contrast to the stimulant effect associated with Korean ginseng. This difference is associated with the two herb's differing ratios of the active ginsenosides Rbl and Rgl.

Potential Applications of American Ginseng:

- stress - mental/physical/environmental
- irritability, anxiety, nervous tension
- fatigue
- weak immunity

- physical endurance during exercise

Principle actives:

Ginsenosides

Contraindications/Drug Interactions:

Caution with anticoagulants, anti-diabetics, MAOFs and stimulants - check with doctor.

Ginseng (American)

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Ginseng (Korean)

panax ginseng C.A. Meyer

A) ADAPTOGENIC

Korean ginseng increases tolerance to various stressors (e.g. mental, physical, environmental). This herb helps normalise the way in which the body responds to stress triggers and acts to regulate the manufacture and secretion of adrenal hormones. It also strengthens the adrenal glands themselves, which is especially important to those suffering from chronic stress.

B) CENTRAL NERVOUS SYSTEM STRENGTHENING EFFECT

Its adaptogenic activity provides non-specific support for the central nervous system, which may help restore proper neurological function after long term stress.

C) IMMUNE TONIC

Studies show that ginseng enhances white blood cell activity, thus providing support to a compromised immune system. In addition, as stress suppresses immune function, the adaptogenic properties of this herb would even further promote resistance to infection.

E) MILD STIMULANT

Korean ginseng appears to be the most stimulating of all types of ginseng, which is in contrast to the calming effect associated with American ginseng. This difference is associated with the two herb's differing ratios of the active ginsenosides Rb1 and Rg1.

Potential Applications of Korean Ginseng:

- stress - mental/physical/environmental
- fatigue
- weak immunity
- physical endurance during exercise
- lack of mental alertness

Principle actives:

Ginsenosides

Contraindications/Drug Interactions:

Korean ginseng should be avoided in cases of high blood pressure unless advised by a qualified medical practitioner. Reports also suggest that its use is not advised in women with a history, or high risk of, fibrocystic breast disease or oestrogen dependent cancer.

Caution with anticoagulants, MAOFs, anti-diabetics and stimulants - check with doctor.

Ginseng (Korean)

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Ginseng (Siberian)

eleutherococcus senticosus

A) ADAPTOGENIC

Although Siberian ginseng is not a true ginseng species, like ginseng it increases tolerance to various stressors (e.g. mental, physical, environmental). This herb helps normalise the way in which the body responds to stress triggers and acts to regulate the manufacture and secretion of adrenal hormones. It also strengthens the adrenal glands themselves, which is especially important to those suffering from chronic stress.

A) CENTRAL NERVOUS SYSTEM STRENGTHENING EFFECT

Its adaptogenic activity provides non-specific support for the central nervous system, which may help restore proper neurological function after long term stress.

B) IMMUNE TONIC

Studies show that Siberian ginseng enhances white blood cell activity, thus providing support to a compromised immune system. In addition, as stress suppresses immune function, the adaptogenic properties of this herb would even further promote resistance to infection.

Potential Applications of Siberian Ginseng:

- stress - mental/physical/environmental
- fatigue
- weak immunity
- physical endurance during exercise

Principle actives:

Eleutherosides

Contraindications/Drug Interactions:

Caution with Digoxin - check with doctor

Ginseng (Siberian)

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Glucosamine

Commonly derived from crab shell, glucosamine is made up of glucose, a sugar that the body burns for fuel, and glutamine (an amino acid). It is an important part of the mucopolysaccharides, which provide structure to the bone, cartilage, skin, nails, hair, and other body tissues.

A) JOINT PROTECTION AND REPAIR

Glucosamine is utilised by the joints to repair, strengthen and improve the integrity of the cartilage, in addition to improving the viscosity of the lubricating (synovial) fluid in joints. Numerous double-blind clinical trials, have shown glucosamine's ability to relieve symptoms associated with osteoarthritis as well as initiating joint repair, including reduction of pain and inflammation (although it is not technically an antiinflammatory compound). Over the long term, studies suggest that glucosamine may be more effective than non-steroidal anti-inflammatory drugs (e.g. ibuprofen), with none of the drugs' common side effects.

B) CONNECTIVE TISSUE INJURY

Damage to cartilage and soft tissues in and around joints can also be due to sports injury, heavy lifting, etc. Chondrocytes in the joint use glucosamine to produce glycosaminoglycans (GAGs) and glycoproteins, which repair the joint and improve mobility by strengthening the cartilage and connective tissues. These compounds are also important in the repair of bone tissue in the case of fracture or age-related bone loss.

C) INTESTINAL PERMEABILITY

Glycosaminoglycans and glycoproteins, an integral part of cell membranes and connective tissue can help stabilise the tissue lining the gut. In the case of intestinal

damage (i.e. leaky gut disorder), due to factors such as chronic candidiasis, alcoholism or inflammatory bowel disease, supplementation may be warranted.

D) VASCULAR HEALTH

The arteries, and the aorta in particular (the main artery from the heart supplying blood to the body) contain glycosaminoglycans (GAGs), which provide them with support and elasticity as well as protection and aid to repair. The inner membrane in particular must be strong enough to avoid tearing or lesions as this may initiate atherosclerosis. GAG's are also essential for vein wall integrity. If venous tissue is weak and does not provide the proper support, the veins bulge, becoming dysfunctional (and also unsightly if in the legs).

Potential health applications of Glucosamine

- joint health • bone health
- sports injuries • general connective tissue support
- cardiovascular health • vascular health
- leaky gut • varicose veins

Contraindications/Drug Interactions

Although interactions are rare, diabetics should be monitored if they intend to use glucosamine. Allergy - the most common supplemental form is derived from shellfish.

Glucosamine

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Setnikar I et al, *Arzneim Forsch*, 41, (1991) pp 542-545
Brandt KD, *Am J Med*, 83, (1987) pp 29-34
Newman NM and Ling RSM, *Lancet* ii, (1985) pp 11-13.
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L-Glutamine

A) MENTAL STIMULANT

Glutamine is the most widely used amino acid and constitutes more than 20% of all the amino acid levels in the body. While it is the most prevalent amino acid, it is considered to be conditionally essential, meaning that stress or excessive exercise can create a need for more of it than the body can provide. Glutamine readily passes the blood-brain barrier and, within the brain, is converted to glutamic acid, which the brain needs to function properly. Aside from generally providing an energy source for the brain, glutamic acid is thought to play a role in mental alertness and perhaps even memory enhancement. It also increases the amount of gamma-aminobutyric acid (GABA), which is needed to sustain proper brain function and mental activity.

B) INTESTINAL HEALER

The gastrointestinal tract is by far the greatest user of glutamine in the body, as cells in the intestinal epithelium use glutamine as their principal metabolic fuel. Glutamine is therefore necessary to promote cellular regeneration (repair) in the gut and has been shown in numerous studies to reverse mucosal atrophy associated with various gastrointestinal conditions. Studies also show that the addition of glutamine may help to improve gut barrier function, as well as immune activity in the gut, thereby preventing the passage of foreign substances through the gut wall (such as in intestinal

permeability). Cabbage juice consumption is thought to be helpful for patients with gastric ulcers and gastritis because of its high glutamine content.

C) IMMUNE SUPPORT/HEALING

The gastrointestinal tract has a large number of immune cells along its length, including fibroblasts, lymphocytes, and macrophages. The ability of glutamine to nourish these immune cells may account for its positive impact on the gastrointestinal tract and immunity. Healing of surgical wounds, trauma injuries, and burns is accomplished in part by the actions of these immune cells. Their proper functioning is dependent on glutamine as a metabolic fuel for growth and proliferation. Therefore, a depletion of intracellular glutamine can slow growth of these cells, and ultimately prolong healing. Studies also report that decreases in glutamine concentrations may result in an increased rate of infection in certain stressed patient populations.

D) ATHLETIC PERFORMANCE

Glutamine has been shown to improve nitrogen balance, increase protein synthesis, and decrease 3-methylhistidine (a marker of muscle catabolism) excretion. Research also suggests that glutamine may elevate human growth hormone secretion. Theoretically this means faster recovery for both the endurance and strength athlete, along with faster muscle growth. Since glutamine also plays a role in the integrity of the immune system by acting as a key substrate for both lymphocytes and macrophages, supplementing with glutamine may help keep the immune system strong and decrease the risk of infection during frequent, intense, or lengthy training sessions. Preliminary studies also indicate that glutamine may stimulate the accumulation of muscle glycogen, which could provide an added advantage for the endurance athlete, who relies heavily on glycogen stores for energy.

E) CRAVINGS

Glutamine is a glycogenic amino acid which means it can convert to sugar for energy production, a process called gluconeogenesis. It may therefore be helpful in promoting blood sugar stabilisation. This, in combination with the effect of glutamine supplementation on brain chemistry, has been shown to significantly reduce craving for alcohol in clinical research.

F) ANTI-ULCER AGENT

As a major metabolic fuel for the endothelial cells of the intestinal tract, glutamine has been shown to speed the rate of healing of digestive ulcers. In one double-blind study, 57 patients were given either glutamine (400mg 4 times per day) or placebo in addition to standard treatment and bland diet. Based on X-ray assessment, 22 out of the 24 patients receiving glutamine therapy had complete ulcer healing within 4 weeks.

Potential Applications of L-glutamine:

- Mental alertness
- Memory enhancement
- Intestinal permeability ('Leaky gut' disorder)
- Athletic performance
- Alcoholism
- Blood sugar imbalance
- Sugar addiction
- Stomach and duodenal ulcers
- Ulcerative colitis and Crohn's Disease

typical intake range:

500-5000 mg per day (taken on an empty stomach)

Food sources

Soy protein, cottage cheese, turkey, crab, turkey, tuna, cod, haddock, cheddar cheese, cabbage, spirulina

Contraindications/Drug Interactions:

- High dosages of glutamine may affect anticonvulsant medication
- Avoid if sensitive to monosodium glutamate or suffering kidney or liver problems

- May be beneficial alongside human growth hormone, indomethacin, methotrexate and paclitaxel.

L-Glutamine

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L-Glutathione

A) LIVER PROTECTANT/DETOXIFIER

Glutathione is required for the detoxification of numerous substances in the liver and is a compound of three amino acids, cysteine, glutamic acid and glycine. Of these, cysteine is most likely to be rate limiting, in other words the availability of cysteine is the biggest factor in how much glutathione can be synthesised. Glutathione conjugation is the method in which approximately 60% of all toxins are neutralised during phase II of the liver's detoxification process. Efficient phase II detoxification ensures that harmful toxic compounds are not able to build up in the liver.

Supplemental glutathione is not thought to be the most effective method of increasing glutathione levels in the body. In fact cysteine, NAC, vitamin C, milk thistle and schisandra have all been shown to be more effective in this regard.

B) ANTIOXIDANT

Glutathione is a powerful free radical scavenger, and combines with selenium to form the potent antioxidant enzyme glutathione peroxidase and is able to quench both reactive oxygen species and peroxide radicals, an action which makes it especially valuable in protecting cell membranes.

C) CARDIOVASCULAR PROTECTANT

Through its antioxidant effects, glutathione can prevent oxidation of LDL cholesterol, a known risk factor in heart disease. Early research indicates that glutathione may significantly inhibit platelet aggregation and improve other haemostatic and haemorheological factors in atherosclerotic patients.

D) MALE FERTILITY

Preliminary research suggests that glutathione may improve sperm motility. In one double blind, placebo-controlled study, injected glutathione demonstrated significant positive effects on sperm motility and sperm counts in infertile men.

Potential Applications of L-glutathione:

- Liver protection and liver disorders
- Detoxification
- Heavy metal poisoning
- Free radical-related disorders in general
- Atherosclerosis
- Male infertility

Typical intake range:

250-500 mg per day (taken on an empty stomach)

Food Sources:

Asparagus, broccoli, avocado, spinach, raw eggs, garlic, fresh unprocessed meats

Contraindications/Drug Interactions:

- Maybe beneficial alongside cisplatin and doxorubicin.
- Best avoided by children, pregnant women and nursing mothers.

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Glycine

A) CALMING AGENT

When glycine is released into a synapse (space between two neurons) it makes the neurone less likely to trigger an electrical impulse. Glycine is therefore a major inhibitory neurotransmitter and may be beneficial as a calming agent. Research has already reported a role for glycine in depression, schizophrenia and even memory enhancement. However, despite the theoretical use for glycine as an anxiolytic (antianxiety) agent, research in humans is still lacking and more evidence is required before this action can be confirmed.

B) ANTI-CONVULSIVE AND ANTI-SPASMODIC

A deficiency of glycine has been shown to result in jerky, exaggerated movements and sometimes even spasticity. These symptoms occur because glycine acts as an inhibitory neurotransmitter in the spinal chord, so a deficiency results in over-excitability of nerve cells leading to poor motor control and seizures. Research suggests a role for glycine as a protectant of the brain in seizure-related disorders such as epilepsy and reduced muscle spasticity.

C) CONNECTIVE TISSUE SUPPORT

Collagen is an important structural protein in the body. It is made up of chains of amino acids, with glycine, proline and hydroxyproline being the most common. Collagen is often organised in long parallel bundles of fibres, forming connective tissue, which has a very high tensile strength (for example tendons and ligaments). Collagen may also be formed into sheets and form the basis for organs such as the skin, retina, blood vessels etc. Glycine may therefore be of value in promoting the health and integrity of connective tissue and improving wound healing.

D) MUSCLE REPAIR AND BUILDING

In addition to the enhancement in the synthesis of collagen (a major component of muscle), research shows that glycine elevates growth hormone release. In one study subjects given either 4, 8 or 12 g of glycine were found to have a significant increase in growth hormone release, which was dose dependant.

E) LIVER SUPPORT

Glycine, along with arginine, ornithine, taurine and glutamine is required for the detoxification of a variety of toxins in the liver. Glycine is by far the most commonly utilised in a phase II liver detoxification process called amino acid conjugation. A variety of liver conditions, as well as chronic exposure to toxins, are known to result in depressed amino acid conjugation, and therefore poor detoxification function.

F) ANTACID

Glycine has been shown to buffer excessive stomach acidity.

Potential Applications of glycine:

- Anxiety and nervous tension
- Panic attacks
- Depression
- Insomnia

- Wound healing
- Ulcers
- Epilepsy
- Spastic disorders
- Athletic performance

Typical intake range:

500-2000 mg per day (taken on an empty stomach)

Food sources:

Pork, turkey, beef, chicken, lamb, ostrich, molluscs, crab, crayfish, lamb, soybeans

Contraindications/Drug Interactions:

- May interact with antipsychotic medication, avoid concurrent use (although research is contradictory as to whether this interaction is positive or negative).
- May potentiate action of anti-spasmodic medication (e.g. aclofen, dantrolene sodium and tizanidine). Concurrent use under medical supervision only.
- Should be avoided by pregnant women and nursing mothers and those with hepatic impairment.

Glycine

Textbook Of Natural Medicine. Pizzorno and Murray. Churchill Livingstone, 2000. ISBN 0443059454

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Glycine Propionyl L-Carnitine (gPLC)

Fatty acids are the primary source of fuel for the heart and are used in endurance exercise by the muscles. Carnitine is required for the transport of fatty acids into the mitochondria where they are metabolised into energy. Carnitine is not only required for shuttling fatty acids into the mitochondria, but it also aids the removal of toxic fatty acid metabolites, which would otherwise build up and impair mitochondrial function. gPLC is a special variety of 'amino-carnitine', where the incorporation of glycine into the molecule offers advantages relating to absorption.

A) CARDIOVASCULAR FUNCTION

Approximately 60-70% of the energy made in the heart comes from fatty acids, which yield more adenosine triphosphate (ATP), the energy molecule, than glucose. Fatty acid metabolism occurs in the mitochondria in a process called beta-oxidation and is reliant on carnitine, which shuttles fatty acids across the mitochondrial membrane as well as ensuring the efficient removal of metabolic by-products.

In a randomised, single-blind, placebo-controlled trial in 30 heart failure patients, oral administration of 1.5 grams/day of propionyl-L-carnitine for 1 month resulted in significantly improved measures of exercise tolerance and a slight but significant decrease in left ventricular size compared to placebo. A larger randomised, double blind, placebo-controlled trial compared the addition of propionyl-L-carnitine (1.5 grams/day) to the treatment regime of 271 heart failure patients to a placebo in 266 patients for 6 months. Exercise tolerance was significantly improved in those taking propionyl-L-carnitine compared to placebo, suggesting that propionyl-L-carnitine may help to improve exercise tolerance in heart failure patients.

In peripheral arterial disease, atherosclerosis of the arteries supplying the lower extremities may diminish blood flow to the point that it is insufficient to supply the metabolic needs of exercising muscles, leading to ischemic leg or hip pain known as claudication. In a randomised placebo-controlled study of 495 patients with intermittent claudication, 2 grams/day of propionyl-L-carnitine for 12 months significantly increased maximal walking distance and the distance walked prior to the onset of claudication in patients whose initial maximal walking distance was less than 250 meters. In a double blind, randomised, placebo-controlled trial of 155 patients with disabling claudication in the U.S. and Russia, 2 grams/day of propionyl-L-carnitine for 6 months significantly improved walking distance and claudication onset time compared to placebo.

Another study compared the efficacy of L-carnitine and propionyl-L-carnitine

administered intravenously for the treatment of intermittent claudication, and concluded that propionyl-L-carnitine was more effective than L-carnitine when the same amount of carnitine was provided.

B) ATHLETIC PERFORMANCE

In endurance exercise muscles use both glycogen (stored blood sugar) and fatty acids as sources of fuel. ATP turnover in exercise happens at a high rate, making fatty acids the ideal fuel source because of their high yield of ATP. With training, athletes become more efficient at using fatty acids, in lieu of glycogen, although glycogen usage is always the rate-limiting factor determining ultimate energy production (i.e. once the glycogen stores run out, no more fatty acids can be used, even if they are available). Improving the efficiency of fatty acid metabolism is a major goal of the endurance athlete, and to this end gPLC would appear to be an appropriate recommendation. gPLC has a special affinity for the peripheral muscles. The combination of gPLC with CoQ10 would be especially warranted for improving energy metabolism during exercise. In one study in healthy but sedentary men and women, exercise parameters including time to fatigue and anaerobic threshold, were significantly better in the group taking 1000mg gPLC per day versus the placebo group over an 8 week period.

C) ERECTILE DYSFUNCTION

A study in Italy showed that three grams of acetyl-L-carnitine and PLC in combination was as good as testosterone in the treatment of erectile dysfunction, and further studies have shown gPLC to be especially helpful in potentiating the action of Viagra.

Potential Applications of gPLC

- Cardiovascular health
- Intermittent claudication
- Angina
- Cardiomyopathy
- Arrhythmia
- Muscle weakness
- Endurance exercise
- Impotence
- Chronic fatigue syndrome

Typical intake range of gPLC

500 - 2000mg per day

Contraindications/drug interactions

No drug interactions are noted in the literature. However, gPLC should only be used in conjunction with other medications under medical supervision only.

gPLC

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Golden sea I Root

hydrastis canadensis

A) ANTIBIOTIC

Due to its content of alkaloids (e.g. hydrastine, berberine, canadine), goldenseal exerts a broad spectrum of anti-bacterial activity against pathogens such as *staphylococcus*, *streptomyces*, *chlamydia*, *corynebacterium diphtheria*, *escherichia coli* (*E. coli*), *salmonella typhi*, *vibrio cholera*, etc.

B) ANTI-FUNGAL

Scientific evidence also points to a potent anti-fungal activity, which make goldenseal alkaloids useful in treatment of *Candida albicans* infection. This benefit, in tandem with its anti-bacterial effect have made goldenseal an especially attractive alternative

to prescribed antibiotics, which are frequently the cause of yeast/fungal infections in the first place.

C) ANTI-PARASITIC

Goldenseal has also demonstrated activity against many parasites, which along with its antibiotic properties is of great value in helping to prevent or treat 'traveller's diarrhoea' and many types of food poisoning.

D) ANTI-DIARRHOEAL

The broad-spectrum anti-microbial capabilities of goldenseal have led to impressive results in studies involving the treatment of infectious diarrhoea.

E) MUCOUS MEMBRANE SOOTHING

Goldenseal displays soothing properties to inflamed mucous membranes, which along with its anti-microbial benefits, which helps explain significant benefits and frequent use in intestinal infections.

F) LIVER TONIC

The alkaloid berberine has been shown to both stimulate bile secretion and correct metabolic abnormalities in liver dysfunction.

G) INHIBITOR OF BOWEL TOXICITY AND 'LEAKY GUT'

The alkaloids in goldenseal inhibit the formation of polyamines, toxins produced in the intestines from the putrefaction of undigested protein by bacteria. Polyamines damage the integrity of the intestinal lining, producing excessive permeability (leaky gut), and as such increase the risk of food allergies. If absorbed into the system polyamines are associated with triggering or exacerbating psoriasis and certain forms of arthritis (e.g. rheumatoid).

Potential Applications of Goldenseal Root

- Infectious diarrhoea (e.g. due to food poisoning, traveller's diarrhoea, influenza)
- Bacterial dysbiosis
- Parasitic infections
- Candida albicans infections
- 'Leaky gut' disorder
- Bile insufficiency

Principle actives

Hydrastine, berberine, palmitine

Contraindications/Drug Interactions

Do NOT use during pregnancy. High doses over a long period of time may interfere with B vitamin metabolism, thus warranting the increased intake of B vitamins if goldenseal is used regularly.

Golden Seal Root

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Gotu Kola

centella asiatica

A) CIRCULATORY AND LYMPHATIC TONIC

A number of studies have shown that extracts of gotu kola are effective in the treatment of varicose veins and venous insufficiency. Gotu kola appears to enhance the connective tissue structure and improve venous circulation.

B) SKIN HEALER

The positive effect of gotu kola on the integrity of skin dermis (the second layer of skin tissue) is associated with its promotion of glycosaminoglycans, a major component of connective tissue. The clinical implications of this benefit have been demonstrated in

numerous studies, e.g. treatment of cellulite, skin ulcers, keloid scars and scleroderma.

C) ENHANCED MENTAL FUNCTION

Research has shown that gotu kola extracts improve concentration, attention, and have anti-stress and anti-anxiety effects.

Potential Applications of Gotu Kola:

- varicose veins
- cold extremities
- cellulite
- skin (e.g. varicose) ulcers
- keloid scars
- poor skin healing
- scleroderma
- mental function

Principle actives:

Asiatic acid, asiatoside, madecassic acid, madecassoside

Contraindications/Drug Interactions:

Caution with sedatives, anti-diabetics, anti-lipidemics - check with doctor.

Gotu Kola

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Green Tea

camellia sinensis

A) ANTIOXIDANT

Green tea is a rich source of very potent free radical scavenging polyphenols, such as epigallocatechin gallate and gallic acid. In addition, it has been shown to raise the activity of glutathione peroxidase and other antioxidant enzymes in the small intestine, liver and lungs.

B) ANTI-MICROBIAL

Evidence suggests that green tea possesses a potent activity against harmful bacteria and viruses, most likely due to the direct effects of catechins and the indirect effect of the raised levels of glutathione peroxidase.

C) ANTI-ALLERGIC

Various flavonoids found in green tea have been shown to inhibit the release of histamine, a major chemical mediator in allergic reactions.

D) THERMOGENIC

Green tea contains compounds such as theophylline and caffeine, both which have been shown to enhance the rate of fat metabolism. Since the greater the rate of fat metabolism the more free radicals produced, green tea's antioxidant properties are especially useful. (Although coffee contains higher levels of caffeine, it also contains potentially harmful roasted hydrocarbons, which are potent free radical sources.)

Potential Applications of Green Tea:

- protection against free radicals
- bacterial infections
- viral infections
- weight control

Principle actives:

Polyphenols (e.g. epigallocatechin gallate, gallic acid), theophylline, caffeine (unless de-caffeinated)

Contraindications/Drug Interactions:

Those with an extreme sensitivity to caffeine may want to avoid green tea unless it has been de-caffeinated. Decaffeinated green tea would also possess the above

mentioned attributes, with the exception of the enhancement of fat metabolism.
Caution with MAOI's and anticoagulants - check with doctor.

Green Tea

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Hawthorne Berries

cratageus oxyacantha

A) CIRCULATORY TONIC

The flavonoid content of hawthorne possesses many attributes that are beneficial to the circulatory system, among the most prominent being a significant vasodilating effect on arteries (particularly the coronary artery which feeds the heart muscle). The ability to stabilise collagen and inhibit free radical damage (see below) makes this herb an exceptional tool in protecting the blood vessels from damage and speeding their repair.

B) BLOOD PRESSURE-LOWERING

Hawthorne is a clinically proven treatment for hypertension. The herb's vasodilating activity and its influence on prostaglandins would account for much of the influence on blood pressure.

C) HEART TONIC

The above-mentioned enhancement of circulation through the coronary artery allows the heart to be fed with oxygen and nourishment. Allowing more efficient dilation of arteries also takes pressure off the heart muscle in terms of its ability to pump blood through the body. In addition, it appears that hawthorne's active compounds influence enzymes involved in energy metabolism within the heart muscle itself. Not surprisingly, it has been shown that hawthorne berries are effective in treatment of angina and other conditions associated with a weak heart.

D) ANTIOXIDANT

The active flavonoids possess their own direct antioxidant properties as well as protecting and increasing intracellular levels of vitamin C. Free radicals are a major destructive force in the cardiovascular system.

E) CONNECTIVE TISSUE STABILISER

These flavonoids also exert collagen-stabilising effects, which enhances the strength and integrity of connective tissue (e.g. in blood vessels, joints, tendons etc).

Potential Applications of Hawthorne Berries:

- angina
- high blood pressure
- poor circulation
- cardiomyopathy (weak heart muscle)
- atherosclerosis
- heart arrhythmia

Principle actives:

Flavonoids (e.g. vitexin)

Contraindications/Drug Interactions:

Caution with anti-hypertensives, cardiac glycosides and central nervous system depressants - Check with doctor.

Hawthorne Berry

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Hematinic (blood building) nutrients

Iron is not the only nutrient involved in blood building and subsequently there is more than one type of anaemia, which can be caused by excessive blood loss, excessive red blood cell destruction or deficient red blood cell production.

A) IRON DEFICIENCY ANAEMIA (microcytic anaemia)

Iron deficiency is the most common cause of anaemia generally, and the red blood cells become very small. Different types of iron supplementation mean that absorption rates vary tremendously, with ferrous sulphate and fumarate generally being less than 5% absorbed (hence high levels being prescribed to gain sufficient iron) and ferrous succinate and glycinate forms up to 80% absorption.

Groups that are at the highest risk of deficiency:

- infants under two years (increased requirement for iron during growth spurts)
- teenage girls (blood loss most often due to excessive menstrual bleeding, curiously iron deficiency can also cause excessive menstrual bleeding)
- pregnant women (increased requirement for iron)
- elderly (decreased absorption of iron is common).
- good levels of vitamin C enhance iron absorption.

B) B12 DEFICIENCY ANAEMIA (macrocytic anaemia)

The red blood cells become quite large. Lack of the intrinsic factor needed to absorb B12 results in pernicious anaemia, (also associated with an additional iron deficiency). Where B12 is poorly absorbed, a sublingual (under the tongue) supplement negates the need for the intrinsic factor - this form can even be effective enough to avoid the need for B12 injections. B12 also works with folic acid in many other processes, including synthesis of DNA and the myelin sheath that surrounds nerve cells.

Groups that are at the highest risk of B12 deficiency include:

- vegetarians (dietary lack of B12 is associated with a strict vegetarian/vegan diet)
- elderly (decreased absorption common)

C) FOLIC ACID DEFICIENCY ANEMIA (macrocytic anaemia)

Possibly the most common vitamin deficiency in the world, folic acid is not stored in the body, unlike iron or B12 and a deficiency will also lead to a macrocytic anaemia.

Groups that are at the highest risk of folic acid deficiency include:

- pregnant women, due to an increased demand for cell reproduction within the foetus.
- people on anticancer or epilepsy drugs, or women on the contraceptive pill
- alcoholics
- gut problem sufferers ie. from Crohns disease, IBS, diarrhea and/or malabsorption.

Potential Health Applications:

- heavy blood loss
- symptoms of anaemia such as pallor, weakness, tendency to be easily fatigued

Contraindications/Drug Interactions

Iron supplementation should ideally be done on instruction of a doctor or nutritional practitioner.

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Hematinic Factors

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L-Histidine

A) ANTI-ARTHRITIC

Levels of histidine have been shown to be depleted both in the blood serum and joint synovial fluid of rheumatoid arthritis (RA) sufferers, a finding that has led some researchers to theorise that histidine supplementation may be of benefit in RA. Some studies have shown benefits of histidine supplementation in strength and mobility in RA sufferers. However more research is necessary before the anti-inflammatory potential of this amino acid can be substantiated.

B) HEAVY METAL PROTECTION

Toxic metals such as mercury, lead, cadmium, and threatening excesses of essential minerals zinc and copper stimulate the rapid formation of metallothionein inside cells of the brain, liver, and kidneys. Metallothionein is a molecule designed to store metals in such a way as to prevent uncontrolled oxidation reactions - protecting the normal workings of the cell. Metallothionein requires both L-cysteine (usually derived from available glutathione stores) and L-histidine to be formed.

C) SEXUAL FUNCTION

Histidine is needed to manufacture histamine, an essential compound for achieving sexual climax in both men and women. Men and women having difficulties achieving orgasms may be helped by histidine supplementation, as this may result in increased histamine levels in the sexual tract, which in turn may make orgasm and ejaculation easier. An additional pro-sexual effect of histidine may lay in its vasodilating effect, thus making blood flow to the sex organs easier. However, research confirming a therapeutic benefit for this purpose is currently lacking.

Potential Applications of L-histidine:

- Arthritis (especially rheumatoid)
- Heavy metal poisoning
- Impotence or frigidity

Typical intake range:

500-3000 mg per day (taken on an empty stomach)

Food sources:

Pork, beef, chicken, soybeans, cheese, turkey, kidney beans, mung beans, chickpeas, baked beans, milk products

Contraindications/Drug Interactions:

- Should be avoided by people with elevated levels of histidine or histamine such as those with manic depression, schizophrenia and chronic allergies
- Should be avoided by children pregnant women and nursing mothers and those with peptic ulcer disease (histamine triggers gastric secretions)

L-Histidine

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Horse Chestnut

aesculus hippocastanum

A) VEIN TONIC

The evidence showing a significant tonifying effect on the veins justifies the substantial scientific focus on horse chestnut to improve lower limb circulation. The primary mechanism appears to be through increasing the contractile potential of the elastic fibres in the vein wall.

B) CAPILLIARY TONIC

Horse chestnut reduces capillary fragility by reducing the number and size of the small pores in the capillary walls. This accounts for the reduction in lower limb oedema reported in the clinical trials.

Potential Applications of Horse Chestnut:

- varicose veins
- oedema

- 'heavy legs'
- general enhancement of lower limb circulation
- cold feet

Principle actives:

Aescin

Contraindications/Drug Interactions:

Caution with anticoagulants, especially Warfarin and Aspirin - check with doctor

Horse Chestnut

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Horsetail (vegetal silica)

equisetum arvense

A) DIURETIC

Due to its effect on the kidneys, vegetal silica has been found to significantly increase urinary flow, and as such is a popular treatment for both general fluid retention and local oedema.

B) HAIR, SKIN AND NAIL STRENGTHENER

The mineral silica (silicon) is a major component of the connective tissue of the hair, skin and nails. It is a frequently used herb for speeding the growth and improving the appearance of hair and nails. Clinical research also confirms that silica supplementation measurably improves skin integrity.

C) BONE STRENGTHENING

The bones also rely on silica for the proper integrity of their connective tissue structure. The silica content in this herb may be a particularly useful adjunct to the supplementation of other bone building minerals (e.g. calcium, magnesium, boron and zinc) in the prevention of bone loss or the healing of fractures.

Potential Applications of Horsetail:

- fluid retention
- slow-growing or brittle hair or nails
- improving skin texture and integrity
- prevention of osteoporosis
- healing of fractures

Principle actives:

Silicon (as silicic acid and silicates), flavonoids,

Contraindications/Drug Interactions:

It has been suggested that prolonged use of high doses may be irritating to the urinary tract, especially if kidneys are inflamed.

Caution with cardiac glycosides, cerebral stimulants & diuretics - check with doctor

Horsetail (vegetal silica)

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Inositol

A) LIPOTROPIC AGENT

Inositol is needed to manufacture phosphatidylinositol, one of the main phospholipids found in lecithin. As a primary component of lecithin, inositol functions as a lipotropic agent (i.e. a compound that prevents the accumulation of fat and cholesterol in the liver). When the liver becomes overloaded with fat and cholesterol, its numerous functions (such as detoxification, metabolism, bile production, etc) become impaired

and the body is adversely affected. This can also lead to the development of gall bladder and bile duct disorders (e.g. gallstones). Although scientific investigation into the liver-protective effects of inositol is currently lacking, it is often combined with either choline or phosphatidylcholine (which have been extensively researched for liver protection) for the purposes of liver support.

B) MENTAL FUNCTION AND EMOTIONAL HEALTH

Inositol plays an essential role in the function of the neurotransmitters acetylcholine and serotonin (i.e. making receptors more sensitive to serotonin). Among other things, these chemical messengers are required for proper cognitive function, memory, mental clarity, mood stabilisation and nerve and muscular activity. For example, studies have confirmed the effectiveness of high-dose inositol supplementation in the treatment of depression. Presumably due to its positive influence on serotonin activity, research has also shown high-dose inositol (12 grams per day for one month) to reduce severity and frequency of panic attacks, and to reduce symptoms of obsessive-compulsive disorder (18 grams per day for 6 weeks).

C) NERVOUS SYSTEM HEALTH

Inositol is also a component of the membranes of nerve cells. This fact, plus its influence on neurotransmitters accounts for much of its requirement in maintaining a healthy nervous system. In fact, the loss of nerve function in cases of diabetic neuropathy has been linked to depleted inositol levels in the nervous system cells. Inositol supplementation appears to enhance the conduction of nerve signals in diabetics.

Potential Applications

- Liver and gall bladder support
- Panic attacks
- Anxiety-related disorder
- Obsessive-compulsive disorder (OCD)
- Depression
- Diabetic neuropathy
- General mental function

Typical Supplemental Dosage Range

- 50-500mg per day

Common Food Sources

- Citrus fruit (except lemons)
- Cantaloupe
- Meat
- Liver
- Brewer's yeast
- Whole wheat
- Nuts
- Beans
- Seeds

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- If taking anxiolytic (anti-anxiety) or tranquilising drugs, high-dose inositol should only be used under medical supervision (as it may compound the drugs' effect).

Iodine

A) THYROID FUNCTION

Iodine is combined with the amino acid tyrosine in order to manufacture active thyroid hormone. In fact, this is the primary function of iodine in the body. Although iodine's activity is essentially linked to thyroid function, a deficiency in this mineral can lead to a wide range of symptoms and disorders. This is due to the fact that thyroid hormones either directly or indirectly impact on so many aspects of human biochemistry and physiology, such as cellular metabolism, body temperature, growth and development, reproductive function, breast health, hair and skin health, etc. A lack of dietary iodine may lead to goiter, which manifests as an enlargement of the

thyroid, with the associated swelling at the base of the neck. The utilisation of iodine in thyroid function can be impaired by foods known as goitrogens (i.e. cabbage, cauliflower, Brussels sprouts, soybeans, cassava, peanuts, millet, turnips, kale, pine nuts, spinach, mustard seed, rutabagas, pears and peaches). It appears that the goitrogenic activity of these foods is usually deactivated by cooking them.

Please note: While deficient iodine can reduce thyroid hormone activity, very high iodine intake (i.e. more than 750-1 000ug per day) may actually reduce thyroid hormone synthesis and secretion (see Contraindications/Cautions below).

A) WEIGHT CONTROL

Although thyroid hormone activity impacts on so many aspects of health, its primary role is controlling the rate of cellular metabolism. The basal metabolic rate not only influences the production of energy within cells, but also reflects the rate at which fats are burned to produce energy. As a result, basal metabolic rate - and thus, thyroid function - is a critical issue with respect to body fat concentrations. Not surprisingly, those with an under-active thyroid (hypothyroidism) will be more prone to obesity. Iodine supplementation, in and of itself, will not necessarily treat obesity or increase the rate of fat metabolism; however if one is iodine deficient, supplementation may allow for more efficient thyroid function (and thus, more efficient fat metabolism).

B) GROWTH AND DEVELOPMENT

Iodine's relationship with cellular metabolism is ultimately influential to not only tissue growth, also one's overall biochemical and physiological function. Iodine also influences cellular differentiation and the synthesis of proteins. All these aspects are critical to normal, healthy growth and development. As such, ensuring proper iodine status is very important in babies and children, as well as during pregnancy.

C) BREAST HEALTH

Research indicates that iodine supplementation can be an effective tool in the treatment of fibrocystic breast disease (FBD), which manifests as benign cysts which cause pain and swelling in the breasts. Scientists have postulated that a lack of iodine in breast tissue may make the breast cells more sensitive to the hormone oestrogen, which in turn, triggers the cystic growth

Please note: The dosages of iodine used in these successful FBD clinical trials were far in excess of amounts that are suitable unless under the care of a physician; however lower doses which ensure adequate iodine status may still be of value in maintaining breast health.

Potential Applications

- Hypothyroidism (under-active thyroid)
- Growth and development
- Weight control (if hypothyroid)
- Fibrocystic breast disease
- Hyperthyroidism (over-active thyroid) [when used in very high doses]

Please note: very high doses of iodine should only be used for hyperthyroidism on the advice and under the strict monitoring of a physician (see Contraindications/Cautions below)

Typical Supplemental Dosage Range

150-500ug per day

Common Food Sources

Iodised salt

Seaweed (especially kelp and dulse)

Cod

Haddock

Shellfish

Garlic

Asparagus

Lima beans

Mushrooms

Soybeans

Spinach

Contraindications/Drug Interactions

- In general, daily doses exceeding 1500ug (1.5 milligrams) are not recommended unless under the strict monitoring of a physician; doses exceeding 1000ug per day are not recommended unless on the advice of a physician or qualified healthcare practitioner; people with hypothyroidism should not exceed 750ug of iodine per day unless under the supervision of a physician. Research indicates that intake of iodine in excess of 1500ug per day may actually *reduce* thyroid hormone activity. It is thought that in people with hypothyroidism, reduced thyroid activity may occur in rare instances with daily doses as low as 750ug.
- High doses of iodine may cause a skin reaction resembling acne.
- Evidence of interactions with any medication appears to be lacking for doses below 600ug per day. However, in those who take thyroid hormone medication, administration of high doses of iodine is not recommended unless on the advice and under the strict monitoring of a physician.
- High doses of iodine are not recommended in patients taking lithium carbonate, unless on the advice and under the strict monitoring of a physician.

Iodine

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Iron

A) BLOOD BUILDING

Iron is the main component needed for the manufacture of haemoglobin, the pigment accounting for the colour of red blood cells. Haemoglobin is comprised of an iron compound combined with a protein, and is the means by which oxygen is transported through the body. A lack of dietary iron leads to iron deficiency anaemia, a problem that is especially common in young women, pregnant women, elderly people (often due to poor absorption), those on low income and in children who are vegan or vegetarian or who eat a poor diet. The need for iron in blood building can vary in the same person depending on special circumstances. For example, women may lose 25-30mg of iron during menstruation, while during pregnancy as much as 1000mg of iron may be provided by the mother in order to support the needs of the foetus. It is interesting to note that the "pool" of available iron in the body of women of childbearing age may be an average of 60-80% less than in men. Nutrients such as vitamin B12, folic acid, vitamin C, copper and molybdenum facilitate the utilisation and function of iron as a blood builder.

B) UTILISATION OF OXYGEN

In addition to facilitating the transport of oxygen through the bloodstream through its influence on haemoglobin, iron is also a component of myoglobin, a pigment which functions in the muscles in a similar manner as haemoglobin does in the blood (i.e. myoglobin allows the muscle cells to retain oxygen).

C) ESSENTIAL COENZYME

Iron is also an essential constituent of many enzymes required for proper health. Among other functions, iron-dependent enzymes influence energy utilisation and metabolism and the synthesis of collagen, brain neurotransmitters and DNA. Many symptoms of iron deficiency anaemia (such as fatigue, weakness and apathy) are

associated not only with cellular oxygen depletion (and the commensurate reduction in cellular energy output), but also the reduced energy production and metabolism due to enzyme deficiencies. It is important to note that iron deficiency anaemia is considered to be the final stage of iron deficiency. Prior to this occurring, there can be considerable biochemical and physiological disruption caused by depleted brain neurotransmitters and a reduction in the enzymes involved in metabolism, energy manufacture and antioxidant systems.

Potential Applications

- Iron deficiency anaemia
- Fatigue (if iron deficient)
- Weakness (if iron deficient)
- "Restless legs" syndrome
- Pregnancy
- Heavy periods
- Excessive loss of blood (i.e. menstruation, peptic ulcers, ulcerative colitis / Crohn's Disease)

Typical Supplemental Dosage Range

10-25mg per day

Common Food Sources

- Liver
- Red meat
- Blackstrap molasses
- Raisins
- Prunes
- Pumpkin seeds
- Almonds
- Cashews
- Legumes

Contraindications/Drug Interactions

CAUTION

With iron supplements there is a danger of a dangerous accidental overdose - as with copper, iron supplements should be kept out of the reach of children. Accidental ingestion of as little as 50 tablets at one time may cause death in small children.

- Symptoms of severe iron poisoning include intestinal tract damage, liver failure, nausea, vomiting and shock. Especially in small children, acute iron poisoning can be lethal.
- It has been reported that regular use of excessive doses may increase the susceptibility to infections and cancer.
- Individuals suffering with haemochromatosis, chronic kidney failure or Hodgkin's Disease should not take iron supplements unless on the advice and under the strict monitoring of a physician.
- Many experts have expressed concerns that elevated blood levels of free (unbound) iron may increase the likelihood of developing cardiovascular disease. It is worth noting that there has yet to be a proven relationship between iron supplementation and an increased risk of cardiovascular disease. However, it is recommended that those who are at higher risk of heart disease should avoid high iron intakes unless on the advice and under the monitoring of a physician. Free (unbound) iron may trigger free radical-induced oxidative damage to cholesterol in the bloodstream, which would ultimately cause atherosclerotic damage to the arteries.

Please note: This type of free radical oxidation can be inhibited by antioxidant nutrients such as vitamins E and C, while bioflavonoids may be of value in protecting the connective tissue of the arteries from oxidative damage.

- Iron supplements may cause constipation, diarrhoea, nausea or irritation to the stomach. Such gastrointestinal symptoms are common with iron administration even when doses are not high, especially when taken in the inorganic form (i.e. ferrous sulfate). In most cases, such problems can be avoided by taking iron in the bisglycinate form. The absorption of iron bisglycinate is also superior to ferrous

sulfate.

- Iron supplements are not recommended in patients taking the drugs allopurinol, penicillamine, warfarin, fluoroquinolone antibiotics or tetracycline, unless on the advice and under the strict monitoring of a physician.

Please note: Due to the above issues, many experts advocate iron supplements only during menstruation, pregnancy and lactation and in cases of diagnosed iron deficiency.

Iron

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Isoflavones

A) OESTROGEN REGULATING

In order for oestrogen to effect the body, it must enter the cells by binding to certain receptors. Some research has shown that phytoestrogens have the ability to attach to oestrogen's receptors and by binding to these receptors, phytoestrogens can block some of the human oestrogen circulating in the body from getting into cells. As soy isoflavones are phytoestrogens with an oestrogenic activity which is typically only 1/1000th or less than that of human oestrogen, this blocking would therefore lower the total oestrogen and may help to reduce the side effects or toxicity of excessive oestrogen levels on the body. However, it may also be of benefit where there is insufficient oestrogen, as in the menopause, because it would provide some oestrogenic activity in otherwise empty receptors.

B) CARDIOVASCULAR BENEFITS

Genistein and daidzein may help prevent cardiovascular disease in various ways, including:

- reducing free radical oxidation of cholesterol
- reducing platelet aggregation
- reducing plaque formation
- reducing adherence of plaque to artery walls
- lowering cholesterol levels

C) CELL PROTECTION

Soy isoflavones such as genistein appear to possess many mechanisms which may inhibit cell damage including:

- helping to inhibit an enzyme that would otherwise stimulate abnormal growth of cells
- aiding in reverting certain damaged cells back into normal cells
- antioxidant activity
- helping to inhibit oestrogen-dependant cell damage through blocking excessive oestrogenic activity

Potential health applications of Isoflavones

- female hormonal imbalance (e.g. premenstrual tension, menopausal symptoms)

- osteoporosis via oestrogenic activity
- prevention of cardiovascular disorders
- cholesterol lowering
- cell protection

Contraindications/Drug Interactions

Extremely high doses are probably best avoided in those with under-active thyroid.

Isoflavones

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Vitamin K

A) BLOOD CLOTTING

Vitamin K is required for normal blood clotting (its name is derived from the German word 'koagulation'). It is essential to the formation in the liver of prothrombin, which converts into thrombin thereby initiating blood coagulation and the conversion of fibrinogen into fibrin (the primary protein in blood clots). Vitamin K is also needed to manufacture other blood clotting compounds - Factor VII, Factor IX and Factor X. These clotting compounds are dependent on vitamin K's role in the production of carboxyglutamate residues. The so-called 'coagulation cascade' associated with these and several other clotting factors is needed not only to coagulate and clot blood, but also to form a 'scab' at sites of tissue injury to prevent excessive blood loss. Due to its wide dietary availability and synthesis by intestinal bacteria, vitamin K deficiency is not common in adults. However, new-born babies are prone to low prothrombin levels due to poor placental transmission of fats and lack of digestive bacteria. As a result, in order to prevent haemorrhage it is not uncommon for expectant mothers to be prescribed vitamin K (as K1) for several days before delivering and for babies to be given vitamin K (as K1) for a short time, i.e. in periodic doses over a 1-3 month period after delivery.

Please note: Vitamin K should only be administered to new-born babies under the care of a physician, and only in the form of K1 (see contraindications).

B) BONE HEALTH

Scientists have discovered that vitamin K-dependent carboxyglutamate residues are also needed to activate the protein osteocalcin, which is essential to bone formation. Osteocalcin facilitates the binding of calcium to the bone matrix. Without adequate vitamin K, osteocalcin remains inactive and cannot bind calcium, thus leading to defective bone mineralisation and an increased risk of osteoporotic fractures. In fact, various studies have revealed that; a) vitamin K supplementation appears to reduce the urinary excretion of calcium in postmenopausal women; b) blood levels of vitamin K tend to be lower in osteoporotic patients; and c) lower blood levels of vitamin K are associated with an increased risk of fractures in osteoporotic patients. Based on these studies, an increased intake appears to be warranted, especially in post-menopausal women and those who already have been diagnosed with (or have a high risk of) osteoporosis. As the richest dietary sources of vitamin K are not liberally consumed within the typical western diet, supplementation may be warranted in those at greatest risk of weak bone density.

C) CARDIOVASCULAR HEALTH

In studies, Vitamin K2 has been correlated with a reduction in coronary heart disease. In fact, one significant study conducted in the Netherlands, followed 4800 healthy men and women for ten years. It found supplemental vitamin K2 reduced the risk of coronary heart disease mortality by 50%. Furthermore, aortic calcification was

reduced by 30-40%. Osteoregulatory proteins are involved in the calcification process in blood vessels, and one of the strongest inhibitors of these proteins is matrix Gla protein (MGP), which directly inhibits the formation of calcium crystals. However, MGP is only effective in the presence of vitamin K2.

Additional research concluded that vitamin K1 did not have these effects as it immediately gets taken away into the liver. Vitamin K2, however, remains circulating in the blood, making it available to the vessels.

Potential Applications of vitamin K

- General bone health
- Osteoporosis
- Cardiovascular health (K2)
- Excessive bleeding due to poor scab formation
- Excessive menstrual bleeding (menorrhagia)
- Preventing haemorrhage in new-borns

Typical Supplemental Dosage Range

- 100-500ug per day vitamin K1
- 45-100ug per day - vitamin K2

Common Food Sources

- Dark green leafy vegetables •
- Green tea •
- Greens •
- Broccoli •
- Spinach
- Egg yolks
- Cabbage
- Lettuce
- Liver

Contraindications/Drug Interactions

- Vitamin K1 is not associated with toxicity at supplemental dosages.
- In new-born babies, vitamin K2 supplementation is associated with haemolytic anaemia (due to accelerated breakdown of red blood cells) and liver toxicity, while K4 supplementation is associated with haemolytic anaemia and transport of bile pigment into the brain. *Please note: Vitamin K3 can convert into K2 in the intestines.*
- In pregnancy or lactation vitamin K supplementation (all forms) should only be used under medical supervision.
- Vitamin K (all forms) supplementation should only be used under strict medical supervision if taking anticoagulant drugs (e.g. warfarin, heparin, aspirin, etc), as this nutrient may counteract the drugs' effect. Vitamin K may also counteract the anti-coagulant effects of certain nutrients and herbs (e.g. high-dose vitamin E, omega 3 fats, garlic, etc).
- Unless under strict medical supervision, vitamin K supplementation (all forms) should not be taken with the anti-malarial/anti-protozoal drug primaquine, as this nutrient may increase the drug's toxic side effects.

Lecithin/Phosphatidylcholine

Lecithin provides a natural source of polyunsaturates including essential fatty acids, choline and inositol in their highly absorbable 'phospholipid' forms and other vitamins, minerals and nutritional factors.

Phosphatidylcholine is a biologically active source of choline found in lecithin (a more concentrated form, often described as triple strength lecithin).

A) BRAIN FUNCTION AND NERVOUS SYSTEM

Around 30% of the brain is composed of lecithin, as well as more than 60% of the protective sheaths surrounding the brain, spine and nerves. It is needed (with B5) in order for the body to manufacture acetylcholine, a vital neurotransmitter for brain

function, which can be deficient in neurological disorders such as short term memory loss, Alzheimer's, Bipolar depression and Myasthenia Gravis.

B) CHOLESTEROL

Lecithin forms part of the lipoproteins, which are cholesterol-carrying vehicles in our blood. These vehicles keep cholesterol and triglyceride fats in solution in the blood stream, enabling them to be distributed more efficiently and keeping cholesterol from sticking to arterial linings. Lecithin has been shown to lower cholesterol levels and protect cholesterol from oxidation, as well as helping to prevent gall and kidney stones from forming.

C) LIVER SUPPORT

As well as helping fat metabolism in the liver, lecithin is necessary in the detoxification functions. Phosphatidylcholine has been shown to protect against alcohol-induced liver disease, in addition to being beneficial in liver problems such as hepatitis and cirrhosis.

D) SPORTS ENDURANCE

Studies show that endurance events lower blood levels of choline because of the increased nerve to muscle signalling necessary for prolonged activity. Supplementing with choline or lecithin has been found to prevent the decline and often improves performance (short-duration activities do not usually lower blood choline levels)

Potential health applications of Lecithin

- acetyl choline deficiency eg.: Alzheimers, Bipolar depression, Tardive Dyskinesia, Huntingtons Chorea, Friedrich's ataxia, Olivoponto-Cerebellus atrophy, Myasthenia gravis
- cholesterol control
- liver support eg. alcoholism, hepatitis, cirrhosis, detoxification, fat metabolism
- increased sports endurance
- improving brain function

Contraindications/Drug Interactions

None noted

Lecithin/Phosphatidylchoine

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Licorice Root

glycyrrhiza glabra

A) ANTI-ULCER

The deglycyrrhised form of licorice (DGL) is clinically proven to treat ulcers in the upper digestive tract, due to its ability to stimulate the normal defence mechanisms that prevent ulcer formation. DGL improves the integrity of the mucosal surfaces of the intestinal tract, increasing the life span of intestinal cells and improving the blood supply to the intestinal mucosa.

A) ANTI-INFLAMMATORY

The well-established anti-inflammatory activity is due to a 'cortisol-like' effect as well as an inhibition of phospholipase A₂, which is responsible for the manufacture of inflammatory prostaglandins and leukotrienes.

B) FEMALE HORMONAL TONIC

Licorice contains phytoestrogenic components, which are frequently employed to modify oestrogenic activity in the body due to their weak activity compared to human oestrogen and to their ability to bind to oestrogen receptors in cells. If the levels of

oestrogen are too high, the herb's comparatively weak phytoestrogens can occupy receptors that otherwise could have been occupied by the much stronger hormone. If the oestrogenic activity in the body is too low, phytoestrogens can exert a mild positive oestrogenic effect. Research also suggests that licorice root may enhance progesterone activity by slowing its destruction in the liver.

C) ADRENAL TONIC

Licorice use as a treatment for 'adrenal exhaustion' is warranted due to the evidence that it counteracts the effects of adrenal hormone insufficiency. Interestingly (especially considering its cortisol-like effects), licorice root also been shown to counteract some of the side effects of long term use of corticosteroid drugs.

D) ANTI-VIRAL

Active compounds in licorice (glycyrrhizin and glycyrrhetic acid) enhance interferon activity, the body's natural anti-viral compound. Licorice has shown an inhibitory effect on viruses associated with common colds, influenza, chronic fatigue syndrome (ME) and herpes infections.

E) DETOXIFICATION

Scientific evidence has shown liver-supportive attributes that may justify the herb's traditional use in Chinese medicine as powerful detoxifier.

F) ANTI-ALLERGIC

The cortisol-like effect and the inhibition of certain prostaglandins and histamine activity add up to a substantial anti-allergic potential.

Potential Applications of Licorice Root:

- ulcers (stomach and duodenal)
- female hormone imbalance (e.g. premenstrual tension)
- chronic fatigue syndrome (ME)
- common cold and influenza
- herpes infections
- arthritis
- allergies
- adrenal exhaustion
- liver toxicity

Principle actives:

Glycyrrhizin (glycyrrhisic acid) [except when deglycyrrhised], glycyrrhetic acid flavonoids, isoflavones

Contraindications/Drug Interactions:

Chronic high dose usage of non-deglycyrrhised licorice may cause an accelerated excretion of potassium and retention of sodium, and thus should be avoided if suffering with high blood pressure or oedema unless under medical supervision. An increase in the intake of potassium-rich foods is recommended if using nondeglycyrrhised licorice regularly.

Caution with non-deglycyrrhised licorice alongside anti-arrhythmics, antihypertensives, cardiac glycosides, corticosteroids, diuretics - check with doctor.

Licorice

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Lipotropic Factors

There are several lipotropic agents including choline, inositol, betaine (TMG), methionine and dandelion.

A commonly employed combination is choline, inositol and methionine.

A) FAT, CARBOHYDRATE AND PROTEIN METABOLISM

Lipotropic factors are substances that help to speed the removal of, or decrease the deposit of, fat in the liver. They are also involved in carbohydrate and protein metabolism.

B) WEIGHT LOSS

Helping to make the liver more efficient in fat metabolism can act as an aid to weight loss, although adjustment of diet and exercise are the most important factors.

C) CHOLESTEROL

As part of a programme, lipotropic factors can be complimentary in lowering cholesterol, due to improving the efficiency of the liver.

D) BILE PRODUCTION

Lipotropic factors, particularly choline, help to promote the production of bile, which acts as an emulsifier (allowing water and lipids to combine) in order to more readily transport fats.

E) LIVER SUPPORT

By helping to reduce fat deposits in the liver, lipotropic agents make the liver more efficient and able to cope more easily.

F) DETOXIFICATION

The liver removes bacteria, endotoxins, antibody complexes and various other particles from the circulation and needs lipotropic agents to achieve this. Trials have also demonstrated a detoxification effect on alcohol and paracetamol.

Potential health applications of Lipotropic Factors

- fat metabolism
- cholesterol lowering
- weight loss
- digestion of fats
- detoxification
- liver support
- gallstones

Contraindications/Drug Interactions

None noted

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L-Lysine

A) HERPES PREVENTION AND TREATMENT

Studies show lysine supplementation to speed recovery from, and prevent recurrence of, herpes infection. Benefits appear to be primarily due to the ability of lysine to antagonise arginine, which otherwise promotes herpes growth, but lysine may also have direct anti-viral properties. In one study patients given up to 1200mg per day of lysine reported accelerated recovery from herpes simplex infection and fewer recurrences. Other studies suggest that a lower daily dose, even as little as 100mg per day, may help to prevent recurrence of herpes simplex. It appears that the best preventative results may be obtained when lysine is combined with vitamin C, zinc, and a diet that promotes an increase in the lysine to arginine ratio. Although research has primarily focused on herpes simplex, it is likely to be of value in other forms of herpes, such as shingles (herpes zoster).

B) CARDIOVASCULAR PROTECTANT

The formation of lesions in the arteries can lead to atherosclerosis, a precursor to heart disease. Lysine has been reported to strengthen the integrity of the tissue in the artery

walls, a process that may inhibit the formation of arterial lesions and/or speed their healing. Lysine is also a precursor of carnitine, a potent cardiovascular tonic.

C) BONE HEALTH

A deficiency of lysine may be a factor in the loss of calcium from bones in the development of osteoporosis. Preliminary evidence suggests that lysine deficiency is associated with increased excretion of calcium in the urine. Additional lysine may therefore be of value in those at risk of osteoporosis such as menopausal women and the elderly, although further research is needed to confirm these findings.

D) LEAD DETOXIFICATION

Lysine has been shown to bond to the heavy metal lead, effectively reducing its toxicity and aiding its removal from the body.

Potential Applications of L-lysine:

- Cold sores • Osteoporosis
- Shingles • Atherosclerosis
- Genital herpes

Typical intake range:

500-4000 mg per day (taken on an empty stomach)

Food Sources:

Fish, chicken, beef, lamb, milk, cheese, beans, brewers yeast, eggs, potatoes

Contraindications/Drug Interactions:

- No drug interactions noted.
- Should not be taken for longer than 6 months as may cause arginine imbalance
- People with allergies to eggs, dairy or wheat should not take lysine

L-Lysine

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Magnesium

A) SKELETAL HEALTH AND CALCIUM REGULATION

Bone tissue contains approximately 60% of the magnesium found in the body. One of the properties of magnesium within the skeletal structure is to help regulate calcium within the bones and teeth. For example, magnesium is needed in order for calcium to be bound to tooth enamel. In addition to an influence on the hormonal processes involved in bone calcium metabolism, magnesium may increase the activity of vitamin D (which, among other things, aids calcium absorption). Although calcium is the most abundant skeletal mineral and the best-known nutrient for maintaining bone density, in recent years the focus on the role of magnesium in bone health has increased considerably. In fact, many experts now feel that magnesium intake is at least as critical to skeletal health as calcium. Research indicates that osteoporotic women have less bone magnesium and that magnesium intake is a significant statistical predictor of bone mineral content.

B) REGULATION OF CALCIUM DEPOSITION

The influence of magnesium on calcium metabolism and regulation may also be useful in preventing abnormal calcium deposition in soft tissues such as the kidneys. For example, in a study of 55 patients with recurrent kidney stones, less than 15% of those taking magnesium formed new stones over a 2-4 year treatment period (compared to 59% in the control group). In the treatment group, there was also a 90% reduction in the average rate of stone development compared with the period prior to treatment. From the standpoint of public health, reducing calcium deposition in the arteries would be especially significant, as arterial calcification can be a major factor in the development of atherosclerosis (and thus, heart disease) [see **CARDIOVASCULAR HEALTH AND FUNCTION** below].

C) MUSCULAR HEALTH AND FUNCTION

Like calcium, magnesium is essential for the proper function of muscles. In particular, magnesium is needed for the relaxation phase of muscle function, while the mineral calcium facilitates the contraction phase. Magnesium's action as a muscle relaxant to a great extent relates to its ability to block smooth muscle uptake of calcium.

Magnesium also affects muscular function through its influence on neurotransmitters, the chemical messengers of the nervous system. The properties of this mineral not only maintain normal function, but can also be preventive and/or therapeutic in the case of muscle dysfunction. For example, in a study on pregnant women suffering with muscle cramps, 90% were symptom-free after one month of magnesium supplementation (as opposed to 33% of the control group). Especially important is the influence of magnesium on the smooth muscle tissue of the vascular system, which has many clinically proven benefits in cardiovascular health (see **CARDIOVASCULAR HEALTH AND FUNCTION** below).

D) ENERGY PRODUCTION, GLUCOSE METABOLISM AND ENZYME FUNCTION

Magnesium is an essential coenzyme within many enzyme systems, and is involved in hundreds of catalytic reactions within the body. It is particularly critical to energy production, and not surprisingly, magnesium deficiency is a common feature in general fatigue and fatigue-related disorders such as ME (myalgic encephalomyelitis or chronic fatigue syndrome). Magnesium supplementation is clinically proven to significantly improve fatigue symptoms in ME sufferers; the fact that this research administered the mineral as an intramuscular injection does not rule out a potential value to oral supplementation in fatigue-related disorders.

Magnesium is also critical to the metabolism of carbohydrates, and is needed for the both the synthesis and secretion of the hormone insulin (which facilitates the cellular metabolism of glucose in the blood). More often than not, diabetics are deficient in magnesium. There is strong justification to magnesium supplementation in diabetes, not only because it may improve glucose tolerance, but also because it may reduce the risk of developing diabetic complications such as cardiovascular disease and retinopathy. As a coenzyme, magnesium is also needed for DNA replication within cells.

E) CARDIOVASCULAR AND CEREBROVASCULAR HEALTH AND FUNCTION

Several studies highlight the importance of magnesium in the prevention and/or treatment of numerous heart and vascular disorders. Magnesium deficiency is a common feature of conditions such as arrhythmias (abnormal heart rhythm), high blood pressure, congestive heart failure, mitral valve prolapse and peripheral vascular disease. For example, a 1990 study compared survival rates of patients with congestive heart failure patients based on their magnesium status. The one-year survival rates in those with low magnesium levels were 37% lower than those with normal magnesium status. After two years, survival rates were 32% lower in the low magnesium group. Evidence suggests that supplementation can also be preventive and/or therapeutic; examples of conditions where this is the case include high blood pressure, cardiomyopathy, angina, arrhythmia, congestive heart failure, mitral valve prolapse, peripheral vascular disease and heart attack. Many of the benefits of magnesium in cardiovascular disease relate to its role in vascular smooth muscle function.

Magnesium facilitates the relaxation phase of vascular muscle function, at least in part by blocking the smooth muscle uptake of calcium (calcium facilitates the contraction of smooth muscle). This action bears a strong resemblance to the antihypertensive calcium channel-blocking drugs, which helps explain one of the more significant ways by which magnesium can help lower blood pressure. Magnesium also helps (along with calcium and potassium) to reduce sodium build-up within cells that could otherwise elevate blood pressure. The accumulation of atherosclerotic plaque is a primary trigger for heart disease, due to the associated reduction of blood flow through the arteries. Through relaxation of the arterial smooth muscle, magnesium

facilitates dilation of the arteries, allowing a greater blood flow and reduced pressure on the artery walls. The ability of magnesium to reduce excessive blood clotting, calcification of the blood vessels and cholesterol levels should also discourage the accumulation of atherosclerotic plaque. Through its enzymatic influence (see ENERGY METABOLISM AND ENZYME FUNCTION below) magnesium increases the production of energy within the heart muscle, thus contributing to the strength of the heart and its ability to pump blood throughout the body.

F) HORMONAL HEALTH

Research confirms that magnesium deficiency can severely impair hormone balance in women, and is undoubtedly a causal factor in many cases of premenstrual tension (PMT). The issue of magnesium status in PMT has been the source of controversy; studies suggest that there is no clear association between low blood plasma levels of magnesium and incidence of PMT, however sufferers of PMT have significantly lower levels of magnesium in red and mononuclear blood cells. Unfortunately, most clinicians who test for nutritional deficiencies in their PMT patients are more likely to carry out plasma testing, and thus may be misled into assuming that magnesium supplementation is not relevant to such patients. The truth is that magnesium supplementation is dramatically effective in relieving numerous symptoms of PMT. For example, a 1984 study demonstrated that supplementation reduced PMT-related breast irritation in 96% of the women, weight gain in 95% and nervous tension in 89%.

Other research highlights a reduction in premenstrual mood swings. Although there are several biochemical influences of magnesium that may account for such benefits, its effect on adrenal hormones is particularly significant. For instance, a high level of magnesium is associated with a lower level of aldosterone, an adrenal hormone which causes sodium and fluid retention and is linked to premenstrual weight gain and breast pain. Magnesium may also help regulate the activity of stress hormones that otherwise can deplete mood-elevating neurotransmitters in the brain.

G) NERVE HEALTH AND FUNCTION

Magnesium works in tandem with calcium to ensure proper nerve impulse transmission, in part through an influence on neurotransmitters (chemical messengers of the nervous system). A lack of dietary magnesium is associated with latent tetany, a condition manifesting in muscle spasms, twitches or tremors due to hypersensitive nerves. Magnesium deficiency is also associated with lactic acid build-up, leading to an imbalance in the ratio between lactic acid and pyruvic acid. A high lactate to pyruvate ratio is linked to anxiety-related disorder.

H) ANTI-STRESS

Magnesium is required for adrenal health and synthesis of adrenal stress hormones. In this manner, it works along with nutrients such as pantothenic acid, vitamin C, B6 and zinc. Also, magnesium's above-mentioned effects on nerve and muscular function beneficially influence disorders and symptoms often associated with stress response (i.e. anxiety, nervous tension, muscle spasms/ twitches, hypertension, etc.).

I) PAIN RELIEF

Magnesium supplementation has been shown to improve certain pain-related disorders such as migraine and tension headaches and fibromyalgia (which manifests with symptoms such as joint and muscle aches and pains). In the case of migraines, most of the benefit from magnesium appears to be linked to its role in vascular muscle function, nerve-relaxation and proper mitral valve function. The heart's mitral valve prevents backflow or leakage of oxygenated blood within the heart, and a prolapse of this valve leads to abnormalities in the pumping of blood as well as causing the release of compounds that precipitate and expansion of the cranial blood vessels. Migraines may be triggered by this vascular expansion; in fact, research suggests that there is twice the rate of mitral valve prolapse in migraine sufferers compared to non-sufferers. Chronic magnesium deficiency exists in 85% of those with mitral valve prolapse, and

not surprisingly, migraine sufferers typically have lower blood magnesium levels than non-sufferers.

Potential Applications

- Cardiovascular health (general)
- High blood pressure
- Angina
- Heart arrhythmia
- Congestive heart failure
- Acute myocardial infarction (heart attack)
- Cardiomyopathy
- Peripheral vascular disease (i.e. intermittent claudication)
- Cerebrovascular disease (i.e. stroke)
- Mitral valve prolapse
- Migraine headaches
- Fibromyalgia
- Skeletal health (general)
- Osteoporosis (in combination with calcium)
- Muscular health and function (general)
- Muscle stiffness, cramps, spasms, twitches or tremors
- Premenstrual tension (PMT)
- Menstrual cramps and period pain
- Asthma / bronchial constriction
- Kidney stones
- Fatigue
- ME (myalgic encephalomyelitis / chronic fatigue syndrome)
- Poor stress tolerance
- Diabetes
- Nerve health and function (general)
- Anxiety

Typical Supplemental Dosage Range

200-800mg per day

Common Food Sources

- Brown seaweed (kelp, dulse)
- Nuts
- Buckwheat
- Whole wheat
- Millet
- Rye
- Brown rice
- Soybeans
- Avocados
- Sweet corn
- Dried figs
- Dates
- Shrimp

Contraindications/Drug Interactions

- Moderate to high doses of magnesium may cause loose stools, especially if taken in the form of Epsom salts, magnesium chloride or magnesium hydroxide.
- Patients with atrioventricular blockage or other severe forms of heart disease should not take magnesium supplements unless on the advice and under the strict monitoring of a physician.
- Patients with kidney disease should not take magnesium supplements unless on the advice and under the strict monitoring of a physician.
- Patients taking drugs for cardiovascular disease or heart defects should not take magnesium supplements unless on the advice and under the strict monitoring of a physician.
- Patients taking the drugs warfarin or tetracycline should not take magnesium

supplements unless on the advice and under the strict monitoring of a physician.

- Because very high intakes of magnesium can reduce the absorption of calcium (and vice versa), it is normally recommended that these minerals should be taken together when used in higher amounts (unless otherwise directed by a qualified healthcare practitioner).

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Manganese

A) CONNECTIVE TISSUE HEALTH AND REPAIR

Manganese is essential to the development and maintenance of connective tissue structures (i.e. within the joints, bones, blood vessels, skin, intestines, etc.). In this respect, manganese facilitates the synthesis of both collagen and mucopolysaccharides, the two primary structural components of all connective tissue. Manganese is also involved in the proper development of the hard structures of the inner ear that are responsible for maintaining balance/equilibrium.

A) ANTIOXIDANT ACTIVITY

As with copper and zinc, manganese is an essential mineral component of the enzyme superoxide dismutase (SOD). SOD is one of the most powerful substances manufactured by the body for the purpose of protecting cells. The protective mechanism of SOD relates to its function as an antioxidant which neutralises superoxide free radicals. Although many parts of the body are adversely affected by superoxide radicals, they are particularly associated with tissue damage within the joints (i.e. arthritis) and eyes (i.e. cataracts). Interestingly, scientists have demonstrated a strong statistical association in mammalian species between tissue SOD levels and life expectancy.

B) JOINT HEALTH

Manganese plays a significant role in joint integrity (including within the vertebral

discs), in part due to its involvement in cartilage and bone growth and stability. Also important to joint health is the antioxidant activity of the manganese-dependent enzyme superoxide dismutase (SOD). As mentioned above, the joint tissue is especially susceptible to superoxide radicals - an interaction which precipitates tissue damage and inflammation. SOD injections are clinically proven to be effective in inflammation, such as that which occurs in rheumatoid arthritis; although studies on the effect of oral intake of manganese in arthritis are currently lacking, supplementation appears to be warranted in arthritic and related inflammatory disorders such as strains and sprains.

C) GLUCOSE METABOLISM AND ENZYME FUNCTION

As an essential coenzyme (non-protein portion of an enzyme), manganese is a component of various enzymes that catalyse the metabolism and utilisation of glucose. This property is critical in the maintenance of blood sugar control; in fact, a 1987 study published in the *American Journal of Clinical Nutrition* reported that the manganese levels in non-diabetics is approximately double that of diabetics. The influence of manganese on glucose metabolism is also crucial to the fuelling and proper function of cells within the brain and nervous system. The adverse neurological implications* of manganese deficiency have been mainly demonstrated in relation to epilepsy, where research suggests that the lower the level of manganese, the higher the rate of seizure activity. Manganese also influences the activity of enzymes that, among other functions, are needed for the synthesis of protein, fatty acids and cholesterol.

Potential Applications

- Arthritis
- Sprains
- Strains
- RSI (repetitive strain injury)
- Tendonitis
- Cataract prevention
- Diabetes
- Epilepsy

Typical Supplemental Dosage Range

- 2-5mg per day

Common Food Sources

- Meat
- Nuts
- Legumes
- Beans
- Pineapple
- Raspberries
- Barley
- Rye
- Whole wheat
- Oats
- Buckwheat
- Spinach

Contraindications/Drug Interactions

- Although standard doses of manganese found in supplements are unlikely to cause side effects or toxicity, very high levels of exposure (usually from environmental or occupational exposure) can lead to many symptoms of manganese toxicity, such as symptoms resembling Parkinson's Disease and Wilson's Disease, irritability, depression, insomnia, hallucinations, delusions, violent acts, defects in motor function, loss of appetite, impotence, weakness, difficult breathing and leg cramps.
- Patients suffering from Parkinson's Disease or Wilson's Disease should only take manganese on the advice and under the strict monitoring of a physician.
- High intakes of manganese may interfere with the absorption of iron, zinc and

copper. If suffering with iron-deficiency anaemia, it is advisable to consult a qualified healthcare practitioner before taking a manganese supplement.

Manganese

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MCT's

(Medium Chain Triglycerides)

MCT's include caprylic, capric, caproic and lauric acids that vary in chain length from 6 to 12 carbons long. In other words they are a medium length fatty acid. MCT's are metabolised easily into energy and generally yield between 7 and 9 calories per gram.

A) MALABSORPTION

The unique properties of MCT's make them the ideal source of fat for those suffering with chronic illnesses where digestion and absorption may be compromised. MCT's require only small amounts of digestive enzymes and bile to facilitate their breakdown and absorption. MCT's are metabolised in the liver to produce energy making them potentially helpful to those with restricted calorie intake or fat digestion problems, as is often the case in chronic illness. A double-blind placebo-controlled study on 24 men and women with AIDS suggests that MCT's can help improve AIDS-related fat malabsorption. The study subjects were split into two groups: One received a liquid diet containing normal fats, whereas the other group received mostly MCT's. After 12 days, the participants on the MCT formula showed significantly less fat in their stool and better fat absorption than the other group.

B) ATHLETIC PERFORMANCE

MCT's have been proposed as an "ergogenic aid," an energy-boosting supplement to enhance athletic performance. MCT's provide more energy per gram than carbohydrates, but unlike normal fats, this energy can be released rapidly. The majority of MCT studies have looked at endurance cyclists to determine the effectiveness of MCT's on increasing endurance performance. However, the results of these studies are mixed and further research is required before this particular use of MCT's becomes widely accepted.

C) WEIGHT CONTROL

MCT's may be beneficial in weight loss programmes. In being metabolised easily into energy they are less likely to result in fat storage. Additionally, diets that are low in carbohydrates and high in protein and fat induce a state called ketosis. In ketosis, the body burns its stored fat for energy. Preliminary research suggests that MCT's can promote calorie burning by as much as 50% when compared with diets containing the same amount of long chain fatty acids. Maximum benefit appears to be gained when dietary long chain fats are minimised.

Potential Applications of MCT's:

Malabsorption disorders

Weight management

Athletic performance

Typical intake range:

1-2 tablespoons per day

Contraindications/Drug Interactions

Diabetics and individuals with liver disease should be closely monitored as MCT's may induce ketoacidosis.

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Medicinal Mushrooms

(*maitake, reishi, shiitake*)

A) MAITAKE (*grifola frondosa*)

Maitake is yet another mushroom with an impressive research record in studies that have assessed its potential health benefits. Its main active phytonutrient compounds are polysaccharides such as alpha-glucans and beta-glucans.

Potential health applications of Maitake

- immune-enhancing • cell protective
- anti-hypertensive • liver protective

B) REISHI (*ganoderma lucidum*)

Reishi mushrooms are very rich in the health promoting phytonutrients such as polysaccharides, triterpenes and phytosterols.

Potential health applications of Reishi

- immune-enhancing • cell protective
- liver protective • anti-allergic
- cholesterol lowering • protective*against radiation
- anti-bacterial • anti-hypertensive

C) SHIITAKE (*lentinus edodes*)

Shiitake has been the subject of considerable research of late due to its impressive health- promoting properties. Its main active phytonutrient components include eritadenine, polysaccharides and lignins.

Potential health applications of Shiitake

- immune-enhancing • anti-bacterial
- cholesterol lowering • anti-viral
- general cardiovascular benefits • cell protective
- anti-parasitic • liver protective

Contraindications/Drug Interactions

None noted.

Medicinal Mushrooms

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L-Methionine

A) LIPOTROPIC AGENT

Methionine inhibits the accumulation of fatty deposits in the liver and promotes the excretion of bile - the substance in which many toxins are ultimately carried into the gut for incorporation in the faeces for removal from the body.

B) LIVER PROTECTION

Needed to manufacture cysteine, a component of glutathione, a potent liver protective tripeptide that neutralises countless compounds known to damage the liver. The role of methionine as a lipotropic agent also helps reduce sluggish liver function due to excessive fatty build-up.

C) DETOXIFIER

Through its conversion to SAMe, methionine aids detoxification through the process of methylation, where toxins are conjugated to the methyl groups of SAMe. Methionine can also be converted to cysteine, and therefore promotes the synthesis of glutathione, another important compound involved in phase II liver detoxification. Through the action of methylation and glutathione conjugation numerous toxins, free radicals and by-products of metabolic and hormonal wastes can be detoxified.

D) HISTADELIC (high histamine) DISORDERS

Various psychological disorders (e.g. certain cases of schizophrenia and depression) are often associated with excessive histamine levels. Methionine has been used with success in treating such disorders, because it can increase the rate at which histamine is degraded by methylation. Evidence suggests that methionine is most successful in those people with schizophrenia who are also depressed.

E) ANTI-ALLERGIC

Methionine appears to be of great value in reducing the severity of reactions to both food-related and respiratory allergens. This is due to its ability to detoxify histamine, the primary chemical involved in allergic reactions.

F) HYPEROESTROGENISM

Methionine may facilitate the removal of excessive oestrogen in the body by promoting its inactivation in the liver through the process of methylation. In addition, methionine promotes the excretion of bile - the substance in which inactivated oestrogen is carried into the gut where it is incorporated into faeces for removal from the body. As a lipotropic factor, methionine also prevents the build-up of fat in the liver, a factor that can promote hyperoestrogenism. High oestrogen levels are very often associated with sluggish liver due to fat accumulation. Excessive oestrogen is a causal factor in approximately 70% of cases of premenstrual syndrome (PMS), and is a factor in a variety of female hormone complaints. Best results may be obtained when methionine is combined with additional B6 and dietary fibre (fibre aids the removal of detoxified oestrogen via the gut).

Potential Applications of L-methionine:

- Fatty liver
- Sluggish liver function
- Detoxification
- Food allergies
- Environmental allergies (e.g. hayfever)
- PMS
- Endometriosis
- Fibroids
- Depression (when associated with high histamine levels)

- Schizophrenia (when associated with high histamine levels)

Typical intake range:

500-1500 mg per day (taken on an empty stomach)

Food sources

Beef, chicken, fish, pork, soybeans, egg, cottage cheese, liver, sardines, yoghurt, pumpkin seeds, sesame seeds, lentils

Contraindications/Drug Interactions:

- May be beneficial alongside acetaminophen, methotrexate and gentamicin.
- It is advised to ensure adequate intake of vitamin B6, B12 and folic acid when taking high levels of l-methionine.
- Persons with bi-polar (manic) depression should not take Methionine or SAME
- Best avoided by pregnant women and nursing mothers.
- Sufferers of neoplastic disease should avoid
- Caution with schizophrenia, hepatic and renal failure - only under medical supervision.

L-Methionine

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S-Adenosylmethionine (SAME)

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Milk Thistle

silybum marianum

A) LIVER DETOXIFICATION AND REGENERATION

Silymarin, the key active compound in milk thistle, is one of the most potent liver protective substances known. Silymarin has been shown to increase glutathione production in the liver by around 30%, thus increasing detoxification capabilities significantly. Silymarin also stimulates protein synthesis in the liver encouraging the growth of healthy liver cells. In addition, bile activity is stimulated with the ingestion of milk thistle, an attribute that is both supportive to the liver and gall bladder.

B) NORMALISING SKIN CELL REPLICATION

Studies show that silymarin can normalise skin cell replication by correcting the ratio between levels of cAMP and cGMP (the compounds that govern skin cell maturation and multiplication). This action, combined with the herb's anti-inflammatory effect has led to substantial clinical success in the treatment of psoriasis.

C) ANTIOXIDANT

Due to silymarin's ability to raise glutathione levels in the liver, antioxidant systems are greatly enhanced. Glutathione is used to make glutathione peroxidase, the body's most potent free radical fighting enzyme. The flavonoids contained in milk thistle also exert direct antioxidant capabilities.

D) ANTI-INFLAMMATORY

Milk thistle provides anti-inflammatory actions due to the inhibition of leukotrienes, the boosting of antioxidant enzyme systems and the elimination of certain toxins that tend to trigger inflammatory reactions.

Potential Applications of Milk Thistle:

- psoriasis
- liver toxicity
- jaundice

- hepatitis
- cirrhosis
- general liver protection and support
- hangover
- gallstones
- Herxheimer reaction (detoxification side effects i.e. from treatment of systemic candidiasis)
- oestrogenic liver toxicity (i.e. as seen in oestrogen-dominant premenstrual tension)

Principle actives:

Silymarin

Contraindications/Drug Interactions:

Caution with drugs that are metabolised by the P-450 enzyme system - check with doctor.

Milk Thistle

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MSM/Sulphur

Sulphur compounds play many roles in the body's organs and systems. There are several sulphur bearing supplements such as garlic, cysteine, methionine and Alpha Lipoic Acid, but MSM (Methylsulfonylmethane) is the most concentrated source available.

A) DETOXIFICATION

The action of sulphur in keeping cells flexible and permeable means that toxins may be flushed out of the body more easily, this also allows nutrients to enter more readily. Sulphur is needed to manufacture glutathione peroxidase, an important detoxifying enzyme in the liver.

B) CONNECTIVE TISSUE REPAIR/HAIR, NAILS AND SKIN

As sulphur is necessary for the production of new cells, it plays an essential part in the synthesis of collagen and keratin, vital protein substances that are needed to make and maintain hair, nails and skin. Hair and nails grow faster and stronger with good levels of sulphur. This compound is also responsible for the flexible bonds between cells and helps to block the cross-linking of collagen, an effect responsible for the appearance of wrinkles and aging skin. Acne, including rosacea has been shown to respond favourably to MSM in studies, sulphur has also been found to enhance wound repair.

C) ALLERGIES

Studies on MSM have indicated that it coats mucosal surfaces and may help to prevent food allergens from binding and harming the gut, leading to an improved tolerance of previously troublesome foods. However, it is generally better to avoid foods that are known to be a problem as they place an extra strain on the immune system. Some literature suggests other anti-allergy activity, e.g. helping reduce hayfever symptoms.

D) ANTI-INFLAMMATORY

Sulphur is found in most body tissues and approximately half is concentrated in the muscles, skin and bones. In an inflamed state the tissue cells swell and pain results from the rigidity of the cell walls, but as sulphur can restore flexibility and thus permeability to these walls it allows fluids to pass through the tissues more easily and reduce the cause of the pain. This enables harmful substances such as lactic acid and toxins to flow out, reducing the pressure build up. The body can also use sulphur and other nutrients such as vitamin C to make new cells, allowing a certain amount of repair.

E) ANTIOXIDANT

Sulphur is a free radical scavenger that helps to clean the blood stream and flush the < toxins from cells that would otherwise build up and cause the cell membranes to become inflexible and damaged. Part of this effect is due to sulphur being a major component of glutathione peroxidase, a powerful antioxidant and detoxifying enzyme.

F) ANTI-PARASITIC

Shown to have anti-parasitic action against several invaders including roundworms, nematodes, Giardia and Trichomonas as well as Enterobius and other intestinal worms. This is thought to be due to MSM competing for receptor sites on the mucous membranes, so that parasites cannot attach themselves.

G) DIABETES

Sulphur is a component of insulin and as such, insufficient levels could contribute to decreased insulin levels and blood sugar problems.

H) HEAVY METAL REMOVAL

Heavy metals such as lead, mercury and cadmium are very destructive to the body in many ways. Sulphur-containing compounds generally, are very effective chelators of heavy metals. In the case of sulphur's ability to chelate heavy metals, this does not refer to aiding their absorption, but rather to latching on to them and assisting their removal from the body.

I) JOINT PROTECTION AND REPAIR

Preliminary research suggests that MSM may provide significant relief from arthritis and other types of joint injury. Indirect anti-inflammatory properties, the tissue stabilising aspects of sulphur and antioxidant activity may account for much of this potential benefit.

Potential health applications of MSM/Sulphur

- antioxidant protection
- arthritis
- inflammation
- detoxification, including excess and heavy metals
- diabetes
- food allergies
- hair, skin and nail health
- general connective tissue support including joints, blood vessels, eyes, etc.
- parasites
- wound healing

Contraindications/Drug Interactions

Some literature suggests that MSM augments warfarin, so supplementation alongside should probably be avoided.

MSM/Sulphur

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N-Acetyl L-Cysteine (MAC)

A) LIVER PROTECTANT

Glutathione is required for the detoxification of numerous substances in the liver and is a compound of three amino acids, cysteine, glutamic acid and glycine. Of these, cysteine is most likely to be rate limiting, in other words the availability of cysteine is the biggest factor in how much glutathione can be synthesised. Additional dietary cysteine is thought to be the most effective method of increasing glutathione synthesis, and thus improving glutathione conjugation - the method in which approximately 60% of all toxins are neutralised during phase II of the liver's detoxification process. Efficient phase II detoxification ensures that harmful toxic compounds are not able to build up in the liver. NAC has been shown in studies to be the most effective method of increasing glutathione levels. Cysteine also has antioxidant properties, which further enhances its liver protective abilities. NAC often administered in the early stages of paracetamol poisoning.

B) DETOXIFIER

Research suggests that NAC is one of the most effective methods of elevating glutathione, a compound required for phase II liver detoxification in a process called conjugation. Approximately 60% of all toxins passing through phase II are detoxified via glutathione conjugation, which makes NAC an important factor in liver detoxification. As a sulphur amino acid, cysteine is abundant in 'smelly' foods such as eggs and garlic, which are known for their liver supportive properties.

C) HEAVY METAL SCAVENGER

In addition to the indirect detoxification potential of cysteine, through the upregulation of glutathione conjugation, it is also able to bind to (chelate) heavy metals, thus aiding their removal from the body.

D) ANTIOXIDANT

NAC, both alone and as part of glutathione, is a very effective free radical scavenger. It also forms a part of the potent antioxidant enzyme glutathione peroxidase and is able to quench both reactive oxygen species and peroxide radicals, an action which makes it especially valuable in protecting cell membranes.

E) CARDIOVASCULAR PROTECTANT

Through its antioxidant effects, NAC can prevent oxidation of LDL cholesterol, a known risk factor in heart disease. NAC also significantly lowers lipoprotein A, which appears to be an even greater risk factor in heart disease than cholesterol.

F) RESPIRATORY SUPPORT

NAC breaks up bonds that account for the thick consistency of mucous, thus aiding its removal. A review of scientific studies has found that NAC may help dissolve mucus and improve symptoms associated with chronic bronchitis, asthma, cystic fibrosis and emphysema. Chronic smokers also may benefit from NAC supplementation due to its antioxidant properties (cigarette smoke is a significant source of free radicals)

G) ANTI-VIRAL

NAC increases glutathione levels in virally infected cells more efficiently than taking glutathione itself. Raised cellular glutathione inhibits viral spread.

Potential Applications of MAC:

- Liver protection and liver disorders
- Detoxification
- Heavy metal poisoning
- Free radical-related disorders in general
- Atherosclerosis
- Cystic fibrosis
- Chronic respiratory congestion
- Viral disorders
- Smoking

Typical intake range:

500-1200 mg per day (taken on an empty stomach)

Food sources:

Soybeans, spirulina, beef, pork, chicken, turkey, spirulina, lentils, adzuki beans, baked beans, chickpeas, kidney beans, peas

Contraindications/Drug Interactions:

- Cysteine may produce a false positive in diabetic tests for ketone bodies.
- Best avoided by children, pregnant women and nursing mothers.
- Vitamin C supplementation is often recommended when taking 1-cysteine.

Nettle Leaf

urtica dioica

A) DIURETIC

Studies suggest that the general ability of nettle to increase urinary flow is accompanied by a relaxing effect on the urinary tract.

B) ANTI-INFLAMMATORY

Recent studies show that the nettle extract inhibits the synthesis of inflammatory prostaglandins and leukotrienes, thus decreasing inflammation.

C) ANTI-ALLERGIC

Nettle is commonly employed to provide relief of hayfever and other allergic symptoms. In addition to the herb's reduction of inflammatory prostaglandins (which can influence allergic processes), nettle is also a rich source of the flavonoid quercetin, which is known to inhibit the release of histamine.

D) HAEMOSTATIC

Nettle is reported to be very useful in arresting excessive bleeding, which among other applications, may warrant its use women who suffer from heavy periods.

Potential Applications of Nettle Leaf:

- general fluid retention
- lower limb oedema
- arthritis
- hayfever and other allergic reactions
- excessive bleeding
- heavy periods

Principle actives:

Silic acid, flavonoids, amines, calcium, silicic acid (silicon)

Contraindications/Drug Interactions:

Caution with diuretics - check with doctor.

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Nettle Leaf

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Niacin, Niacinamide

Vitamin B3, nicotinic acid, nicotinamide

A) ESSENTIAL COENZYME (*all forms of B3*)

In the body niacin converts into the active coenzymes nicotinamide adenine dinucleotide (NAD⁺) and nicotinamide adenine dinucleotide phosphate (NADP⁺), which are essential to many bodily processes including: production of energy, synthesis of certain hormones and DNA; metabolism of carbohydrates, fats, cholesterol and proteins; and the growth of body tissues.

B) CHOLESTEROL AND FAT REGULATION (*niacin or inositol hexanicotinate only*)

It has been confirmed in numerous clinical trials that both niacin and inositol hexanicotinate (a non-flushing, inositol-bound form of niacin) are remarkably

effective for lowering total blood cholesterol levels, essentially by reducing cholesterol production in the liver. An added advantage -is that these supplements have also been shown to *increase* levels of HDL (good) cholesterol. Niacin and inositol hexanicotinate also lower levels of lipoprotein A (which carries and deposits cholesterol into damaged areas in the arteries and impedes the breakdown of clots), triglycerides and fibrinogen (a protein involved in the formation of blood clots). In fact, research has found that niacin and inositol hexanicotinate provide greater reduction in heart disease risk than prescribed cholesterol-lowering drugs, and without the high risk of toxicity associated with the drugs. The greater protection from the supplements may be due to the fact that although the drugs are more effective in lowering LDL (bad) cholesterol, they are far less effective in raising HDL, and have no impact on lipoprotein A (considered by many experts to be an even greater cardiovascular risk factors than cholesterol).

Please note: Research shows that inositol hexanicotinate is a more clinically effective cholesterol/ lipid-lowering agent than standard niacin, as well as possessing lower toxicity and little risk of side effects (see contraindications below).

C) CIRCULATION (*niacin or inositol hexanicotinate only*)

Both niacin and inositol hexanicotinate have been found to increase blood flow in circulatory disorders such as Raynaud's Disease (fingers and toes that are hypersensitive to cold) and intermittent claudication, which is characterised by walking-induced cramping caused by depleted oxygen in the lower extremities. Some of the circulatory benefits of niacin and inositol hexanicotinate are due to the influence on blood clotting and blood lipids. Also significant is the temporary stimulatory effect of niacin on dilation of blood vessels near the surface of the skin, in part, accounting for the temporary flushing (redness, heat and itching) experienced soon after ingestion.

Please note: With inositol hexanicotinate, the vasodilation is sufficiently gradual to completely avoid the flushing symptoms, however this also means that the circulatory stimulation will not be as prominent or acute as with standard niacin preparations.

D) BLOOD SUGAR REGULATION (*niacinamide only*)

It is well established in scientific literature that niacinamide increases both the sensitivity and secretion of insulin. It also appears to protect the insulin-producing cells in the pancreas from damage caused by various factors including auto-immune reactions and free radicals. Such damage is associated with the development of insulindependent diabetes mellitus (IDDM). Various studies have been carried out to evaluate the effectiveness of niacinamide in the treatment of IDDM.

While results were mixed, many patients had significant benefits with niacinamide therapy, and supplementation resolved the diabetes completely in some that were diagnosed not long before therapy began.

Additional research highlights the fact that niacinamide supplementation is even more effective in the *prevention* of IDDM in those who are at high risk. The results of both the therapeutic and preventive trials underline the advantages of beginning supplementation as early as possible after IDDM is diagnosed or after one's high risk of IDDM has been confirmed.

E) HISTAMINE REGULATION (*all forms of B3*)

Niacin supplementation has been used in clinical practice to elevate abnormally low levels of histamine and to aid in the detoxification of excessive copper (which often co-exists with histamine deficiency). Histamine deficiency may manifest in various signs and symptoms such as recurrent mouth ulcers; tinnitus (ringing in the ears); and certain mental/emotional/psychological disorders (e.g. anxiety, mental confusion, acute [not chronic] schizophrenia, hallucinations and/or paranoia [the connection with histamine is especially a concern if loose stools and/or skin complaints such as eczema began around the time of the mental/emotional disorder]). Standard niacin preparations also cause the release of stored histamine in the tissues under the skin surface, thus accounting for the familiar flushing effect.

Potential Applications

- Elevated cholesterol levels (*niacin, inositol hexanicotinate*)

- Elevated triglyceride levels (*niacin, inositol hexanicotinate*)
- Elevated lipoprotein A levels (*niacin, inositol hexanicotinate*)
- Cardiovascular disease (*niacin, inositol hexanicotinate*)
- Impaired peripheral circulation (*niacin, inositol hexanicotinate*)
- Raynaud's Disease (*niacin, inositol hexanicotinate*)
- Intermittent claudication (*niacin, inositol hexanicotinate*)
- Insulin-dependant diabetes [of recent onset] (*niacinamide*)
- Arthritis (*niacinamide*)
- Excessively low histamine levels (*all forms of B3*)
- Hypochlorhydria [low stomach acid] (*niacin, inositol hexanicotinate*)
- Acute (not chronic) schizophrenia [when associated with excessively low histamine levels] (*niacin, inositol hexanicotinate*)

Please note: When using B3 for a particular indication, it is important to ensure that the correct form is used (see above). If B3 is required but niacinamide is not appropriate, then in order to avoid severe flushing and discomfort start with no more than 50-100mg of niacin per day and then gradually increase dosage to whatever level has been indicated. Alternatively, inositol hexanicotinate (a non-flushing form of niacin) can be used.

Typical Supplemental Dosage Range

- 10-500mg per day

Common Food Sources

- Brewer's yeast
- Liver
- Brown rice
- Whole wheat
- Peanuts
- Seeds
- Fish
- Beef
- Poultry
- Leafy green vegetables

Contraindications/Drug Interactions

- Niacin (not inositol hexanicotinate or niacinamide) may cause temporary 'flushing' (redness, tingling, sensation of heat, itchiness), especially in doses above 50-100mg. The 'niacin flush' has not been shown to be harmful to the body.

Please note: The duration and severity of the flushing depends on the person, the dosage and the quantity and type of food and/or drink in the stomach at the time. With consistent daily use of a particular dose of niacin, the severity of the flush will typically diminish gradually, to the point that the flush will eventually cease to occur after ingestion.

- Time-release preparations of niacin may cause liver damage, and should be avoided.

Please note: Although the niacin in inositol hexanicotinate is metabolised one molecule at a time (due to molecular bonding to inositol) it is NOT a time-release preparation and does not possess the safety risks of time-release niacin.

- High-dose niacin *in any form* should be avoided in those with pre-existing liver disease (or elevated liver enzymes) or gall bladder disease, unless under medical supervision.
- It is advised that liver function and cholesterol testing be periodically carried out on those using long-term high-dose niacin (i.e. more than 2000mg per day) in any form.
- Long-term, high-dose niacin or inositol hexanicotinate should be avoided in diabetics unless medically supervised, as it may impair glucose tolerance and decrease effectiveness of anti-diabetic drugs.

- High-dose niacin should be avoided in cases of pregnancy, peptic ulcers or gout unless under medical supervision.
- Taking high-dose niacin with alcohol, beta-blockers, mecamlamine or pargyline may cause severe hypotension (low blood pressure).
- High-dose niacin may occasionally cause nausea and gastric irritation.
- High-dose niacinamide may cause depression in some adults.
- Niacin may reduce effectiveness of chenodiol (drug for dissolving gallstones).
- High-dose niacin may reduce the effectiveness of choline and block zinc in the body.
- Niacin and inositol hexanicotinate should be taken with food.
- High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised. Please note: Research shows that as well as avoiding the 'niacin flush', inositol hexanicotinate is less toxic and more clinically effective than standard niacin preparations.

Octacosanol

Octacosanol is described as a 28-carbon chain alcohol. A main component of Policosanol, it is found in sugar cane, whole wheat and other grains.

A) ATHLETIC PERFORMANCE

Experiments carried out with swimmers have shown an enhanced endurance, possibly by converting lipids into energy, but also by the improvement of oxygen utilisation. A small trial also showed an improved reaction time to visual stimulus and increased grip strength.

B) LIPID METABOLISM

Cholesterol lowering effects have been studied, with octacosanol significantly reducing total cholesterol and low density lipoprotein. This is probably due to the high plant sterol content of beta-sitosterol in octacosanol.

C) PLATELET AGGREGATION

Octacosanol has been shown to reduce platelet stickiness and works synergistically with aspirin.

D) PARKINSONISM

Small but significant improvements were noticed in patients who took octacosanol for Parkinsonism in their self-assessment of "activities of daily living" and "mood".

E) ALTITUDE SICKNESS

Improvement of oxygen utilisation, as well as having sports benefits, is also useful at high altitude for reducing altitude sickness.

Potential health applications of Octacosanol

- stamina/athletic performance
- cholesterol
- anti-clotting
- Parkinsonism
- altitude sickness

Contraindications/Drug Interactions

Possible caution with warfarin.

Octacosanol

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Olive oil

Largely comprises oleic acid, which is a mono-unsaturated fatty acid. Also rich in phenolic compounds that have potent antioxidant and immune supportive properties. The first pressing of olives results in extra virgin olive oil with the beneficial properties of the oil diminishing with each subsequent pressing. As a monounsaturated olive oil is relatively temperature stable.

A) CHOLESTEROL

Studies into LDL cholesterol have suggested that oxidation is an important step in the development of atherosclerosis. It seems that mono-unsaturated fats reduce the capacity of LDL cholesterol to oxidise, which may explain the protective properties of olive oil. However, extra virgin olive oil also contains around 40 antioxidant phytochemicals. Antioxidants have been associated with reduced oxidation of LDL cholesterol, and are thought to be one of the major factors responsible for the health benefits associated with olive oil. In one study, extra virgin olive oil was found to prevent the most LDL oxidation compared to other varieties.

B) ANTIOXIDANT

Recent studies have shown that the abundant phenolic antioxidant fractions of olive oil have a potent inhibitory ability on free radicals such as reactive oxygen species. Researchers have also demonstrated significant protection against oxidative stress from passive smoking due to the antioxidant properties of phenolic compounds in olive oil.

C) ATHEROSCLEROSIS

Oxidised low-density lipoproteins (LDL) contribute to the progression of human atherosclerosis. Antioxidants have been shown to prevent LDL modification. The beneficial effects of olive oil are thought to be attributable to the unique antioxidant properties of its phenolic compounds.

D) ANTIMICROBIAL

Olive polyphenols have been demonstrated to inhibit or delay the rate of growth bacteria such as Salmonella, Cholera, Staphylococcus, Pseudomonas, and Influenza in vitro. These data suggest a potential role of olive oil polyphenol antioxidants in promoting intestinal and respiratory health whilst also supporting immune function.

Potential Applications for olive oil:

Cardiovascular health

Hypercholesterolaemia

Immune support

Typical intake range:

Up to 50g per day

Contraindications/Drug Interactions

None noted.

Olive Leaf

olea europa

A) ANTI-MICROBIAL

The active compound oleuropein has powerful anti-bacterial, anti-fungal and antiviral properties. Extracts of olive leaf have been shown to inhibit a variety of organisms including herpes virus, influenza A, Coxsackie, salmonella, staphylococcus, and E coli.

B) FEVER REDUCING

Historical use of the olive tree since the mid-19th century suggests potential benefits in lowering fevers (particularly in reducing the symptoms of malaria). Studies show another key active vauqueline does indeed exert fever-lowering effects.

C) CARDIOVASCULAR TONIC

Scientific investigation of oleuropein points to a potential blood pressure-lowering action, an increase in blood flow through the coronary vessels and an anti-arrhythmic capability. Although clinical trials are currently lacking with respect to olive leaf's cardiovascular attributes, the research that has been published suggests that it does

show great promise as a general cardiovascular tonic.

D) ANTIOXIDANT

Phenolic compounds found in olive leaf have long been known to exert antioxidant / free radical scavenging properties that are reported to exceed that of vitamin E.

Potential Applications of Olive Leaf:

- viral infections (e.g. colds and flu)
- bacterial infections
- fungal infections (e.g. *Candida albicans*)
- parasitic infections
- hypertension
- angina
- heart arrhythmia
- protection against free radical damage

Principle actives:

Oleuropein, vauqueline

Contraindications/Drug Interactions:

None noted.

Olive Leaf

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Omega 3 Fatty Acids

A) INFLAMMATION

Studies suggest a role for omega 3 fatty acids in various inflammatory conditions. One study attributed an improvement in Crohn's symptoms to the inflammation-inhibiting properties of fish oils. The study established that the laboratory tests for inflammatory processes, such as an increased erythrocyte sedimentation rate (ESR), had been significantly reduced in the fish-oil group in comparison with the placebo group. It is further important to note that because of a beneficial influence on intestinal cell growth, the fish-oil supplementation may lead to an increase of the intestinal mucosal surface area, thereby increasing the absorption of nutrients and improving the nutritional status of the patient. Deficiency of Omega 3 fatty acids is relevant to a variety of inflammatory conditions including arthritis, colitis, crohn's, etc.

B) CARDIOVASCULAR HEALTH

Many studies have linked dietary EPA and DHA intake to a reduced risk of cardiovascular disease. An American case-control study determined that people who consume monthly quantities of seafood containing a total of 5.5 grams of long-chain omega 3 polyunsaturated fatty acids, (corresponding with one meal of fatty fish a week), have 50% less chance of a primary cardiac arrest than people whose daily menu does not contain these fatty acids.

NOTE

The conversion of Alpha Linolenic Acid (ALA) to EPA and DHA occurs to a low extent (about 10%-15% efficiency) in the adult human body and the research is somewhat mixed as to the effectiveness of ALA in cardiovascular disorders.

C) PREGNANCY

An adequate intake of DHA and EPA is particularly important during pregnancy and lactation. During this time the mother must supply all of the baby's needs for DHA and EPA because it is unable to synthesize these essential fatty acids itself. DHA makes up 15 to 20% of the cerebral cortex and 30 to 60% of the retina so it is absolutely necessary for normal development of the fetus and baby. There is some evidence that an insufficient intake of omega-3 fatty acids may increase the risk of premature birth and an abnormally low birth weight. There is also emerging evidence that low levels of omega-3 acids are associated with the development of pre-eclampsia in pregnant women.

D) DYSMENORRHEA

Research suggests that omega 3 fatty acids may be beneficial in alleviating menstrual cramping. In a double-blind placebo-controlled study among a group of girls suffering from dysmenorrhea, it was found that the symptoms could be significantly reduced by dietary supplementation with the long-chain omega-3 fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid). The anti-inflammatory properties of omega 3 fatty acids may be a factor, along with the importance of essential fatty acids in sex hormone manufacture and the high probability of omega 3 to omega 6 imbalance.

E) BRAIN HEALTH

Omega 3 fatty acids such as Alpha linolenic acid are metabolised into DHA, which is also available directly from fish oils. DHA comprises about 25% of the brain and along with arachidonic acid is a major structural component of the brain. Low levels of DHA have been correlated with changes in disposition, memory loss, and visual and other neurological conditions.

One researcher has found sub-optimal DHA levels in dyslexia, a learning disorder marked by impairment of the ability to recognize and comprehend written words. DHA supplementation in adult dyslexics improved night vision. Anecdotal observations in the study showed improvements in reading ability and behavior as well. Children with Attention Deficit Hyperactivity Disorder (ADHD) also have low DHA levels and exhibit symptoms of fatty acid deficiency including hyperactivity and short attention span.

F) MENTAL HEALTH

Studies suggest that omega 3 fatty acids may be helpful in preventing depression. Researchers have discovered that cholesterol lowering diets increase the incidence of depression. This is thought to be a result of decreased omega 3 intake reducing the levels of DHA in the brain. If this highly unsaturated omega-3 fatty acid, which is an essential part of the neuronal cell membranes, is replaced by an omega-6 fatty acid, changes in the membrane properties may occur, which increase the vulnerability to depression. Various studies support the theory that higher consumption of omega 3 fatty acids correlates with a decreased incidence of depression.

G) AUTO-IMMUNE DISORDERS

Many auto-immune disorders involve inflammatory processes that result in a variety of symptoms. For example inflammation of the joints in rheumatoid arthritis. The anti-inflammatory properties associated with omega 3 fatty acids therefore make them relevant in the diets of those suffering with auto immune diseases. In a 12-month randomised double-blind study the influence of 2 different dosages of omega-3 fatty acids (2.6 and 1.3 grams per day) were compared with placebo in a group of 90 patients with rheumatoid arthritis. In the group consuming 2.6 gram omega-3 fatty acids a significant clinical improvement was noted. In this group, the proportion of patients who were able to reduce their conventional antirheumatic medication was also significantly greater.

Potential Applications of omega 3 fatty acids:

Auto-immune conditions Hypertension

Cardiovascular disease

Dysmenorrhea

Endometriosis

Fibrocystic breast disease

Hypercholesterolemia

Inflammatory conditions

Lactation

PMT

Pregnancy

Renal support

Typical dosage range:

Fish oil EPA 180- 1500mg per day

DHA 120 - 1000mg per day

Flax seed oil 1-3 tablespoons per day

Contraindications/Drug Interactions:

Do not use with warfarin or anti-coagulant medications

Omega 3 fatty acids

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Omega 6 fatty acids

A) INFLAMMATION

Theoretically the use of omega 6 fatty acids in inflammatory conditions makes sense. Linoleic acid can be converted into the powerful anti inflammatory chemicals known as prostaglandin series 1. However, research in this field is mixed, indeed some studies have shown that omega 6 supplementation actually increases tissue levels of arachidonic acid, a precursor chemical of the series 2 prostaglandins that have proinflammatory properties. In reality using omega 6 in balance with omega 3 is likely to provide the best results.

B) PRE-MENSTRUAL SYNDROME (PMS)

Deficiency of essential fatty acids has been reported in women with PMS. Omega 6 fatty acids in the form of linoleic acid, is converted into gamma linolenic acid (GLA) and eventually into prostaglandins - hormone like substances - that control a variety of physiological functions including hormone production and nerve transmission, both particularly relevant in prevention of PMS. GLA from evening primrose oil has been shown to improve many symptoms including pre-menstrual headaches, depression, irritability, and bloating

C) MENORRHAGIA (HEAVY PERIODS)

Fatty acid imbalance may play a significant role in heavy menstruation. High levels of arachidonic acid from animal products such as meat and dairy foods is known to increase the levels of prostaglandin series 2 - the so-called 'bad' prostaglandins - that may increase blood flow and prevent blood clotting in those with heavy menstruation. Reducing levels of meat and dairy products and increasing intake of essential fatty acids may be supportive in cases of heavy menstrual bleeding.

D) BREAST HEALTH

Scientific studies have demonstrated that omega 6 fatty acids in the form of GLA from evening primrose oil may be helpful in reducing the pain and tenderness associated with pre-menstrual breast pain and fibrocystic breasts. In one study almost half of 92 women with cyclic breast pain experienced improvement with evening primrose oil compared with one-fifth of the patients who received the placebo.

E) HORMONE BALANCE

The hormone modulating effects of prostaglandins derived from essential fatty acids

makes them particularly important if optimal hormonal health is to be achieved.

F) DIABETIC NEUROPATHY

Clinical research has discovered that GLA may be an important factor contributing to prevention of neuropathy - nerve damage that affects between 60% and 70% of all diabetics. In fact, a recent review article concluded that GLA supplementation is one of the most effective treatments available today for diabetic neuropathy. Anyone with diabetes may consider supplementing with a good source of GLA such as borage oil or evening primrose oil as a preventive measure against neuropathy.

G) SKIN HEALTH

GLA may be one of the most important nutrients for the promotion of skin health. In studies various skin conditions including eczema and dry skin have respond well to additional GLA intake from both borage and evening primrose oils. In the last 20 years, researchers have discovered that eczema may be linked to a deficiency of GLA. Recently a 12-week study conducted at the University of Italy, patients taking GLA, in the form of borage oil, saw itching decrease by 90%. These patients also saw improvements in the patches of red skin and oozing of wounds. Anecdotal reports indicate that GLA supplementation also improves symptoms of psoriasis.

Potential Applications of omega 6 fatty acids:

- Inflammatory conditions (with omega 3)
- PMS
- Dysmenorrhoea (painful periods)
- Fibrocystic breast disease
- Endometriosis
- Ovarian cysts
- Dry skin, eczema and other skin conditions
- Diabetic neuropathy

Typical intake range:

150 - 1500mg per day of GLA

Contraindications/Drug Interactions:

Some reports suggest that GLA may worsen epilepsy. It is therefore advisable for epileptics to avoid supplementation with GLA.

Omega 6 fatty acids

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Omega 9 Fatty Acids

Omega 9 fatty acids are derived from monounsaturated fats such as olive oil, almonds, avocados and peanut oils. The major omega 9 fatty acid being oleic acid.

Monounsaturated fatty acids (MUFA's) can be metabolised into energy but may also be incorporated in nerve fibres and cell membranes. MUFA's can also temporarily 'stand in' for essential fatty acids when there is a dietary shortage, however this can only provide temporary cover.

A) CARDIOVASCULAR HEALTH

A number of studies have shown that MUFA's have favorable effects on cholesterol levels. In addition to these benefits there is also evidence that MUFA's may affect blood clotting by decreasing platelet aggregation. Substitution of MUFA's for saturated fats appears to positively influence a number of CHD risk factors including lowering both total cholesterol and LDL cholesterol levels whilst increasing HDL and decreasing plasma triglyceride levels.

B) GLUCOSE TOLERANCE

There is some evidence that monounsaturated fats, when replacing saturates and trans fats in the diet may be helpful in aiding blood sugar control. Research shows that a high-fat, MUFA-enriched diet with a low proportion of energy from saturated fat, was associated with better glycaemic control and reduced insulin requirements compared with a high carbohydrate diet.

C) MEMBRANE HEALTH

Monounsaturated fatty acids are incorporated into cell membranes. The integrity of cell membranes is crucial in maintaining proper cell function and health.

D) GASTROINTESTINAL HEALTH

There is evidence, that a high intake of monounsaturated fatty acids exerts beneficial effects on the gastrointestinal tract by reducing gastric acid secretion and preventing gallstone formation. The impact of the dietary fat composition on other gastrointestinal diseases, e.g. reflux oesophagitis or constipation, has not been evaluated thoroughly. There are, however, some studies that suggest further favourable effects of diets rich in monounsaturated fatty acids.

Potential Applications of omega 9 fatty acids (monounsaturated fatty acids):

Cardiovascular disease Hypertension

Cell membrane integrity Hypoglycaemia (blood sugar control)

Gallstones Intestinal health

Hypercholesterolaemia

Typical intake range:

Up to 50g per day

Omega 9 fatty acids

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Oregano

origanum vulgare

A) ANTI-MICROBIAL

Very potent anti-bacterial and anti-fungal capabilities are associated with the primary

actives thymol and carvacrol, which are found in significant amounts in oregano oil.

B) ANTI-CATARRHAL

Oregano oil acts as a powerful expectorant, i.e. helping to break up and eliminate mucous in the respiratory tract.

C) ANTI-SPASMODIC

Reports suggest that oregano also functions as an anti-spasmodic, helping soothe the muscle lining of the digestive tract and settling flatulence, and stimulating the flow of bile.

This may also partly account for oregano's potential value in suppression of coughs (see below).

D) COUGH SUPPRESSIVE

The combination of the anti-catarrhal and anti-spasmodic activity would help explain the reports claiming an ability to suppress coughs. Also, in cases where the cough accompanies infective condition such as bronchitis the anti-bacterial aspects would be especially valuable.

E) ANTIOXIDANT

Studies show that thymol is a potent antioxidant, providing exceptional protection against the peroxy free radical.

Potential Applications of Oregano:

- bacterial infections
- fungal infections (e.g. *Candida albicans*)
- chronic coughs
- bronchitis
- protection against free radical damage
- indigestion and flatulence

Principal actives:

Thymol, carvacrol

Contraindications/Drug Interactions:

Excessive use should be avoided in pregnancy.

Oregano Leaf

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L-Ornithine

A) ATHLETIC PERFORMANCE

Although recent research does not support the claim that ornithine supplementation can increase growth hormone release, as was first thought, studies suggest that it may still be valuable for strength athletes. Gains in strength and muscle size were reported in one study, despite no increase in growth hormone being noted. Through its conversion into arginine, ornithine may enhance the transport and storage of nitrogen in muscle tissue, as well as improving muscular energy through influencing the production of creatine phosphate. Strength training subjects taking arginine and ornithine in combination appear to excrete less of the metabolic markers of tissue breakdown in their urine, a factor that would appear to indicate an increase in muscle mass.

B) LIVER PROTECTION

Ammonia, a major toxin to the liver, is converted into urea by ornithine (and arginine). Additionally, ornithine, along with glycine, taurine and arginine, is utilised during phase II liver detoxification in the process of amino acid conjugation. A deficiency in these amino acids is often present in patients with a variety of liver conditions, or those with chronic exposure to toxins.

C) WOUND HEALING

Research shows that ornithine supplementation enhances collagen synthesis and speeds

repair time of tissue injury from surgery. Ornithine has also been shown to be supportive in patients with burns injuries where studies have demonstrated reduced length of hospital stay, fewer infections and improved immune function with increased ornithine intake.

D) CONVALESCENCE

As part of the stress response to injury or illness, protein stores in the body get broken down to provide energy for other metabolic processes. This decrease in protein stores can be a major problem for the seriously ill patient. Supplementation with ornithine may help prevent lean muscle breakdown during illness or surgery. Preliminary studies suggest that ornithine given intravenously to patients hospitalised with burns, trauma and severe infection may help improve protein balance, wound healing and decrease recovery time.

E) IMMUNE SYSTEM SUPPORT

Arginine (such as from ornithine conversion) may protect the thymus (the main gland of immunity) from damage, as well as aiding T-cell activity.

Potential Applications of L-ornithine:

- Athletic Performance (especially strength training/muscle building)
- Infection
- Cirrhosis
- Detoxification
- Healing of injuries
- Convalescence

Typical intake range:

500-2,500 mg per day (taken on an empty stomach)

Food sources:

Meat, fish, dairy, eggs, soy, legumes

Contraindications/Drug Interactions:

- Should not be supplemented in cases of active herpes infection or schizophrenia.
- Should be avoided by pregnant women and nursing mothers.

L-Omithine

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PABA

Para-aminobenzoic acid

A) METABOLIC COENZYME

Though not classed as an 'essential' nutrient, PABA is often unofficially linked with the B-vitamin family. PABA is essential for the proper metabolism and utilisation of proteins, and is required for the formation of red blood cells. PABA is a component of folic acid, as well as facilitating folic acid production through the stimulation of intestinal bacteria.

B) SKIN HEALTH

Most PABA research appears to be associated with disorders affecting the skin. For example, high-dose PABA has displayed impressive clinical results in the treatment of scleroderma, a disease which manifests as thickening and impaired capillary circulation of the skin due to over-production of collagen. Although not all of the relevant research has confirmed such benefits, one of the positive studies reported that *all but one* of 135 scleroderma patients experienced measurable skin softening after at least 3 months of therapy. Another study, involving patients suffering from vitiligo (manifesting with white, unpigmented patches of skin), showed benefits with PABA supplementation after several months of treatment; however paradoxically, it has been reported that very high-dose PABA supplementation (i.e. 8 grams per day) may *cause*

vitiligo in some. Though research is limited, there is evidence suggesting that PABA may also help in dermatitis herpetiformis (tiny skin blisters associated with coeliac disease), pemphigus (another condition manifesting with skin blistering) and dermatomyositis (auto-immune disease involving skin rash and inflamed and weak muscles).

Please note: PABA is best known as an effective sunscreensing agent when applied topically, however, it appears that orally ingested PABA has not been proven to possess sunscreensing properties (see contraindications).

C) HORMONAL INFLUENCE

PABA has been reported to increase the effect of the hormone cortisone, and may also influence oestrogen and other hormones in a similar manner. It has been speculated that PABA may slow the metabolic breakdown of various hormones in the liver. PABA supplementation has also provided promising results in the treatment of female infertility. Although apparently this has not been investigated in more recent research, a 1942 study of 16 previously infertile women found that 75% were able to successfully conceive after seven months of supplementing with 100mg of PABA taken four times per day.

Potential Applications

- Scleroderma
- Vitiligo (*see contraindications*)
- Dermatitis herpetiformis
- Pemphiga
- Dermatomyositis
- Female infertility
- Peyronie's Disease (excessive fibrous tissue build-up in penis)
- Sunscreen (topical application)

Typical Supplemental Dosage Range

- 10-500mg per day

Common Food Sources

- Brewer's yeast
- Liver
- Kidney
- Whole grains

Contraindications/Drug Interactions

- In small children, the use of massive doses (over 20 grams (20,000mg per day) has resulted in deaths.
- There is also a reported death (from toxic hepatitis) of an adult with lupus who had taken 48 grams (48,000mg) per day for 6 days, followed by seven months at a dosage of 8 grams (8000mg) per day.
- Very high doses (8 grams or more per day) have been reported to cause liver damage, low blood sugar and vitiligo (patches of white, unpigmented skin).
- PABA toxicity may result in damage to the liver, heart and/or kidneys.
- PABA toxicity may cause symptoms such as jaundice, skin rash, fever, nausea and/or vomiting, and high-dose side effects may include stomach irritation, diarrhoea, nausea or vomiting.
- High doses may reduce the number of white blood cells.
- Although sulfa-class antibiotic drugs can cause PABA deficiency, PABA supplementation can interfere with the action of these drugs - therefore one should not take the two together unless under medical supervision.
- Some people may experience allergic sensitivity to oral and/or topical use of PABA.
- PABA may cause increased sensitivity to light in some people.

Pancreatin

Mainly used with food as a digestive enzyme, pancreatin has other benefits both with

and away from food (taken at least half an hour before a meal). Pancreatin is known as a protease because it is critical to proper protein digestion, but there are many different types of protein in the body. It also naturally contains lipase, a fat digesting enzyme.

Before food

A) ANTI-INFLAMMATORY

Fibrin promotes inflammation by forming a 'wall' around the inflamed area, which causes a blockage in blood and lymph vessels and leads to swelling. Protease enzymes cause an increase in the breakdown of fibrin, helping to remove the obstruction to the flow of blood.

B) CARDIOVASCULAR

Fibrin can also contribute to blood clots that cause heart attacks or strokes. Again, protease enzymes have been shown to be beneficial in helping break down potentially harmful clots.

C) IMMUNE COMPLEX DISEASES

Studies have shown that proteases are very effective in reducing the high levels of circulating immune complexes that are associated with several autoimmune diseases including rheumatoid arthritis, lupus and MS.

D) SHINGLES

Studies in Germany compared the use of pancreatin to acyclovir (Zovirax) and found no significant difference in effect, both were equally beneficial. The mechanism for pancreatin's effect was thought to be the stimulation of the breakdown of immune complexes and enhancement of immune function.

With food

E) CANDIDA

Candida thrives in a lack of digestive enzymes, therefore supplementation of digestive aids such as betaine hydrochloride and pancreatin can be beneficial as part of an anticandida programme.

F) FOOD ALLERGIES

In studies, it was common for people suffering from food allergies to be deficient in proteases. This was thought to be because incompletely digested food molecules in the intestines were too large to be properly absorbed, triggering a process leading to an allergic reaction.

G) WEIGHT CONTROL

Poor digestion, leading to weight loss, has been helped by pancreatin supplementation. There is also a study suggesting that pancreatin can aid weight loss, presumably also by regulating faults in the digestive process.

Potential Health Applications of Pancreatin

Before food

- autoimmune diseases
- cardiovascular with regard to reducing blood clots
- inflammation, incl. sports injuries, inflammatory bowel disease, rh. arthritis
- pancreatic insufficiency eg. pancreatitis, cystic fibrosis
- shingles

With food

- Candida
- food allergies
- weight control

Contraindications/Drug Interactions

None noted

Pancreatin

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Pantothenic Acid

Vitamin B5

A) ESSENTIAL COENZYME

Pantothenic acid converts into pantotheine, which is then converted into coenzyme A or CoA (pantethine is the stable form of pantotheine). CoA is essential to the production of energy and the metabolism of fats, carbohydrates and protein. Pantothenic acid is also needed in order to synthesise fatty acids (through the manufacture of a compound called acyl carrier protein); cholesterol; adrenal, reproductive and growth hormones; haemoglobin; antibodies; the neurotransmitter acetylcholine; and phospholipids.

B) ADRENAL GLAND SUPPORT

Pantothenic acid supplementation is often employed for improving tolerance to various types of stress (i.e. mental, physical, etc), a use supported in part by its role in adrenal function and the production of adrenal hormones. Although pantothenic acid is often used in isolated stressful circumstances, it may be particularly valid in prevention or treatment of 'adrenal exhaustion' - a condition associated with the depletion of adrenal hormone supply (usually caused by long-term, chronic stress or extreme stress of a relatively long duration) - and its symptoms. Pantothenic acid is often called 'the anti-stress vitamin'.

C) INTESTINAL FUNCTION

A deficiency in pantothenic acid can lead to chronic constipation. Among other things, this nutrient is required for synthesis of acetylcholine, a neurotransmitter involved in peristaltic action of the intestinal muscles. Therefore it is not surprising that pantothenic acid has demonstrated effectiveness in clinical trials for treatment of chronic constipation and paralytic ileus (paralysis of intestinal muscles involved in peristalsis). It may also be of value in helping to overcome laxative dependence. Please note: For any of these purposes, it may be most useful if taken with phosphatidylcholine, the primary nutrient required in acetylcholine synthesis.

D) ANTI-ARTHRITIC

Research suggests that pantothenic acid supplementation may be of therapeutic value in relieving symptoms of rheumatoid arthritis. In one particular trial, after two months of therapy with 500mg 4 times per day, rheumatoid arthritis patients reported a significant reduction morning stiffness, pain severity and degree of disability.

Please note: It is worth noting that the same study reported no significant benefit in osteoarthritis patients.

E) LIPID-LOWERING (*pantethine only*)

Scientific investigation confirms that pantethine, the stable form of vitamin B5's intermediate metabolite pantotheine, significantly lowers total cholesterol, LDL (bad) cholesterol and triglycerides, while raising HDL (good) cholesterol.

Please note: Although pantothenic acid converts into pantotheine, pantothenic acid supplementation has little or no effect on cholesterol or triglycerides (the reason for this is unclear at present).

Potential Applications

- Stress
- 'Adrenal exhaustion'
- Chronic fatigue
- Physical endurance
- Chronic constipation and laxative dependence
- Rheumatoid arthritis
- Lupus erythematosus

- High cholesterol and triglycerides (*pantetine only*)

Typical Supplemental Dosage Range

10-500mg per day

Common Food Sources

- Brewer's yeast
- Liver
- Nuts
- Soybeans
- Fish
- Milk
- Poultry
- Whole grains

Contraindications/Drug Interactions

- No known toxicity for levels found in supplements.
- High doses may decrease the effectiveness of the drug levodopa in Parkinson's Disease (however it appears that carbidopa-levodopa is not adversely influenced in this way).
- High doses should be avoided by haemophiliacs unless under medical supervision.
- Acetylcholine-elevating supplements should be avoided in clinical (non-bipolar) depression unless medically supervised, as they may deepen depression in some cases. Though this concern is mentioned more commonly in reference to choline and phosphatidylcholine, it may be advisable to also avoid high doses of pantothenic acid in such cases unless medically supervised.
- High doses of single B-vitamins may deplete other B-vitamins; therefore if high doses are required, supplementation with a multivitamin or B-complex is advised.

Passion Flower (passiflora)

passiflora incarnata

A) SEDATIVE

The historical use of passion flower as a natural sedative is backed up by research suggesting a beneficial effect on sleep patterns (e.g. enhancing sleep quality and duration). Particularly encouraging is the fact that like other herbal sedatives, passion flower treats insomnia without dependency and without side effects such as stupor, depression and confusion, which often occur with sedative drugs.

B) NERVE RELAXANT

Due to what scientists have confirmed to be a rather complex action on the central nervous system, passion flower is also a useful remedy during the day for nervous tension, irritability and related symptoms. Studies confirm a marked anti-anxiety effect.

C) ANTI-SPASMODIC

The impact of passion flower on the nervous system includes a spasm-reducing influence on smooth muscle tissue and an ability to reduce locomotor activity.

D) VASODILATOR

The normalising action on smooth muscle appears to facilitate a vasodilatory response in the blood vessels. This would suggest a potential benefit in cases of high blood pressure, especially in cases that are being exacerbated by chronic stress or nervous tension.

E) ANALGESIC

As is often the case with herbs that demonstrate both nerve-calming and antispasmodic effects, passion flower has also been shown to provide a measurable reduction in pain.

Potential Applications of Passion Flower:

- insomnia
- anxiety
- irritability
- nervous tension
- muscle spasms

- irritable bowel syndrome
- hypertension
- asthma (due to bronchial spasm)

Principle actives:

Flavonoids

Contraindications/Drug Interactions:

Do NOT use during pregnancy.

Caution with central nervous system depressants and MAOIs - check with doctor.

Passion Flower

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 Pan d'Arco (lapacho, taheebo)
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Pau d'Arco (lapacho, taheebo)

tabebuia avellanedae

A) ANTI-MICROBIAL

Studies have shown that the active naphthoquinones in pau d'arco exert strong bactericidal and fungicidal activity. These compounds are particularly active against pathogens such as *Candida albicans* and *trichophyton mentagrophtes*. Not surprisingly, pau d'arco is one of the most popular treatments for candidiasis infections in natural medicine.

B) ANTI-PARASITIC

Lapachol, the key active component has demonstrated a significant activity against a number of disease-causing parasites.

Potential Applications of Pau a" Arco

- fungal infections (e.g. *Candida albicans*)
- bacterial infections
- parasitic infections

Principle actives

Naphthoquinones (e.g. lapachol)

Contraindications/Drug Interactions

Not recommended in high doses in cases of excessive bleeding or when taking prescribed anti-coagulant drugs such as warfarin.

Peppermint

Mentha x piperita

A) ANTI-SPASMODIC

In digestive conditions such as irritable bowel syndrome it is common for the smooth muscle of the intestinal tract to be in a state of spasm. Active constituents within peppermint appear to block the influx of calcium into muscle tissue, thereby preventing the involuntary contractions associated with intestinal muscle spasms.

B) CARMINATIVE

Carminative substances promote the elimination of intestinal gas. Research indicates that peppermint has carminative properties, which are thought to be attributable to relaxation of the esophageal sphincter.

C) CHOLERETIC

Choleretic substances stimulate the release of bile by the liver. Bile has several important digestive functions. Bicarbonates in bile act to neutralise the acidity of the chyme (food mixed with stomach secretions) that enters the small intestine from the stomach. In addition bile contains lecithin which is necessary for the emulsification of

fats.

D) GALLSTONES

Gallstones generally occur when levels of cholesterol contained in the bile are excessive. The result is the formation of deposits, known as stones, in either the gallbladder itself or the bile ducts. Research suggests that menthol, a major active compound within peppermint, may be helpful in the prevention and treatment of gallstones. Menthol has been shown to help dissolve gallstones by lower concentrations of cholesterol in bile, whilst increasing concentrations of lecithin and bile salts, both of which are required for the effective breakdown of fats.

Potential health applications of peppermint

- Indigestion
- Intestinal gas
- Irritable bowel syndrome
- Gastrointestinal spasm
- Gastritis
- Gallstones

Principal actives

Essential oil (Menthol, menthone)

Contraindications/Drug Interactions

Those suffering from gallstones must consult their physician before undertaking supplementation with peppermint. Peppermint may increase stomach acid secretion and should therefore NOT be used by those suffering from stomach or duodenal ulcers.

L-Phenylalanine & DL-Phenylalanine (DLPA)

A) ANTI-DEPRESSANT

Researchers have found that 10-15 percent of depressed patients have low plasma levels of phenylalanine. Two double-blind comparative studies reported that phenylalanine was as effective as the antidepressant medication Imipramine. Phenylalanine is a precursor to the mood elevating compound dopamine (which is found to be low in some depressed patients). It also enhances other mood enhancing chemicals such as PEA and endorphins.

B) PAIN RELIEVER

DLPA has been shown in research to be an effective reliever of pain, especially chronic pain associated with osteoarthritis, rheumatoid arthritis, back pain, menstrual cramps and migraine headaches. DLPA appears to prevent the actions of a pain-inducing protein called enkephalinase, while also elevating morphine-like endorphins in the brain. In one study arthritis patients given 375mg of DLPA daily reported good to complete pain relief within a period of one week to one month.

C) MENTAL ALERTNESS

Aside from dopamine, DLPA converts into other stimulatory brain chemicals, such as noradrenaline (norepinephrine), which may ultimately enhance mental alertness.

D) APPETITE CONTROL

CCK (cholecystokinin) is an intestinal hormone that signals the brain to feel satisfied when enough food is consumed. Phenylalanine governs the release of CCK and as such, is thought to act as an appetite suppressant.

E) PREMENSTRUAL SYNDROME

A study compared phenylalanine with placebo treatment for women who had premenstrually depressed mood. Phenylalanine was shown to alleviate several psychological and emotional symptoms associated with PMS.

Potential Applications of L-phenylalanine:

- Depression
- Mental fatigue
- Chronic pain relief
- Appetite reduction
- Premenstrual syndrome

Typical intake range for DLPA and L-Phenylalanine:

500-2000 mg per day (taken on an empty stomach)

Food sources

Soybeans, cottage cheese, fish, meat, poultry, almonds, brazil nuts, pecans, pumpkin, sesame seeds, chickpeas, lentils

Contraindications/Drug Interactions:

- Combined use with antipsychotic drugs may increase the risk of developing tardive dyskinesia.
- Phenylalanine may cause hypertension if taken with MAOAs.
- PKU sufferers should avoid.
- Should be avoided by pregnant women and nursing mothers.

Phenylalanine & DLPA

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Phosphatidylserine (PS)

Phosphatidylserine belongs to a class of fat-soluble compounds called phospholipids, which are essential components of cell membranes. High concentrations of phospholipids are found in the brain, the most abundant of which is phosphatidylserine.

A) ADRENAL STRESS

Cortisol is a vital stress hormone with many functions in the body. However, too much can be produced under constant stress, until the adrenal glands start to become exhausted. Phosphatidylserine can reduce cortisol secretion in response to stress, by helping the hypothalamic and pituitary membranes regain their sensitivity and ability to suppress excess adrenal output.

B) MENTAL ENHANCEMENT

This important phospholipid has been shown to improve memory and mental acuity in both young and older adults. The effects are due to multiple functions including enhancing cell membrane fluidity, increasing the number of acetylcholine receptors, keeping fatty substances in the brain in a soluble state and helping to 'untangle' nerve pathways in the brain.

C) ANTI-DEPRESSANT

Mood elevation was noted in studies on both young and elderly adults, and appears to be primarily associated with the ability of phosphatidylserine to enhance neurotransmitter activity.

D) MUSCLE REPAIR AND BUILDING

Phosphatidylserine lowers excess levels of cortisol, a catabolic hormone that can speed the breakdown of muscle tissue.

Potential health applications of Phosphatidylserine

- senile dementia
- Alzheimer's Disease
- excessive mental stress or mental fatigue
- depression (especially in the elderly)
- poor memory
- sports nutrition

Contraindications/Drug Interactions

Do not use if taking prescribed anti-coagulant drugs such as warfarin without the consent of a qualified medical health practitioner.

Phosphatidylserine

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Phosphorus

A) ENZYME ACTIVATION AND ENERGY METABOLISM

Phosphorus plays a major part in the body's biochemistry; in fact, it participates to varying degrees in every metabolic reaction within cells. Among the most important of its functions, phosphorus is needed for the activation of several enzymes, including those that are responsible for the metabolism of carbohydrates, fats and proteins into energy. This mineral is also needed for the activation of B vitamins, several of which are also critical to cellular metabolism and energy release from foods.

B) PHOSPHOLIPID FORMATION AND CELL MEMBRANE STRUCTURE

The second most abundant mineral in the body, phosphorus is an essential structural constituent of cells. In particular, phosphorus is bound to other components such as fats to form phospholipids (i.e. lecithin, phosphatidylserine). Among other functions, phospholipids represent a major part of most cell membranes. Nutrients are transported into and out of the cells via the portion of the membranes of which phosphorus is a component. Although all cells depend on the presence of phosphorus within cell membranes, it is especially critical within the nervous system. Certain phospholipids (i.e. lecithin) emulsify fatty compounds such as cholesterol, as well as facilitating their transport in the watery parts of the body.

C) CALCIUM METABOLISM AND BALANCE AND SKELETAL HEALTH

Skeletal tissue (bones and teeth) contains approximately 99% of the body's calcium and 85% of the body's phosphorus. When the phosphorus and calcium bind to one another, calcium phosphate is formed, which maintains the hardness, strength and structural integrity of skeletal tissue. Healthy bone tissue is not inert - it is constantly being built up and broken down in order to ensure a balance between proper skeletal integrity and blood calcium levels. Calcium maintains bone density not only by its role in the structural composition, but also by stimulating the release of the thyroid hormone calcitonin. Calcitonin causes calcium to be taken from the blood to replenish levels in bone tissue. Calcium's influence on calcitonin is intended to work in balance with phosphorus, which stimulates parathyroid hormone release. Parathyroid hormone causes calcium to be taken from the bone in order to elevate blood calcium levels. Other than the influence of calcitonin and parathyroid hormone, the kidneys are to a great extent responsible for regulating calcium and phosphorus levels (i.e. through influencing the rates of calcium reabsorption and urinary excretion of phosphorus).

Potential Applications

- Maintaining proper cellular function
- Maintaining optimal metabolism
- Maintaining phospholipid formation
- Maintaining proper cellular integrity
- Maintaining proper cellular nutrient transport
- Maintaining proper calcium balance

Typical Supplemental Dosage Range

• *Please note: phosphorus is found in all foods (and in especially liberal quantities in animal foods) and is typically consumed in excessive quantities in proportion to calcium intake. Therefore supplementation is seldom required. It is normally recommended to consume phosphorus in daily amounts that are similar to one's daily intake of calcium. If phosphorus supplementation is used, it is recommended that, when combined with one's dietary intake, it does not exceed the daily intake of calcium from both diet and/or supplements.*

Common Food Sources

Though phosphorus is found in all foods, below are some of those with the most liberal quantities:

- Carbonated soft drinks
- Meat
- Poultry
- Fish
- Eggs
- Dairy products
- Soybeans
- Whole grains
- Nuts and seeds
- Beans and legumes

Contraindications/Drug Interactions

- Unfortunately, excessive dietary phosphorus is the rule rather than the exception in the typical 'western diet'. What constitutes an excessive phosphorus intake depends to a great extent on one's calcium intake. In other words, if one's daily calcium intake typically falls within, for example, the 800-1000mg range, then one's daily phosphorus intake should preferably also fall within 800-1000mg. There are various estimates as to the typical ratio of phosphorus to calcium in those with a typical western diet. The average ratio would appear to fall between 2:1 and 4:1 phosphorus to calcium. Non-vegetarians are especially prone to severe phosphorus imbalances - in fact, red meat contains approximately 15-25 times more phosphorus than calcium. Not surprisingly, vegetarians have a much lower incidence of osteoporosis - a fact which helps underline the importance of keeping phosphorus intake more or less in proportion to calcium.
- Excessive phosphorus intake can adversely affect calcium balance and utilization, thereby increasing the risk of developing calcium deficiency signs and symptoms.
- Excessive phosphorus intake over an extended period may lead to a reduction in bone density and possibly increase one's risk of developing osteoporosis.

Phosphorus

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Phytosterols

Phytosterols are plant compounds that have similar chemical structure and biological functions as cholesterol. Phytosterols are naturally found in a variety of whole grains, legumes, nuts, seeds, fruits and vegetables as well as vegetable oils in very small amounts. More than 40 sterols have been identified from plants of which beta-sitosterol, stigmasterol and campesterol are the most abundant. Beta-sitosterol comprises 50% of all dietary phytosterols.

A) CHOLESTEROL

The cholesterol-lowering effect of phytosterols was recognised in the 1950s and since this time many trials have confirmed that phytosterols, whether taken in fortified foods

or as dietary supplements, have the ability to reduce LDL and total cholesterol, whilst importantly not decreasing protective HDL levels. As the molecular structure of phytosterols is almost identical to cholesterol, the body is unable to tell the difference, thus phytosterols are readily accepted at the cholesterol absorption sites, where they are absorbed in place of cholesterol. As there are limited numbers of receptors for cholesterol attachment and absorption, phytosterols are able to physically block the cholesterol and prevent the body from absorbing it. Furthermore, it appears that phytosterols inhibit the re-absorption of cholesterol from bile acids in the digestive process, thus reducing the amount of cholesterol entering the bloodstream. The blood LDL cholesterol-lowering effect of phytosterols appears to be established within the first 2-3 weeks of use and appear to be effective both in the short- and long-term, with studies as short as 3 weeks and as long as 85 weeks showing a significant reduction in cholesterol after supplementation with phytosterols. One study on 60 volunteers with normal cholesterol found that supplementing their diet with 2.1g phytosterols daily for 3 weeks reduced their total cholesterol by 9% and their LDL cholesterol by 5%

B) INFLAMMATION

In one clinical trial, 55 healthy adults were assigned one of three diets: a diet low in saturated fat, the same diet plus a cholesterol-lowering statin drug, or the same diet plus increased amounts of plant sterols, viscous fibre, soy protein, and nuts. C-reactive protein (CRP) levels (an important marker for inflammation) was monitored. After one month, serum CRP levels in all groups were reduced. In the low-fat diet group, CRP dropped 10%. Those who consumed a low-fat diet enriched with plant sterols and fibres achieved a 28% reduction in CRP - only marginally less than the 33% drop seen in those taking a powerful statin drug.

C) PROSTATE HEALTH

According to the Linus Pauling Institute, preliminary studies suggest that sterols may play a role in the managements of symptoms arising from benign prostatic hyperplasia (BPH), or enlargement of the prostate. In a six-month study of 200 men with symptomatic BPH, 60 mg/d of a beta-sitosterol preparation improved symptom scores, increased peak urinary flow and decreased post-void residual urine volume compared to placebo. A follow-up study reported that these improvements were maintained for up to 18 months in the 38 participants who continued beta-sitosterol treatment after the study ended. Similarly, in a six-month study of 177 men with symptomatic BPH, 130 mg/d of a different beta-sitosterol preparation improved urinary symptom scores, increased peak flow and decreased post-void residual volume compared to placebo. A systematic review that combined the results of those and two other controlled clinical trials found that beta-sitosterol extracts increased peak urinary flow by an average of 3.9 ml/second and decreased post-void residual volume by an average of 29 ml.

Potential Applications of Phytosterols:

- Cholesterol
- Cardiovascular health
- Inflammation
- Prostate health

Typical Intake Range:

- 2000 - 2500mg per day

Contraindications/drug interactions

Concomitant use with cholesterol lowering drugs under medical supervision only.

Pomegranate

punica granatum

A) ANTI-MICROBIAL

Pomegranate contains a variety of compounds including ellagic acid and alkaloids, which have been shown to inhibit pathogenic bacteria, viruses and fungi. In fact, with respect to the anti-fungal properties researchers have demonstrated complete inhibition of infectivity.

B) LIVER PROTECTIVE

Pomegranate extracts have the ability to increase phase II detoxification enzymes (glutathione-S-transferase) in the liver. Ellagic acid has been shown to protect the liver from chemically induced toxicity and to help restore proper liver function.

C) CARDIOVASCULAR HEALTH

Numerous studies have demonstrated the cardio-protective properties of the antioxidants found in pomegranate. In one study published by the American Journal of cardiologists, 45 patients with ischemic heart disease (in which not enough blood gets to the heart muscle) were given either 8 ounces of pomegranate juice or placebo over a period of three months. Those who took the pomegranate juice had significantly less oxygen deficiency to the heart during exercise, suggesting increased blood flow to the heart. Pomegranate juice has shown the ability to inhibit the oxidation of LDL cholesterol- a process that contributes to atherosclerosis. By neutralizing free radicals, the antioxidants within pomegranate juice may be effective in the prevention of plaque within the arteries. One study showed a 30% reduction in arterial plaque in patients given pomegranate juice. Additionally, according to some researchers, pomegranate juice may also reduce plaque that has already built up in blood vessels. Nitric oxide is a chemical compound that acts as an important signalling molecule in the body. It signals the smooth muscle fibres to relax, which improves circulation. This action may be especially relevant in preventing conditions such as hypertension and congestive heart failure (CHF). Research has found that pomegranate juice may help to preserve the body's levels of nitric oxide, thereby maintaining healthy blood vessels and increasing blood flow to the heart.

Potential Applications of Pomegranate:

- fungal infections (e.g. *Candida albicans*)
- bacterial infections
- viral infections (e.g. common cold, influenza, herpes)
- liver toxicity
- jaundice
- hepatitis
- general liver support

Principle actives:

Ellagic acid

Contra-indications: None noted.

Pomegranate

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Potassium

A) FLUID BALANCE AND SODIUM REGULATION

The vast majority (approximately 98%) of the potassium in the body is found within the cells. Intracellular potassium maintains a proper balance in the fluid concentrations within cells. This is accomplished by regulating the quantities of sodium that can enter cells. Most of the sodium in the body functions in the extracellular regions. Among other things, sodium helps maintain proper volume of body fluids. However, if the intracellular level of sodium becomes excessive, fluid retention can occur and the cells can become damaged or even destroyed through fluid engorgement. An increase in potassium and reduction in sodium intake can help reduce such a cellular imbalance. However, in some individuals the cells remain relatively unresponsive to manipulation of sodium and potassium intake alone. When this occurs, it is often due to a deficiency in magnesium; magnesium triggers a mechanism which pumps sodium out of the cells

and potassium into the cells. As a result, when there is an excess of intracellular sodium and commensurate lack of cellular potassium it is often recommended that magnesium supplementation is combined with an increased potassium intake and lower sodium intake.

B) NEUROMUSCULAR HEALTH AND FUNCTION

Like magnesium and calcium, potassium is essential for proper function of the nerves and muscles. Potassium works with sodium to trigger nerve impulses by influencing cellular 'electricity'. Among other relevant functions, both calcium and magnesium influence the neurological chemical messengers (neurotransmitters) that ensure proper nerve transmission. When a nerve is stimulated by neurotransmitters, potassium leaves the cell and sodium enters. The electrical charge that results from this electrolyte exchange conducts impulses down the nerve axon, which in turn can trigger muscle contraction. Potassium deficiency also impairs storage of glycogen (the form of glucose that fuels muscle function), which not surprisingly can lead to muscle fatigue, weakness and poor muscular performance. The influence of potassium on muscle function, sodium balance and glycogen storage is especially important to the health of the heart and blood vessels (see **CARDIOVASCULAR HEALTH AND FUNCTION** below).

C) CARDIOVASCULAR HEALTH AND FUNCTION

The beneficial effect of potassium on cardiovascular health primarily stems from its influence on regulation of muscle contraction and fluid levels. As mentioned above, potassium boosts muscle glycogen storage and helps trigger nerve impulses that stimulate muscle contraction. In this respect, this mineral is necessary for vascular contraction and a cardiac pumping action that is strong and efficient. This may help explain the strong association between potassium deficiency and conditions such as heart arrhythmias and congestive heart failure. The ability of potassium to reduce fluid retention can generally influence cardiovascular health, but is especially pivotal in the maintenance of normal blood pressure. There is a strong scientific correlation between potassium and sodium status and blood pressure. This is not only the case in individuals with cardiovascular disease or a history of hypertension. One interesting crossover study of men with normal blood pressure showed that a manipulation of dietary potassium and sodium intake had a substantial impact on blood pressure. When the men were put on a low potassium diet they experienced a significant increase in blood pressure compared to when they were consuming the normal potassium diet.

They were given a loading dose of sodium at a particular stage while consuming both the low and normal potassium diet. It is worth noting that the infusion of sodium further raised the blood pressure during the low potassium diet but not during the normal potassium phase. It is also interesting to note that the influence of potassium balance on blood pressure is not restricted to adults. A 1990 study of 233 children showed (over an average observational period of seven years) that blood pressure was measurably higher during the periods when their potassium intakes were lower.

Please note: Although manipulating potassium and sodium intake can provide considerable benefit in blood pressure control, research exclusively employing potassium supplements has led to mixed results. Reviews of this research suggest that when sodium is not being restricted, potassium supplements are more likely to be effective in black people than white people. Though sodium restriction is warranted in both groups, many (if not most) hypertensive people are not sodium sensitive (i.e. their blood pressure is not significantly affected by manipulation of sodium intake alone). In any case, it would seem prudent for both black and white people with hypertension to both decrease sodium intake and increase potassium intake.

D) STRESS PROTECTION

The body's response to stress (controlled by adrenal hormones) has three main phases - alarm, resistance and exhaustion. After the short-lived alarm phase, the resistance phase allows the body's stress adaptation to be maintained for longer periods.

Unfortunately, the hormonal response to this phase (especially aldosterone release)

causes a significant depletion of cellular potassium and retention of sodium - one of the main factors leading to the symptoms associated with the exhaustion phase of stress. Especially in individuals who experience chronic stress, the long-term depletion of potassium can lead to fatigue and exhaustion, hypertension and other cardiovascular problems, neurological and muscular problems, etc. Replacement of potassium stores is critical to counteracting the long-term negative health implications of chronic stress.

Potential Applications

- Cardiovascular health - general (see Contraindications/Cautions below)
- High blood pressure
- Fluid retention
- Fatigue
- Exhaustion
- Muscle weakness
- Sports nutrition
- Stress

Typical Supplemental Dosage Range

- 50-99mg elemental potassium per day *

Common Food Sources

Bananas
Oranges
Avocado
Potatoes
Lima beans
Plums
Mushrooms
Watercress
Parsley

** Although a supplemental daily dosage of 50-99mg per day bears no resemblance to the recommended dietary intake range of 2000-5000mg per day, certain governments restrict the amounts of potassium that can be put into a dietary supplement. This is evidently due to the concerns regarding potential side effects and toxicity of high doses of potassium salts (see **Contraindications/Cautions** below).*

*** What constitutes an optimal intake of potassium depends greatly on one's intake of sodium, and vice versa. Although there is no official RDA for either potassium or sodium, many experts recommend that they be consumed in a ratio of at least 5:1 potassium to sodium (some believe that even higher potassium is better still for optimal health). Unfortunately, the typical 'western' diet contains more sodium than potassium. Although recommendations vary, it is often suggested that adult dietary consumption of potassium fall between approx. 2000-5000mg per day, with a sodium intake of between 500-1000mg per day. Exceptions include those who lose significantly higher than average amounts of one or both minerals, such as through heavy perspiration, strenuous exercise, diarrhoea, potassium-draining diuretics, laxatives, severe stress, etc.*

Contraindications/Drug Interactions

- Patients with kidney disease should not take potassium unless on the advice and under the strict monitoring of their physician.
- Especially in those with defects in potassium excretion (i.e. kidney disease), potassium toxicity can lead to muscle weakness, appetite loss, hypotension, paralysis of legs and/or arms, irregular heart beat, coma or even fatal renal or cardiac failure.
- For the average person, potassium toxicity may occur if dietary intake and/or supplemental daily intake exceeds 18 grams (18,000mg.), although it is worth noting that potassium toxicity is very rare in individuals with normal renal

function.

- Unless on the advice and under the strict monitoring of a physician, very high doses are also not recommended in patients with digestive system ulcers, intestinal obstruction, severe dehydration, serious burns, heart blockage or Addison's Disease.
- High doses of potassium should not be used by people taking ACE inhibitor medication, potassium-sparing diuretics, NSAIDs (especially in the elderly), heparin or trimethoprim/ sulfamethoxazole unless on the advice and under the strict monitoring of a physician.
- There are reports that the drug haloperidol may either raise or lower potassium levels; potassium status should be checked prior to increasing potassium intake if taking haloperidol.
- Supplements or medications containing high doses of potassium salts (potassium chloride, etc) may in some people cause abdominal cramping, diarrhoea, nausea and/or vomiting. Digestive ulcers may also occur, especially in those taking high doses of modified-release potassium. Such symptoms will generally not occur with equivalent amounts of potassium from food sources.

Potassium

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Pollen (Bee)

Bee pollen is the male reproductive part of flowering plants. Harvested by the female worker bee, it is collected as she returns to the hive, through a series of screens/fine brushes. These gently remove pollen from the containers on the bees legs, without hurting the insect.

A) MULTINUTRIENT

Pollen is rich in vitamin A and the B complex vitamins. It is also high in protein (20-25%) providing 20 amino acids. Minerals, enzymes, trace elements and other vitamins are also found in lesser amounts.

B) ENERGY

Simple and complex carbohydrates are also present in bee pollen and provide a shortterm energy boost as well as sustained levels for endurance.

C) STAMINA AND ENDURANCE

Used by many sports enthusiasts in the belief that it increases stamina and endurance, this is partly due to increased production of haemoglobin (studies have shown an increase of up to 30% in bee pollen takers), leading to a higher level of oxygenation in the blood.

D) RECOVERY

Subjects in a double blind study showed decreased recovery time between hard physical efforts.

Potential health applications of Bee Pollen

- nutritional support during convalescence
- energy production
- sports
- altitude sickness

Contraindications/Drug Interactions

None noted apart from allergy

Pollen (Bee)

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Potassium/Magnesium Aspartates

A) ENERGY ENHANCEMENT

Studies show that supplementing with aspartates of potassium and magnesium may be beneficial in the relief of chronic fatigue. Magnesium is required for the production of the energy molecule ATP and potassium is necessary for the proper function of nerves and muscles. Deficiency of either mineral is associated with fatigue. In addition, aspartic acid itself is involved in the cellular energy (Krebs) cycle. One study of over 2,000 people found that 80% of those treated with potassium magnesium aspartate reported relief from fatigue, compared to approximately 20% reporting improvement with the placebo. Another study found 85% of subjects taking potassium magnesium aspartate reported an increase in strength and physical activity compared to just 9% of those taking placebo.

B) CARDIOVASCULAR DISEASE

Both potassium and magnesium are essential for the proper functioning of the entire cardiovascular system, and intra-cellular deficiencies are common in heart disease. Potassium, magnesium and aspartic acid are required for the electrochemical events that control muscles and nerves, and magnesium and aspartic acid are involved in energy production within the heart. Improvements in heart rate and reduction in arrhythmias have been reported in studies using potassium and magnesium. Researchers have also found that potassium/ magnesium aspartate may be particularly useful in reducing the risk of heart attack. Magnesium is also necessary for proper muscle relaxation that may help to promote dilation of arteries (including coronary arteries) and therefore improve blood flow and oxygen delivery to the heart and extremities. Potassium magnesium aspartate supplementation may therefore be of use in a variety of cardiovascular disorders including angina, cardiomyopathy, arrhythmia, angina and congestive heart failure, potential benefits for high blood pressure.

Potential health applications of Potassium Magnesium Aspartate

- chronic fatigue syndrome / ME
- general tiredness and low energy
- cardiovascular health
- heart attack
- heart arrhythmia
- angina

Contraindications/Drug Interactions

None noted.

Potassium/Magnesium Aspartate

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Oligomeric Proanthocyanidins

OPC's are combinations of flavonoids that occur together in various plants. There are thousands of flavonoids that have been categorised to date, these compounds are largely responsible for the colours of fruits and vegetables and provide protection against oxidative and free radical damage. OPC's are predominantly found in purple/blue fruits and vegetables.

A) ANTIOXIDANT/FREE RADICAL SCAVENGER

Research suggests that proanthocyanidins scavenge certain common free radicals 50 times more effectively than vitamin E, and 20 times more effectively than vitamin C. OPC's also protect vitamin C and carotenoids in the body, which in turn protect and recycle vitamin E in body tissues.

B) ANTICOAGULANT

Research showed that a single dose of 100 to 120mg of Pycnogenol, compared to 500mg of aspirin, demonstrated a similar effect in reducing blood clotting. However, Pycnogenol did not increase bleeding, whereas aspirin did.

C) COLLAGEN BINDING AND STABILISING

OPC's bind to collagen, the main protein in connective tissue, and maintain or restore its flexibility and integrity. Collagen is a primary component of the skin, blood vessels, joint tissues, respiratory tract, intestinal tract, etc.

D) ANTI-INFLAMMATORY

There are various avenues whereby OPC's may reduce or prevent inflammation. For example, they inhibit the release or production of histamine and inflammatory prostaglandins and enzymes. Free radicals can also trigger inflammation, so the antioxidant effect of OPC's is beneficial in this respect too.

E) ANTI-ALLERGIC

OPC's may reduce allergic reactions, in part, by inhibiting histamine, the compound most associated with allergic reactions. The ability of OPC's to strengthen collagen may reduce the susceptibility of tissues to allergic processes.

F) ENHANCES VITAMIN C

Flavonoids such as OPC's protect vitamin C in the body and appear to aid the entry of vitamin C into cells.

G) PROTECTS CAPILLARIES

OPC's inhibit excessive permeability (leakiness) of capillaries by virtue of a collagen strengthening effect, helping to reduce easy bruising and the appearance of thread veins. This effect also makes general circulation more efficient, which can help to reduce problems such as oedema.

Potential health applications of Oligomeric Proanthocyanidins

- protection against heart disease
- vascular disorders (e.g. varicose veins, phlebitis, haemorrhoids)
- improved circulation
- arthritis
- allergic reactions (e.g. hay fever, food allergies)
- protecting the skin from wrinkles and lack of elasticity (anti aging)
- promotion of healing
- possible protection against eye disorders by improvement of micro-circulation in the eye (e.g. cataracts, macular degeneration, diabetic retinopathy)
- prevention and treatment of oedema
- anti clotting without increased bleeding
- reducing bruising and thread veins
- can be added to creams, as topical application appears to have anti-aging and collagen strengthening effects as well

Common supplemental sources of OPC's

PYCNOGENOL/PINE BARK EXTRACT

Pycnogenol is a patented extract of French Maritime Pine (*pinus maritima*). Generic pine bark extracts are also available which have very similar concentrations of OPC's compared to Pycnogenol, although there will be some variance in the levels of the many compounds found in the different extracts. The OPC concentration of Pycnogenol and certain generic extracts is approximately 65-75%.

GRAPE SEED EXTRACT

Much of the research into OPC's utilised extracts of grape seeds. Grape seed extracts can be found commercially with OPC concentrations up to about 80%. They are rich in several Proanthocyanidin B compounds, which are not found in pine bark extracts.

Contraindications/Drug Interactions

Pycnogenol/Pine Bark - none noted, although it may be best to be cautious with warfarin.

Grapeseed Extract - in theory, the same caution as above.

Oligomeric Proanthocyanidins

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Probiotics

A) DYSBIOSIS

A healthy gut will comprise up to 1 kg of beneficial bacteria. They feed on indigestible fibres and in doing so provide energy, immune compounds and a healthy intestinal environment. Inappropriate diet or incomplete breakdown of food may lead to the proliferation of undesirable bacteria, a condition known as dysbiosis.

Proliferation of 'bad' bacteria can lead to a number of digestive conditions including irritable bowel syndrome, diarrhoea, allergy, flatulence and bloating. In contrast, beneficial bacteria are responsible for the production of various acids such as butyric acid, which is a direct source of metabolic fuel for the cells lining the gastrointestinal tract. Research shows that supplementation with probiotics can promote a healthy intestinal environment. In a study involving 100 people with IBS, over 75% of the patients given probiotic supplements reported significant improvements compared with 27% of those using antispasmodic medication.

B) DIGESTIVE FUNCTION

Lactobacilli bacteria have the capacity to break down proteins and fats into their component parts, as well as lactose, the sugar found in dairy products. This can be especially helpful in those people who lack the lactase enzyme and therefore suffer from lactose intolerance.

C) ANTI-MICROBIAL

Through the fermentation of fibre in the gastrointestinal tract, probiotics are able to produce various organic acids. These acids have the effect of reducing the pH (increasing the acidity) of the intestines and as such make the environment undesirable for resident and non-resident pathogenic bacteria, parasites and yeasts. In addition, probiotics produce hydrogen peroxide, a potent antibiotic substance that further prevents the proliferation of harmful bacteria and competes for implantation space on the intestinal wall.

D) POST-ANTIBIOTIC THERAPY

Antibiotic medication is prescribed to fight bacterial infections, however although they can be life-saving drugs in many instances, reduced levels of beneficial flora have been observed in patients following antibiotic therapy. Probiotic supplementation has been

shown to support levels of beneficial during and after antibiotic therapy.

E) CANDIDIASIS

Probiotic bacteria may control *Candida albicans* in the digestive tract through various properties such as; 1/ lowering the pH (raising the acidity) in the intestinal tract; 2/ competing with the *Candida* for food; 3/ competing with *Candida* for implantation space on the intestinal wall.

Potential health applications of probiotics

- Infectious diarrhoea (traveller's diarrhoea)
- IBS
- Constipation
- Diverticulitis
- Flatulence & bloating
- Coeliac disease
- Candidiasis
- Indigestion
- Intestinal permeability
- Parasites
- Bacterial dysbiosis
- Allergy

Contraindications/Drug Interactions

L. acidophilus and *L. bulgaricus* should not be given to children under 4 years.

Common probiotics found in supplements

LACTOBACILLUS ACIDOPHILUS

L. acidophilus is one of the most widely researched of all probiotic bacteria in relation to human health. It is a natural inhabitant of the small intestine, upper part of the colon, the mouth and the vagina. This micro-organism enhances lactose digestion and has the potential to inhibit the growth of pathogenic organisms, and inhibits the growth of *Candida albicans*.

BIFIDOBACTERIUM LACTIS

As with *L. acidophilus*, *B. lactis* has been widely researched for its benefits in human health. A natural inhabitant of the colon and lower part of the small intestine, these important bacteria tend to decline with age. They compete for implantation sites with pathogenic organisms and synthesise various organic acids that further promote a healthy intestinal environment. They also manufacture various B vitamins and are responsible for the formation of faeces.

BIFIDOBACTERIUM LONGUM

B. longum is another natural inhabitant of the large intestine. Along with other bifidobacteria such as *B. lactis* they prevent invading pathogens from colonising the intestine by competing for absorption sites and producing various acids that prevent the proliferation of unfriendly bacteria. They are also able to synthesise B vitamins.

BIFIDOBACTERIUM INFANTIS

Along with other bifidobacteria such as *B. lactis* and *B. longum*, *B. infantis* make up the majority of the flora in the large intestine of babies. They help to promote weight gain in babies and synthesise various B vitamins. They also produce lactic and other organic acids that inhibit pathogenic organisms by lowering the pH (raising the acidity) of the bowel.

LACTOBACILLUS BULGARICUS

L. bulgaricus is a transient (i.e. non-resident) strain of bacteria in the human intestine. It is important for the production of organic acids that lower the pH (raise the acidity) of the gut, making it an undesirable environment for unfriendly organisms. *L. bulgaricus* also produces lactase for the digestion of milk sugar.

STREPTOCOCCUS THERMOPHILUS

S. thermophilus is another well researched transient (non-resident) strain that produces lactic acid from the fermentation of dietary carbohydrates, resulting in lower pH and

therefore inhibition of undesirable organisms in the gut. This micro-organism also produces lactase for the digestion of milk sugar.

L-Proline

A) AGEING

The loss of collagen in the skin as a result of the ageing process is responsible for the appearance of wrinkles. Proline assists in the synthesis of collagen thereby improving the texture and appearance of the skin. It appears that the addition of vitamin C to proline enhances its skin protecting effects.

B) JOINT REPAIR

Proline is one of the most abundant compounds in the collagen structure of joint membranes.

C) TISSUE HEALING

Proline is necessary for collagen synthesis and repair, an important factor in healing of lesions, ulcers, burns or other forms of tissue injury.

D) CARDIOVASCULAR PROTECTION

The formation of lesions in the arteries can lead to atherosclerosis, a precursor to heart disease. Proline, through its role in collagen replacement, may inhibit breakdown of arterial collagen and speed the healing of existing arterial lesions.

Potential Applications of L-Proline:

- Arthritis
- Ageing
- Sports injuries (e.g. sprains, strains, etc.)
- Ulcers
- Burns
- Cardiovascular disease (e.g. atherosclerosis)

Typical intake range:

500-1500 mg per day (taken on an empty stomach)

Food sources

Cottage cheese, beef, soy protein, savoy cabbage, turkey, chicken, pork, lamb

Contraindications/Drug Interactions:

None known.

Proline

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Pueraria Mirifica

A) FEMALE HORMONAL TONIC

Pueraria mirifica (PM) contains several phytoestrogens including genestein and diadzein, but is the only known source of one particular phytonutrient called miroestrol. Miroestrol is similar to oestriol, the weakest of the three major oestrogens in the female body. Miroestrol occupies the body's oestrogen receptor sites. If the oestrogen level is high, miroestrol will compete with receptors, weakening the effects of the hormones. If the oestrogen level is low, miroestrol will exert its oestrogenic effect of potentiation. In clinical trials assessing the use of PM to relieve menopausal symptoms, every woman who participated experienced immediate positive results and after six months, every woman reported a decline in all symptoms. The symptoms assessed included hot flushes, night sweats, depression and loss of sex drive, amongst others. Daily occurrences of hot flushes were reduced from 2.1 to 0.5 per day, night sweats from 1.5 to 0.26, headaches from 2.03 to 0.8 and mood stability from 2.2 to 0.9. Sixteen other symptoms also improved accordingly. These results are more consistent than those gained with other phytoestrogens.

B) BREAST HEALTH

Researchers have found that the lowest rate of certain breast diseases in the known world was in Thailand's northern region where the herb Pueraria mirifica is widely

used. It is thought that because of miroestrol's structural similarity to oestriol, it has the ability to displace excessive levels of stronger and more potentially harmful oestrogens such as oestradiol. An interesting side effect found in clinical trials on PM was an enhancement in breast size and tone. In one study done in Tokyo, it was demonstrated that 72 percent of women taking PM exhibited significant increases in breast size. Younger women had a markedly higher success rate than older women.

C) FEMALE HORMONE BALANCE

Miroestrol has no effect on oestrogen levels in the body as it only influences the oestrogen receptor. Miroestrol occupies the body's oestrogen receptor sites. If the oestrogen level is high, miroestrol will compete with receptors, weakening the effects of the hormones. If the oestrogen level is low, miroestrol will exert its oestrogenic effect of potentiation. In theory, these actions may be of benefit to women with disorders linked to either high or low oestrogen levels. Although other phytonutrients operate in much the same way, miroestrol is significantly stronger.

Potential Application of Pueraria Mirifica

- Menopausal symptoms
- Breast health
- Female hormone balance

Principle actives:

Miroestrol

Contraindications/Drug interactions:

Do NOT use during pregnancy

Pueraria Mirifica

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Purple Corn

Purple corn (*Zea mays*) has been consumed by the people of the Peruvian Andes for thousands of years. It is the main ingredient of a refreshing beverage called chicha morada, which dates back to the Inca Empire and is reputed by native folklore to bestow good health to its drinkers. The kernels of this ancient plant are a dark purple seldom seen in the botanical kingdom.

A) ANTIOXIDANT/FREE RADICAL SCAVENGER

Purple corn is rich in phenolic compounds and anthocyanins. Cyanidin-3-O-β-D-glucoside or C3G is the most abundant anthocyanin in purple corn (and other blue/purple foods). To date, the radical scavenging/antioxidant capacity of C3G has been demonstrated in at least a dozen different assays. In one study, C3G came out on top when compared to 13 other anthocyanins in the ORAC (oxygen radical absorbance capacity) test, which evaluates antioxidant activity. The ORAC value was even higher than that found in fresh blueberries. Another study found that C3G was 40 times better than vitamin E in preventing damage caused by ultra violet light.

B) ANTI-INFLAMMATORY

Inflammation is a healthy immune response to infection or irritation that involves the mobilisation of white blood cells to the injured site. Cytokines are chemical messengers involved in signalling the immune cells to the site of inflammation. Unfortunately, these pro-inflammatory cytokines also release free radicals into the system, so sometimes their presence is less than helpful. CG3, one of the anthocyanins found in purple corn, has been shown to modulate pro-inflammatory cytokines and may therefore be of value in conditions characterised by chronic inflammation.

C) CHOLESTEROL REGULATION

The evidence for Purple Corn's ability to actually *reduce* cholesterol levels is ambiguous, however, anthocyanins, by their very nature promote blood flow and inhibit cholesterol synthesis. Research suggests that C3G may help to maintain

cholesterol levels that are already within a healthy range.

D) ARTERIAL PROTECTION

A mechanism by which atherosclerotic plaque accumulates on the walls of arteries is the oxidation of LDL cholesterol. Research has shown that C3G decreases the susceptibility of cholesterol and triglycerides to oxidation, which in turn supports the health of the arteries. Also, inflammation is an emerging trigger in heart disease; purple corn is a potent anti-inflammatory agent.

E) WEIGHT MANAGEMENT

Excess weight can diminish the body's ability to respond effectively to insulin. Since insulin regulates glucose and fat metabolism, being overweight can actually contribute to further weight gain. Preliminary studies suggest that C3G from purple corn may improve insulin resistance, induced by high dietary fat intake. Additionally, C3G may be helpful as part of a weight loss programme by altering fat cell gene expression.

Potential Applications of purple corn:

- protection for heart health
- vascular health (e.g. varicose veins, phlebitis, haemorrhoids)
- circulation
- joint health
- protecting the skin from wrinkles and lack of elasticity (anti aging)
- eye health (e.g. cataracts, macular degeneration, diabetic retinopathy)
- cholesterol protection
- weight loss

Contraindications/Drug Interactions:

None noted, although it may be best to be cautious with warfarin.

Purple Corn

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Quercetin

Widely distributed in the plant kingdom and the most abundant of the flavonoid molecules, quercetin is found in many foods, including apples, onions, tea, berries and brassica vegetables.

A) ANTI-INFLAMMATORY

Research has shown that quercetin inhibits the release of histamine by influencing two enzymes involved in its release from mast cells. Leukotriene synthesis is decreased through quercetin's effect on prostaglandins. These are the chemicals of inflammation.

B) PAIN RELIEVER

Compared to aspirin, quercetin has been found to relieve pain and stiffness naturally, whilst fortifying connective tissue. Unlike many glucocorticoids and drugs, quercetin does not cause damage to the gastrointestinal wall.

C) ALLERGIES

The inhibition of histamine release by quercetin, prevents leukotriene synthesis and reduces the production of inflammatory prostaglandins. These factors are involved in the allergic response.

D) ANTI-VIRAL

Shown to possess anti-viral properties, quercetin works by interfering with enzymes that breakdown the protective protein coat of a virus. Once this coat is removed the virus can then replicate and infect its host's cells. Quercetin has been shown to stunt the growth of the Herpes virus.

E) COLLAGEN STRENGTHENER

As a bioflavonoid, quercetin is helpful in supporting collagen structures and preventing

collagen destruction.

F) ANTIOXIDANT

Quercetin scavenges oxygen radicals and inhibits xanthine oxidase as well as inhibiting lipid peroxidation in vitro, this effect means that it also inhibits the harmful effect of oxidation of LDL cholesterol.

Potential health applications of Quercetin

- helps prevent easy bruising
- hayfever
- migraine headaches
- gout
- tendinitis & bursitis
- rheumatoid & osteo arthritis

Contraindications/Drug Interactions

None noted

Crohns disease and ulcerative colitis

antioxidant

inflammation

allergies

anti viral

Quercetin

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Red Clover

trifolium pratense

A) FEMALE HORMONAL TONIC

Red clover is a source of the phytoestrogenic isoflavones (e.g. biochanin A, genistein and daidzein), which are frequently employed to modify oestrogenic activity in the body due to their weak activity compared to human oestrogen and their ability to bind to oestrogen receptors in cells. If the levels of oestrogen are too high, the herb's comparatively weak phytoestrogenic isoflavones (1,000 times weaker) can occupy receptors that otherwise could have been occupied by the much stronger hormone. If the oestrogenic activity in the body is too low, phytoestrogens can exert a mild positive oestrogenic effect.

B) PROSTATE PROTECTIVE

As excessive oestrogenic activity is also associated with prostate dysfunction (such as enlarged prostate) the oestrogen-blocking capabilities of the herb's phytoestrogenic isoflavones (see above) are thought to be of potential benefit.

C) CELL PROTECTIVE

The phytoestrogenic isoflavones have been very thoroughly studied with respect to their potential cell-protecting abilities. The research suggests a number of relevant mechanisms for this protective effect, including inhibition of certain cell damaging agents (e.g. free radicals) and inhibition of adverse cellular changes.

D) ANTI-BACTERIAL

Laboratory tests on red clover have shown it to possess activity against a variety of pathogenic bacteria.

E) EXPECTORANT

Although research has yet to clearly elucidate the reasons for this use, one of the most prominent historical uses of red clover is as an expectorant in clearing respiratory congestion in cases of coughs and other bronchial conditions.

Potential Applications of Red Clover

- premenstrual tension (especially when associated with oestrogenic excess)
- enlarged prostate and other prostate disorders
- cellular protection
- coughs and general respiratory congestion
- bronchitis

Principle actives

Isoflavones (e.g. biochanin A, genistein, daidzein)

Contraindications/Drug Interactions

Best avoided in pregnancy

Caution with anticoagulants - check with doctor

Red Clover

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Resveratrol

A) AGEING

In recent years, resveratrol has been under scientific investigation for its role as an anti-ageing agent. Research has uncovered a family of proteins called sirtuins in humans that are involved in a number of important cellular processes, such as gene stability, DNA repair and apoptosis. Through these and other mechanisms, the research has also shown that sirtuins may serve as regulators of ageing and longevity in humans. Additional studies have demonstrated that resveratrol up-regulates metabolic regulators that increase lifespan. It also decreases markers associated with insulin resistance that are usually elevated with a high calorie diet. A dramatic reduction of calories (while optimising nutrients) has been shown to increase lifespan. Studies suggest that resveratrol may enhance longevity in a similar way, without the need for calorie restriction.

B) ANTIOXIDANT

Resveratrol's potent antioxidant activities are believed to be due to its protective effects on the cellular membranes. In one study, it was found that when certain body cells undergo lipid oxidation induced by iron and ethanol, the addition of resveratrol protects them from peroxidative stress and tissue damage.

C) CARDIOVASCULAR HEALTH

Much of the research into the effects of red wine has focused on its potential cardiovascular benefits. Resveratrol appears to prevent platelet aggregation (reduces excessive blood clotting), an action thought to be linked to the inhibition of compounds that promote platelet stickiness and vasoconstriction. Resveratrol has also demonstrated significant inhibition of LDL cholesterol oxidation, a major risk factor in heart disease.

ANTI-INFLAMMATORY

There is evidence of resveratrol's anti-inflammatory role in various health conditions, such as arthritis and atherosclerosis. The anti-inflammatory activity of resveratrol is partly due to its inhibition of the cyclooxygenases and partly due to its activity in detoxifying or slowing the production of harmful superoxide radicals.

Potential Applications of resveratrol

- Anti-ageing
- Cardiovascular health
- Antioxidant protection
- Inflammation

Typical Supplemental Dosage Range

100 - 200mg a day

Common Food Sources

- Grape seed
- Peanuts
- Red wine

Contraindications/Drug Interactions

Do not use when pregnant or breastfeeding. Not recommended for those prescribed anticoagulant Warfarin for cerebrovascular disease unless monitored by a qualified medical practitioner.

Resveratrol

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Rhodiola

rhodiola rosea

A) ADAPTOGENIC

Rhodiola increases tolerance to various stressors (e.g. mental, physical, environmental), in part by beneficially modifying the stress response. This herb acts predominantly on the hypothalamus in a way that normalises the manner in which the body responds to stress triggers. The enhancement of serotonin activity (see below) would also be of value in reducing anxiety-related symptoms associated with chronic stress.

BI ANTI-DEPRESSANT

Rhodiola's role in aiding depression is due to various factors. Active compounds in this herb (e.g. rosavin and salidroside) enhance the transport of serotonin precursors (tryptophan and 5-HTP) into the brain, and through an MAO/COMT inhibiting effect these compounds also reduce the degradation of mood-elevating neurotransmitters. With respect to serotonin, the studies show a 30% increase of levels in the brain. As stress accelerates the destruction of mood-boosting neurotransmitters, the adaptogenic effects of rhodiola would be additionally valuable.

C) MENTAL ENHANCER

Rhodiola intake may also boost learning and memory skills. Improvements have been shown even after 10 days treatment with rhodiola extract.

D) MALE SEXUAL TONIC

Rhodiola has traditionally been used as a tonic to enhance male sexual function. Subsequent research in the field has confirmed its therapeutic effect in certain sexual dysfunctions. For example, in one study involving men suffering from a weak erection and/or premature ejaculation, treatment with rhodiola extract led to substantial improvement in sexual function.

E) IMMUNE SUPPORTIVE

Research suggests that rhodiola's benefits extend to the immune system - a factor that combines especially well with its adaptogenic activity. Not surprisingly, it has been reported that rhodiola is particularly effective in aiding recovery after viral infection.

F) ANTIOXIDANT

The herb's active components are shown to be powerful antioxidants, especially protective against lipid peroxidation.

Potential Applications of Rhodiola:

- stress (mental, physical, environmental)
- chronic fatigue (e.g. ME)
- depressant
- anxiety
- impotence
- general mental enhancement
- poor memory

- convalescence after illness
- protection against free radicals

Principle actives:

Salidrozyd, rosavin, polyphenols

Contraindications/Drug Interactions:

Best avoided in cases of nervous excitability, exhaustion of cortical cells, feverish states and hypertensive crisis.

Caution with antidepressants and anti-psychotics - check with doctor

Rhodiola

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D-Ribose

D-Ribose is a simple five-carbon sugar that is made by every cell in the body and is an essential component of important biological molecules called nucleotides. These are used to make adenosine triphosphate (ATP) and the genetic material, RNA and DNA, as well as the vitamin riboflavin.

D-Ribose is not an essential nutrient because it can be made in the body from other substances such as glucose. However, despite its theoretical abundance in the body, research has shown that ribose administration is effective in promoting normal heart and muscle function, accelerating tissue recovery following strenuous exercise and reducing fatigue. What these all have in common is the need for cellular energy or energy recovery. Ribose is extraordinarily effective in accelerating tissue energy synthesis. Ribose is the fundamental building block of ATP, so without sufficient ribose in the cell, ATP cannot be formed. If ATP cannot be formed, the energy pool cannot be re-supplied if the cell becomes energy starved.

That is why it takes so long for cells and tissues to recover following metabolic or physical stress.

A) CARDIOVASCULAR HEALTH

D-Ribose improves oxygen utilisation efficiency in congestive heart failure patients. This is very important because the efficiency of oxygen utilisation is a strong predictor of morbidity and mortality in this patient population.

Other studies show that ribose improves diastolic cardiac function, exercise tolerance, and quality of life in patients with coronary artery disease and congestive heart failure. Still other studies show that ribose increases the anaerobic energy reserve of healthy hearts.

In one study of 20 men (aged 45 to 69 years) with severe coronary artery disease and a history of angina induced by normal daily activities, 60 grams of ribose (in four doses of 15 grams each) were tested against placebo. Treated subjects exhibited improvement in ECG readings and reduced time to onset of moderate angina (during exercise testing). No improvements were noted in the placebo group.

B) ATHLETIC PERFORMANCE

Several studies have looked at peripheral muscle health and recovery from athletic performance where D-ribose has shown some encouraging effects, especially in relation to recovery from intense periods of exercise.

The availability of ribose in muscle tissue is a limiting factor for the rate of ATP recycling during exercise, and therefore impacts exercise endurance. In one study 10 grams of D-ribose was administered twice per day during loading (pre exercise), intense exercise and recovery phases lasting a total of 11 days. Those subjects taking supplemental ribose had a larger increase in mean power over 5 days of training (4.2% vs. 0.6%), and greater peak power output at the last sprint session (11.4 watts/kg vs. 10.4 watts/kg) than the placebo group.

An additional benefit of efficient ATP recycling is that ribose helps overcome soreness and fatigue that can last for days following unaccustomed exercise.

C) FIBROMYALGIA/CHRONIC FATIGUE

Studies suggest a role for D-ribose in fatigue and myalgia. Fibromyalgia is linked to chronic fatigue syndrome and is characterised by muscle aches and stiffness in multiple sites around the body. Scientists think that it may be associated with a muscular imbalance between adenosine diphosphate and adenosine triphosphate (ATP), and as a key component of the nucleotide adenosine, D-ribose is thought to promote proper energy metabolism and thus help restore normal muscle function.

Potential Applications of D-ribose

- Cardiovascular health
- Angina
- Cardiomyopathy
- Athletic performance (recovery)
- Fibromyalgia
- Fatigue

Typical Intake Range for D-ribose

3 to 5 grams daily as a preventative in cardiovascular disease, for athletes on maintenance programmes and for healthy people doing strenuous activity.

5 to 10 grams daily for patients with cardiovascular disease or peripheral vascular disease, and for athletes working out in chronic bouts of high-intensity exercise.

Contraindications/drug interactions

Pregnant women and nursing mothers should avoid supplemental D-ribose.

May cause increased uric acid levels so should be avoided by those with gout. May cause hypoglycaemia so diabetics should use with caution and under medical - supervision.

D-Ribose

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Rosemary

rosmarinus officinalis

A) DETOXIFICATION AND CELL PROTECTION

Extracts of rosemary have been shown to support detoxification through the inhibition of cytochrome P450 synthesis, preventing activation of certain cell-damaging compounds, and enhancement of the phase II enzymes which play a crucial role in detoxifying the cells of destructive agents.

B) ANTIOXIDANT

Rosemary is also a potent antioxidant and free radical scavenger, a fact impressively

demonstrated by a 50% reduction in the peroxidation of lipids.

C) ANTI-VIRAL

Current scientific studies have demonstrated rosemary's activity against several viral pathogens. This action combines very well with the other cell-protective properties of this popular spice.

D) CARMINATIVE

The volatile oils present in rosemary have soothing properties on digestion and relax the smooth muscles of the digestive tract.

E) DIAPHORETIC (INDUCES PERSPIRATION)

The diaphoretic action of rosemary is beneficial in cases where a reduction in body temperature is desired (i.e. to help break a fever).

Potential Applications of Rosemary:

- detoxification
- cell protection
- viral infections
- indigestion
- digestive spasms (e.g. irritable bowel syndrome)
- protection against free radical damage
- inducing perspiration when feverish

Principle actives:

Rosmarinic acid, volatile oils

Contraindications/Drug Interactions:

Do NOT use in high doses during pregnancy

Rosemary

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Sf. John's Wort

hypericum perforatum

A) ANTI-DEPRESSANT

Several clinical trials have confirmed the mood elevating properties of St John's Wort. Although early scientific investigation suggested that the anti-depressant mechanism might be due to an ability to inhibit monoamine oxidase (MAO) enzymes (which degrade mood-elevating neurotransmitters in the brain), newer studies show that it possesses little or no MAO inhibiting effects *in vivo* (in the body). Recent research suggests that the herb's ability to inhibit the reuptake of serotonin, dopamine and noradrenaline is probably most responsible for the herb's anti-depressant effects. St John's Wort's inhibition of interleukin-6 production (a compound linked to depression in some people) has also been proposed as a theory.

B) NERVE RELAXANT AND MILD SEDATIVE

Extensive research has found that this herb is effective in anxiety and nervous excitement and may also improve sleep patterns (especially in depressed individuals), presumably due to the impact on serotonin activity in the brain. Interestingly, in depressed patients St John's Wort provided relief of both insomnia and hypersomnia.

C) ANTI-MICROBIAL

One of the primary active compounds hypericin has been shown to exhibit strong antiviral activity (e.g. herpes simplex 1 and 2, mononucleosis and influenza) as well as the ability to kill several different types of pathogenic bacteria.

Potential Applications of St. John's Wort:

- depression
- anxiety and nervous tension
- insomnia (especially when linked to depression)
- viral infections
- bacterial infections

Principle actives:

Hypericin, pseudohypericin, flavonoids

Contraindications/Drug Interactions:

May cause photosensitivity (increased sensitivity to ultraviolet light), especially with regular use of high doses.

Caution with antidepressants - check with doctor

It is often recommended to avoid taking this herb with tyramine containing foods such as cheese, beer, wine and yeast (although we are unaware of any reports of negative interactions between these foods and St John's Wort usage in the scientific literature).

St John's Wort

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Safflower oil

Source of omega 6 fatty acids in the form of linoleic acid. Can be metabolised into either series 1 or series 2 prostaglandins.

A) INFLAMMATION

Theoretically the use of omega 6 fatty acids in inflammatory conditions makes sense. Linoleic acid can be converted into the powerful anti-inflammatory chemicals known as prostaglandin series 1. However, research in this field is mixed, indeed some studies have shown that omega 6 supplementation actually increases tissue levels of arachidonic acid, a precursor chemical of the series 2 prostaglandins that have proinflammatory properties. In reality using omega 6 in balance with omega 3 is likely to provide the best results.

B) PRE-MENSTRUAL SYNDROME (PMS)

Deficiency of essential fatty acids has been reported in women with PMS. Omega 6 fatty acids in the form of linoleic acid, is converted into gamma linolenic acid (GLA) and eventually into prostaglandins - hormone like substances - that control a variety of physiological functions including hormone production and nerve transmission, both particularly relevant in prevention of PMS.

C) MENORRHAGIA (HEAVY PERIODS)

Fatty acid imbalance may play a significant role in heavy menstruation. High levels of arachidonic acid from animal products such as meat and dairy foods is known to increase the levels of prostaglandin series 2 - the so-called 'bad' prostaglandins - that may increase blood flow and prevent blood clotting in those with heavy menstruation. Reducing levels of meat and dairy products and increasing intake of essential fatty acids may be supportive in cases of heavy menstrual bleeding.

D) HORMONE BALANCE

The hormone modulating effects of prostaglandins derived from essential fatty acids makes them particularly important if optimal hormonal health is to be achieved.

E) DIABETIC NEUROPATHY

Clinical research has discovered that GLA may be an important factor contributing to prevention of neuropathy - nerve damage that affects between 60% and 70% of all diabetics. In fact, a recent review article concluded that GLA supplementation is one of the most effective treatments available today for diabetic neuropathy. Diabetics may consider supplementing with safflower oil although direct sources of GLA such as borage oil or evening primrose oil may be more appropriate.

F) SKIN HEALTH

Linoleic acid may be one of the most important nutrients for the promotion of skin health. In studies various skin conditions including eczema and dry skin have responded well to additional linoleic acid intake. In the last 20 years, researchers have

discovered that eczema may be linked to a deficiency of GLA, a metabolite of linoleic acid. A recent 12-week study conducted at the University of Italy, patients taking GLA saw itching decrease by 90%. These patients also saw improvements in the patches of red skin and oozing of wounds.

Potential Applications of safflower oil:

- Inflammatory conditions (with omega 3)
- PMS
- Dysmenorrhoea (painful periods)
- Fibrocystic breast disease
- Endometriosis
- Ovarian cysts
- Dry skin, eczema and other skin conditions
- Diabetic neuropathy

Typical intake range:

1000-10,000mg per day

Contraindications/Drug Interactions:

Some reports suggest that GLA may worsen epilepsy. Although safflower oil is not a direct source of GLA, the fact that GLA can be metabolised from linoleic acid makes it advisable to exercise caution with epileptics.

S-Adenosylmethionine

iSAmE)

AI ANTI-DEPRESSANT

Numerous studies show that SAmE is effective in the treatment of depression, a condition in which low serum SAmE levels are often found. The SAmE precursor, methionine, appears less effective than SAmE itself in raising levels. SAmE donates methyl groups in the brain to aid in the re-synthesis of mood elevating brain compounds such as serotonin, dopamine and noradrenaline, from their degraded byproducts. Supplementation leads to increased activity and receptor binding of mood elevating neurotransmitters in the brain and improves brain cell fluidity, a key factor in improving mental function.

BI ANTI-ARTHRITIC

SAmE is an important component of joint tissue, and a deficiency leads to a reduced integrity and tolerance of cartilage to wear and tear. Numerous studies involving tens of thousands of patients have shown SAmE to be very effective in arthritis treatment. Symptomatic improvements in pain and inflammation were generally as good as, and sometimes better than, NSAID drugs (e.g. aspirin, ibuprofen, indomethacin, etc.). However, unlike NSAID drugs, SAmE is not associated with inhibiting cartilage repair.

C) LIVER SUPPORT

SAmE aids detoxification through the process of methylation, where toxins are conjugated to the methyl groups of SAmE. Methionine can also be converted to cysteine, and therefore promotes the synthesis of glutathione, another important compound involved in phase II liver detoxification. Through the action of methylation and glutathione conjugation numerous toxins, free radicals and by-products of metabolic and hormonal wastes can be detoxified. The role of methionine as a lipotropic agent also helps reduce sluggish liver function due to excessive fatty buildup. Studies suggest that SAmE may be of value for those with liver conditions including cirrhosis, cholestasis, Gilbert's syndrome and alcoholic liver injury.

D) HYPEROESTROGENISM

SAmE may facilitate the removal of excessive oestrogen in the body by promoting its inactivation in the liver through the process of methylation. In addition, SAmE promotes the excretion of bile - the substance in which inactivated oestrogen is carried

into the gut where it is incorporated into faeces for removal from the body. As a lipotropic factor, methionine also prevents the build-up of fat in the liver, a factor that can promote hyperoestrogenism. High oestrogen levels are very often associated with sluggish liver due to fat accumulation. Excessive oestrogen is a causal factor in approximately 70% of cases of premenstrual syndrome (PMS), and is a factor in a variety of female hormone complaints. Best results may be obtained when SAME is combined with additional B6 and dietary fibre (fibre aids the removal of detoxified oestrogen via the gut).

E) ANTI-ALLERGIC

SAME appears to be of great value in reducing the severity of reactions to both food-related and respiratory allergens. This is due to its ability to detoxify histamine, the primary chemical involved in allergic reactions.

F) HISTADELIC (high histamine) DISORDERS

Various psychological disorders (e.g. certain cases of schizophrenia and depression) are often associated with excessive histamine levels. SAME has been used with success in treating such disorders, because it can increase the rate at which histamine is degraded by methylation. Evidence suggests that SAME is most successful in those people with schizophrenia who are also depressed.

Potential Applications of SAME:

- Depression (except manic)
- Arthritis (especially osteo)
- Liver congestion/fatty liver
- Sluggish liver function
- Detoxification
- Food allergies
- Environmental allergies (e.g. hayfever)
- PMS
- Schizophrenia (when associated with high histamine levels)

Typical intake range:

500-1500 mg per day (taken on an empty stomach)

Food sources (methionine)

Beef, chicken, fish, pork, soybeans, egg, cottage cheese, liver, sardines, yoghurt, pumpkin seeds, sesame seeds, lentils

Contraindications/Drug Interactions:

- Long-term use may increase methylation and inactivation of L-dopa.
- Avoid concurrent use with anti-depressant medication
- May be beneficial alongside paracetamol, methotrexate and gentamicin.
- It is advised to ensure adequate intake of vitamin B6, B12 and folic acid when taking high levels of L-methionine and SAME.
- Persons with bi-polar (manic) depression should not take Methionine or SAME
- Best avoided by pregnant women and nursing mothers.
- Sufferers of neoplastic disease should avoid.
- Caution with schizophrenia, hepatic and renal failure - only under medical supervision.

Sarsaparilla

smilax officinalis, smilax ornata

A) INHIBITOR OF BACTERIAL TOXINS

The saponins found in sarsaparilla have the ability to bind to bacteria cell wall-derived toxins (endotoxins). This is a significant property considering the destructive influence of endotoxins on the body when absorbed into the system in large quantities.

B) ANTI-INFLAMMATORY

Especially due to the influence that they have on certain immunological processes, circulating endotoxins play a critical role in aggravating inflammation and inadvertently triggering cell damage (especially in arthritic conditions).

C) SKIN PROTECTANT

Traditional herbal medicine has focused on sarsaparilla as a blood purifier and as a treatment for skin complaints such as psoriasis, eczema and acne. The scientifically confirmed effect on endotoxins would seem to warrant this, especially since endotoxins do indeed toxify the blood. Endotoxins also compromise liver function, an effect with potentially disastrous consequences in those suffering with psoriasis. As it happens, clinical research has found that sarsaparilla is an effective treatment for psoriasis.

Potential Applications of Sarsaparilla:

- psoriasis
- osteo- and rheumatoid arthritis
- rheumatism
- eczema
- acne
- blood purification
- general liver support

Principle actives:

Saponins

Contraindications/Drug Interactions:

Caution with diuretics - check with doctor

Sarsaparilla

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Saw Palmetto

serenoa repens

A) PROSTATE PROTECTIVE

Most men over 50 suffer with enlargement of the prostate gland known as benign prostate hyperplasia or hypertrophy (BPH). BPH appears to be caused by an elevation of the powerful androgen dihydrotestosterone (DHT) and oestrogen in prostate tissue. Saw palmetto is clinically proven to treat prostate enlargement and its associated symptoms such as frequent urination, difficulty or pain when passing urine and impotence. The active fatty acids and sterols of this plant have been found to inhibit DHT's transport and binding to cell receptors, as well as reducing the activity of 5-alpha-reductase, the enzyme needed for oestrogen production and for conversion of testosterone to DHT.

B) OVARIAN PROTECTIVE

The clinically research into the ability of saw palmetto to treat BPH may have farreaching implications for treatment of certain female hormonal dysfunctions, especially polycystic ovaries. This increasingly common condition is also associated with elevated DHT and oestrogen, and thus may be very responsive to saw palmetto therapy.

C) DHT INHIBITOR IN 'MALE-PATTERN' BALDNESS

It appears that elevated levels of DHT in the scalp trigger the primary mechanism of male pattern baldness. Although clinical research is currently lacking with respect to this use of saw palmetto, the theory behind its use for this purpose is sound (although the required dosage may well differ from that which has been shown to be effective in BPH).

D) DHT INHIBITOR IN HORMONALLY-INDUCED HAIR LOSS (WOMEN)

As with male-pattern baldness, elevated DHT can also lead to 'male pattern' hair loss in women, suggesting a potential value to saw palmetto. Not surprisingly, this problem appears to be especially common in women who suffer with polycystic

ovaries (see above).

E) DHT INHIBITOR IN EXCESSIVE FACIAL AND BODY HAIR (WOMEN)

DHT also appears to be the prominent factor in women suffering with hirsutism (excessive facial and/or body hair). This condition often, though not always, accompanies hormonally-induced hair loss and polycystic ovaries, and may warrant the use of saw palmetto.

Potential Applications of Saw Palmetto:

- prostate enlargement
- frequent urination
- difficulty or pain when passing urine
- male pattern baldness

Principle actives:

Fatty acids, sterols

polycystic ovaries

excessive facial and body hair (women)

impotence

hormonally-induced hair loss (women)

Contraindications/Drug Interactions:

Best avoided in pregnancy.

Caution with anti-inflammatories, hormone therapies and immunostimulants - check with doctor.

Saw Palmetto

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Schisandra

schisandra chinensis

A) ADAPTOGEN

Increases tolerance to various stressors (e.g. mental, physical, environmental), in part by beneficially modifying the stress response.

B) MENTAL ENHANCER

In addition to its adaptogenic impact on central nervous system function, schisandra has been shown to directly stimulate the nervous system and improve mental clarity and the speed of reflexes.

C) LIVER PROTECTIVE

Current research has shown that the herbs active schisandrins prevent liver damage, stimulate liver repair and normalise liver functioning. These effects appear to be to a great extent due to a positive impact on glutathione activity and general liver detoxification processes.

Potential Applications of Schisandra:

- stress (mental, physical, environmental)
- general mental enhancement
- poor memory
- general liver health
- liver toxicity
- jaundice
- hepatitis
- cirrhosis

Principle actives:

Schisandrins

Contraindications/Interactions:

Do NOT use during pregnancy.

Best avoided by persons with peptic ulcers, epilepsy and high blood pressure.

Schisandra

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Ip S, et al, *Free Rad Biol Med*, 21, 5, 1996, pp709-12.

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Scutellariae

scutellaria baicalensis

A) ANTI-INFLAMMATORY

Although clinical trials are currently lacking, scientific investigation of this Chinese herb suggests a very potent inhibiting effect on inflammatory prostaglandins and leukotrienes (which are approximately 1,000 times more inflammatory than histamine). Experimental research has noted an inflammation-reducing action comparable to nonsteroid anti-inflammatory drugs.

B) ANTI-ALLERGIC

Aside from its influence on inflammatory prostaglandins, the flavonoids present in scutellariae also appear to exert anti-allergic capabilities due to the inhibition of histamine release from mast cells.

C) ANTIOXIDANT

Scutellariae flavonoids demonstrate a significant antioxidant capacity - a property that is especially valuable, considering the detrimental impact of free radicals on inflammatory processes.

Potential Applications of Scutellariae:

- arthritis
- rheumatism
- hayfever
- asthma
- food allergies
- atopic (allergic) eczema
- protection against free radicals

Principle actives:

Flavonoids

Contraindications/Drug Interactions:

Do NOT use during pregnancy.

Caution with anticoagulants - check with doctor

Scutellariae

Kubo M, et al, *Chem Pharm Bull*, 32,1984 pp2724-29.

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Tokuda H, et al, *Chem Pharm Bull (Tokyo)* (1992 Feb) 40(2):531-3

Selenium

A) ANTIOXIDANT ACTIVITY

Selenium is an essential component of glutathione peroxidase, an antioxidant enzyme formed from selenium and the tri-peptide glutathione. Along with superoxide dismutase (SOD), glutathione is one of the most potent substances made by the body for the purpose of cell protection. While SOD scavenges superoxide radicals, glutathione peroxidase quenches hydroxyl radicals and hydrogen peroxide. (Hydroxyl radicals are among the most destructive of free radicals, and are implicated in damage to cellular proteins, cell membranes, DNA and lipids.) As with SOD, scientists have demonstrated a strong statistical association in mammalian species between tissue glutathione peroxidase levels and life expectancy. Selenium may also possess its own

antioxidant activity independent of its role in glutathione peroxidase. Of special interest is the relationship between selenium and vitamin E, the primary lipidprotective vitamin. As an antioxidant, selenium works synergistically with vitamin E in the protection of fats and cell membranes. Selenium and vitamin E can, to an extent, substitute for one another in some of their antioxidant actions (however, it is important to note that neither nutrient can replace the other in terms of their overall function - both must be ingested in adequate amounts in order to sustain human life). The antioxidant activity of selenium (especially in combination with vitamin E) may provide protection against many of the ravages of ageing; diseases associated with cell mutation; degeneration of the cardiovascular system, eyes and joints; various inflammatory conditions; immunological dysfunction; male fertility problems (due to oxidative sperm damage); and many other challenges to health.

D) DETOXIFICATION AND LIVER SUPPORT

The glutathione component of glutathione peroxidase is the body's most important detoxification compound. Though glutathione functions in all tissue cells, the liver contains a particularly high concentration, due to its primary responsibility of removing toxins. Selenium enhances glutathione activity, as well as facilitating glutathione peroxidase synthesis. As mentioned, glutathione peroxidase protects the cells from highly damaging free radicals. Glutathione helps eliminate and/or reduces the destructiveness of a wide range of potentially toxic compounds such as environmental chemicals and pesticides, hormones, metabolic end-products, medications, heavy metals and so on. Regarding heavy metals, selenium impairs the uptake and increases excretion of cadmium (i.e. from tobacco smoke and air pollution). Selenium also binds both organic and inorganic forms of mercury, and studies suggest that it can protect against the entire range of mercury's toxic effects. In addition, lead and aluminium are antagonised by this mineral. Of special importance to the public health is the ability of selenium to neutralise and detoxify free radicals formed by fat oxidation/metabolism (i.e. lipid peroxides). Lipid peroxides catalyse fast-spreading free radical chain reactions that damage lipids, cellular membranes, proteins and DNA and increase the risk of liver damage, cardiovascular disease and diseases associated with cell damage and mutation.

E) CELL PROTECTION

Selenium is one of the most important of all nutrients in the protection of cells within the body. Although its antioxidant properties account for a great deal of selenium's cell-protective activity, additionally there are many other biochemical facets of selenium which contribute in this respect. For example, selenium detoxifies many varieties of cell-damaging compounds such as heavy metals and numerous environmental carcinogens/mutagens. The influence of selenium on detoxification is further boosted by its protective effect on liver function. Selenium also stimulates immunological response. Numerous large-scale epidemiological studies confirm a clearcut link between higher intakes of selenium and a lower risk of diseases associated with cell mutation (and *vice versa*). Although selenium supplementation has been shown to possess preventive effects in this respect, research suggests that its protective properties may be significantly boosted by other antioxidant nutrients such as vitamin E.

F) CARDIOVASCULAR HEALTH

Many antioxidant nutrients have demonstrated protective benefits on the cardiovascular system, and selenium is no exception. There is a strong statistical association in epidemiological research between low selenium intakes and high rates of cardiovascular disease (and *vice versa*). Among other benefits, selenium has been shown to address three cardiovascular risk factors - vascular cholesterol deposits, the ratio of HDL (good) and LDL (bad) cholesterol and the stickiness of blood platelets. Studies highlight that selenium reduces cholesterol deposits, increases the proportion of HDL compared to LDL cholesterol and reduces platelet aggregation (thereby

protecting against excessive blood clotting). It is likely that the augmentation of vitamin E (see ANTIOXIDANT ACTIVITY above) and the influence on glutathione peroxidase account for much of the benefit of selenium in heart health. Vitamin E (with added assistance from selenium) prevents oxidation of fat and cholesterol in the arteries. LDL cholesterol oxidation is a major risk factor in atherosclerosis development.

G) EYE HEALTH

The eyes are among the most susceptible body tissues to free radical damage. They are constantly under attack from not only the internally produced oxidative radicals that affect all cells, but also those generated through exposure to ultraviolet rays, ozone, air pollution and so on. Such damage can either cause or exacerbate degenerative eye disorders such as cataracts and macular degeneration as well as the general reduction in vision associated with the ageing process. Presumably due to this high susceptibility, healthy eye tissue carries a disproportionately high concentration of antioxidants (such as the enzymes glutathione peroxidase, superoxide dismutase (SOD) and catalase, and individual antioxidant nutrients including carotenoids (e.g. lutein), selenium, vitamin C and vitamin E). Selenium concentration in the aqueous humour of the eyes is particularly critical to the subject of cataracts; a 1995 study showed that the selenium concentration in the aqueous humour of cataract patients is only around 60% of levels found in healthy subjects. This may help explain the rather astonishing scientific discovery that the hydrogen peroxide level in the cataract-affected aqueous humour is 25 times higher than normal. The free radical hydrogen peroxide accelerates oxidation of lipids in eye tissue and adversely affects the eye's cellular fluid balance. The selenium-dependent enzyme glutathione peroxidase effectively scavenges hydrogen peroxide.

H) FOETAL GROWTH AND DEVELOPMENT

The importance of selenium in pregnancy and lactation is dramatically demonstrated in research linking selenium deficiency to Sudden Infant Death Syndrome and certain disorders for which heart damage (in the form of focal cardiac necrosis) is a common manifestation. It has been theorised that the focal cardiac necrosis seen in newborns afflicted with these disorders is probably caused by accelerated oxidation due to lack of selenium and the associated adverse effect on vitamin E function. Although Sudden Infant Death Syndrome is currently not officially linked to any particular cause, it may be significant that after reviewing 200 cases, a study published in the journal *Forensic Science International* reported that all 200 babies had been affected by focal cardiac necrosis. It is worth mentioning that a serious childhood heart disorder called Keshan's Disease tends to only occur in areas of China with selenium-deficient soil. In response to this disease Chinese physicians carried out a study in 1974 where thousands of at-risk children received either selenium supplementation or placebo. During 1974 and 1975 the number of Keshan's cases in the placebo group was more than 6 times higher than in the selenium group. The benefits of the selenium were so dramatic that in 1976 the use of the placebo was eliminated and all of the 12,579 children were given selenium.

I) IMMUNE HEALTH

Although a lack of *any* essential nutrient will impair immune function, a selenium deficiency is especially detrimental. Research demonstrates that low selenium status is associated with weakened function of the thymus (the master gland of immunity) and suppressed white blood cell activity. It has also been established that selenium supplementation promotes immune function, as highlighted in a 1994 study showing that 200ug of selenium per day increased natural killer cell activity by more than 80% and the ability of lymphocytes to kill abnormal cells by almost 120%. What is especially interesting about this research is the fact that the individuals receiving selenium had normal selenium status to begin with, showing that selenium supplementation does not only elevate immunity in those who are selenium deficient.

Potential Applications

- Protection against free radicals

- Slowing the ageing process
- Cell protection
- Protection against diseases associated with cell mutation
- Liver protection
- Cataracts
- Detoxification
- Elimination of and/or protection against heavy metals (i.e. cadmium, mercury, lead)
- Arthritis and various other inflammatory conditions
- Cardiovascular health (general)
- Promoting healthy foetal growth and development
- Immune dysfunction
- Thyroid dysfunction
- Male fertility problems

Typical Supplemental Dosage Range

- 50-400ug per day

Common Food Sources

- Brazil nuts
 - Butter
 - Liver
 - Shellfish
 - Fish
 - Apple cider vinegar
 - Whole wheat *
 - Oats *
 - Brown rice *
 - Milk
 - Red swiss chard
- The selenium content of cereal grains is highly variable depending on the content of selenium in the soil. Therefore, grains grown in seleniumdeficient soil will low in selenium.*

Contraindications/Drug Interactions

- Inorganic forms of selenium (e.g. sodium selenite/selenate) may become toxic at a daily intake level of around 850-1000ug; it has been reported that toxicity from organic selenium may begin at levels 2000-3000ug per day.
- Symptoms/signs of selenium toxicity include nausea and vomiting, metallic taste in the mouth, dizziness, hair loss, irritability, nervous tension, fatigue, neuropathy, nail defects, skin lesions, garlic odour on the breath and perspiration, rapid breathing, spinal cord inflammation and bone marrow dysfunction. In extreme cases, selenium toxicity can be fatal.
- Yeast-derived selenium supplements should not be used by patients taking monoamine oxidase (MAO) inhibitors unless on the advice and under the strict monitoring of a physician. Yeast-free selenium supplements can be used as an alternative.

Please note: Studies suggest that inorganic selenium (selenite I selenate) has a much higher toxicity than the organic forms (selenomethionine, yeast-bound selenium). The inorganic forms are also likely to be less effective and may even be ineffective in correcting selenium deficiency. In addition, as opposed to the organic forms, inorganic selenium may actually encourage free radical formation, thus calling into question the safety of sodium selenite and sodium selenate in human nutrition.

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Serine (Phosphatidylserine)

A) MENTAL ENHANCEMENT

Serine, is a component of the phospholipid phosphatidylserine, which has been shown to improve mental health in various ways. PS has been shown to improve memory and mental acuity in both young, and especially older adults. The effects are due to multiple functions including; enhancing cell membrane fluidity, increasing the number of acetylcholine receptors, keeping fatty substances in the brain in a soluble state and helping to 'untangle' nerve pathways in the brain. The largest double-blind study of supplemental PS was conducted upon 494 elderly patients, all with moderate to severe cognitive impairment. Those receiving 300mg daily of PS showed significant improvements in cognition and behaviour in comparison to the placebo group.

B) ANTI-DEPRESSANT

Alzheimer's disease is often accompanied by depression. Studies show that by supplementing with PS, elderly Alzheimer's patients experienced relief from depression.

C) ATHLETIC PERFORMANCE

It appears that PS lowers levels of cortisol, a catabolic hormone that can speed the breakdown of muscle tissue. This is especially beneficial to athletes involved in bodybuilding and other forms of athletic training. PS may also offer protection against the effects of overtraining syndrome often seen in professional athletes.

D) PAIN

Opiates, such as morphine depress the central nervous system and are used principally to relieve pain. Serine enhances the effects of opiates and may therefore be a useful adjunct to a nutritional programme for natural pain relief.

Potential Applications of Serine and Phosphatidylserine:

- Senile dementia
- Alzheimer's Disease
- Excessive mental stress or mental fatigue
- Depression (especially in the elderly)
- Poor memory
- Bodybuilding
- Pain relief

Typical intake range:

100-400 mg (of elemental Phosphatidylserine) per day

Food sources:

Meats, dairy products, peanuts and soy products

Contraindications/Drug Interactions:

- Do not use if taking prescribed anti-coagulant drugs such as warfarin without the consent of a qualified medical health practitioner.

Serine

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Shark Cartilage

A by-product of the shark fishing industry, shark cartilage has been shown to slow/stop the production of weak, but prolific blood vessels that can be a problem in several health conditions.

A) RHEUMATOID ARTHRITIS

Abnormal capillary growth can occur and destroy joint cartilage. Shark cartilage has been shown to block the process of invasion by extra blood vessels and in studies reduced the pain and stiffness associated with the disease.

B) OSTEOARTHRITIS

This condition often starts with degeneration and thinning of cartilage, subsequent invasion of blood vessels then leads to the cartilage calcifying and breaking up. Reducing this extra blood vessel production can significantly decrease joint inflammation and pain. In addition, the mucopolysaccharides that are partly responsible for this effect are also an important component of cartilage and have been shown to encourage a certain amount of repair to joint tissues.

C) PSORIASIS

In studies, shark cartilage has successfully been used internally and externally in the treatment of psoriasis, a condition based on extra capillary production.

D) DIABETIC RETINOPATHY

In diabetic retinopathy, unwanted, abnormal blood vessels can grow on the back of the vitreous part of the eye, causing loss of sight. Initial research has indicated that shark cartilage may be of benefit.

Potential health applications of Shark Cartilage

- arthritis (rheumatoid and osteo)
- psoriasis
- diabetic retinopathy

Contraindications/Drug Interactions

Do not use during pregnancy or when attempting to conceive

Avoid for at least 6 weeks after deep surgery as wound healing is delayed - check with a doctor

Anyone who has had a heart attack should avoid shark cartilage for at least 3 weeks - check with a doctor

Shark Cartilage

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Shark Liver Oil

A by-product of the shark fishing industry, shark liver oil has been used by fishermen for centuries for various ailments. It is rich in *Alkyglycerols*, a fatty substance that is also found in small quantities in mother's milk, bone marrow, the liver and spleen.

Research has shown that this substance is involved in the production of white blood

cells and exerts a positive influence on immunity. Shark liver oil is also a rich source of *Squalene*, a highly unsaturated fatty material, long known for its topical application in beauty creams and ointments. However, oral administration has shown it to be quickly absorbed, transformed into bile acids and targeted to fatty tissues in the body where it exerts a positive effect in healing and protecting tissues.

A) IMMUNE SUPPORT

Shark liver oil has been shown to help strengthen the immune system and has been used in several countries for hundreds of years as a remedy for various sicknesses and diseases, also to help recovery after illness. It was even used topically by Norwegian fishermen in the 18th Century to help repair wounds.

B) ANTIBIOTIC/ ANTI-FUNGAL

Studies suggest both antibiotic and antifungal activity, particularly for alkylglycerols which were shown to increase peripheral granulocyte count as well as serum immunoglobulins in one trial.

C) ULCERS

Twenty-five patients with numerous mouth ulcers took shark liver oil for three months. The frequency of occurrence of the ulcers decreased significantly and during the two months after treatment 4 patients had no ulcers and an improvement was exhibited in all except 3 of the remaining patients. There is also evidence suggesting a benefit for peptic and gastric ulcers.

Potential health applications of Shark Liver Oil

- immune boosting
- anti-bacterial
- anti-fungal
- anti-viral
- adjunct to chemo and radiotherapy
- helpful for tissue repair, delayed wound healing and acne (external and internal application)
- liver/age spots, topical application can minimise appearance
- mouth ulcers
- peptic, gastric ulcers

Contraindications/Drug Interactions

None noted.

Shark Liver Oil

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Silicon (silica)

A) CONNECTIVE TISSUE INTEGRITY

Silicon (also known as silica) is essential to the synthesis of collagen, the primary connective tissue protein in the body. As such, silicon is a critical nutrient in the formation of joint cartilage, bone tissue, ligaments, tendons, blood vessels, lung tissue, skin, hair, nails, trachea and other tissue in the body. Silicon is both a structural component of collagen and is needed for the triggering of collagen formation via the enzyme prolyhydroxylase. Essentially, silicon provides structural stability and strength to body tissues.

B) BONE HEALTH

Silicon concentrates in active calcification sites within bone tissue, facilitates the construction of the protein matrix upon which calcium is bound and allows for the formation of the main bone constituent, apatite crystal. These facts have understandably fuelled speculation as to the potential role for silicon supplementation

in bone health. A 1993 French study showed that one year of silicon supplementation in osteoporotic women yielded a significant increase in thigh bone mass density.

C) CARDIOVASCULAR HEALTH

Although clinical research is currently lacking, silicon may be of value in maintenance of cardiovascular health. This stems, in part, from research evaluating silicon concentration in healthy arteries versus those that are affected by atherosclerosis. A series of studies carried out by Jacqueline Loeper *et al*, showed that silicon levels in atherosclerotic arteries was considerably lower than in healthy arteries. In fact, one study showed that in patients over the age of 60 silicon concentration in diseased arteries was 14 times lower than in arteries not affected by atherosclerosis! Although the clinical significance of this has apparently yet to be fully clarified in clinical trials, it seems unlikely that one's silicon status is irrelevant to cardiovascular health. It is important to note here the success of chondroitin sulphate in atherosclerosis research. Several clinical trials have demonstrated that chondroitin, a silicon-rich structural polysaccharide, dramatically reduced cardiovascular symptoms associated with atherosclerosis. It has been reported that Jacqueline Loeper successfully replicated the chondroitin results with other silicon compounds. Interestingly, a 1980 study published in the *Lancet* reported that deaths from cardiovascular disease in England are lowest in the regions that have the highest concentrations of silicon in drinking water.

C) SKIN, HAIR AND NAIL HEALTH

One of the main areas of more recent scientific interest is the role of silicon in the health of the skin, hair and nails. As mentioned, silicon is an essential structural component of skin, hair and nails, providing them both strength and stability. In 1993, *the Journal of International Medical Research* published a study on the influence of silicon in 50 women with skin ageing, fragile hair and brittle nails. The women received both an oral silicon supplement and a topical silicon preparation. After 3 months, there was a marked reduction in wrinkles as well as increased thickness and strength of facial skin, as well as a general improvement in the state of the hair and nail tissue.

D) JOINT HEALTH

Although clinical trials are currently lacking, the influence of silicon on the formation of cartilage, ligaments, tendons and bone tissue may have a significant impact on maintaining the health of the joints. Cartilage provides the primary protection and cushioning of the joint articulation, while certain ligaments and tendons help hold the joints in place.

Potential Applications

Bone health (general)

Osteoporosis

Cardiovascular health (general)

Atherosclerosis

Skin ageing / wrinkles

Weak, thin hair

Weak, brittle nails

Joint health (general)

Typical Supplemental Dosage Range

- 10-50mg per day

Common Food Sources

Alfalfa

Rice bran

Oat bran

Wheat bran

Sugar beet

Soybean meal

Brown rice

Whole oats

White onions
Cabbage
Parsnips
Radish
Cucumbers

Contraindications/Drug Interactions

- There appears to be no established level of toxicity from oral ingestion of silicon; however as there is currently limited information available on long-term silicon supplementation it is generally advised to not exceed around 50mg per day in the form of supplements.
- Although there currently is no evidence linking oral intake of silicon to Alzheimer's Disease, it has been observed that silicon does concentrate in the deposits of plaque and neurofibrillary tangles associated with this disorder. Although it is unclear as to whether silicon merely accumulates or actually contributes to the damage, it may be advisable at this time for Alzheimer's patients to avoid silicon supplementation unless on the advice and under the strict monitoring of a physician.

Silicon

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SOD (Superoxide Dismutase)

A) ANTIOXIDANT

A particularly powerful free radical called superoxide anion radical, is deactivated (dismutated) by a family of enzymes called superoxide dismutase (SOD). An antioxidant that occurs naturally in the body, SOD protects against the major damage the superoxide anion causes, however, levels of this important antioxidant can easily be reduced by stress and mineral deficiencies.

B) AGING AND LONGEVITY

Imbalances of neurotransmitters (chemical messengers) in the brain can contribute to accelerated aging and depression. An important neurotransmitter, Noradrenaline, is rapidly destroyed in the presence of the superoxide free radical, suggesting that protection with SOD could be beneficial. In fact, in scientific studies on ageing, it was found that short-lived fruit flies have less SOD than long-lived fruit flies.

C) ARTHRITIS

Extracellular superoxide radicals are produced in inflamed joints by white cells - and at least part of that reaction can be blocked by adding SOD, helping to reduce inflammation and pain. Several trials on SOD (using injected and oral forms) have shown it to be safe and effective in reducing morning stiffness, pain and swollen joints.

Potential health applications of SOD

- antioxidant
- anti-aging
- arthritis

Contraindications/Drug Interactions

None noted.

SOD

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Taurine

A) ANTI-HYPERTENSIVE

Taurine plays a major role in regulating the transport of minerals such as potassium, sodium, magnesium and calcium into and out of cardiovascular cells. Studies suggest that patients with hypertension have lower than normal levels of taurine in their blood. When taurine levels in both the blood and urine are decreased, renin is activated and angiotensin is formed. Angiotensin is a blood protein that causes blood pressure elevation. Supplemental taurine can suppress renin and inhibit the formation of angiotensin.

B) CARDIOVASCULAR HEALTH

The heart contains a high concentration of taurine and various studies have shown the benefits of supplemental taurine to a variety of heart conditions including arrhythmias, cardiomyopathy and mitral valve prolapse. In studies, taurine was found to increase the retention of potassium and magnesium in the heart muscle - these nutrients are needed for electrical stability and regular contractions of the heart.

C) CHOLESTEROL REDUCTION

Elevated cholesterol levels are a common feature of cardiovascular disease. According to research, taurine increases production of taurocholate, a compound that causes more cholesterol to be excreted in the bile. In a single-blind, placebo-controlled study, subjects fed a high fat/high cholesterol diet that was supplemented with 6g of taurine daily, had significantly lower total cholesterol and LDL compared to the group given a similar diet but no supplementation.

D) LIVER/GALLBLADDER TONIC

Taurine is needed to form bile in the liver and allows for more efficient bile excretion. Bile inhibits the formation of cholesterol-based stones forming in the gallbladder.

E) ANTI-CONVULSIVE

Taurine is a neuroinhibitory amino acid and therefore has a potent anti-convulsant effect. Low concentrations of taurine have been observed in the brains of those suffering with seizure disorders, such as epilepsy.

F) EYE PROTECTION

Taurine is the most abundant amino acid in the retina and protects the eye from various toxic influences. Taurine supplementation has been implicated in conditions such as retinitis pigmentosa and cataracts.

Potential Applications of taurine:

- High blood pressure
- Cardiomyopathy
- Heart arrhythmia
- Gallstones
- Poor fat digestion
- Anxiety and nervous tension
- Panic attacks
- Insomnia
- Age-related eye degeneration
- Retinitis pigmentosa

e.g. cataracts, macular degeneration)

Typical intake range:

500-3000 mg per day (taken on an empty stomach)

Food sources:

Meat and fish.

Contraindications/Drug Interactions:

- No known interactions.
- Best avoided by pregnant women and nursing mothers.

Taurine

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L-Theanine

L-theanine is an interesting amino acid that is not found in protein from foods, but is found almost exclusively in the green tea plant as a free amino acid (i.e. not part of a protein structure). Green tea is the second most consumed beverage in the world (after water) and many of the reported benefits to green tea consumption are thought to be attributable to its theanine content. Theanine appears to cross the blood brain barrier and has been shown to influence brain wave activity, possibly via an influence on neurotransmitters such as dopamine and serotonin, suggesting Potential Applications in mental health.

A) ANXIETY

Green tea has long been known as a relaxing beverage, and scientists now believe that its relaxing properties are attributable to its theanine content. Theanine appears to cross the blood brain barrier and has been shown to influence brain wave activity, possibly via an influence on neurotransmitters such as dopamine and serotonin, suggesting Potential Applications in stress, anxiety and depression. Theanine also appears to counteract the stimulatory properties of caffeine - a fact that probably explains why people feel relaxed after drinking green tea, despite its caffeine content. Research on human volunteers has demonstrated that L-theanine creates a sense of relaxation in approximately 30-40 minutes after ingestion by directly stimulating the production of alpha brain waves, creating a state of deep relaxation and mental alertness similar to that achieved through meditation. It also promotes formation of the inhibitory neurotransmitter, gamma amino butyric acid (GABA)(3), which influences levels of dopamine and serotonin, both of which are important in relaxation and mood stabilisation. Interestingly, participants in this study appeared to achieve a relaxed, yet alert state of mind, without sedation - suggesting potential use by people suffering with anxiety/stress related disorders that need to stay alert in order to perform their day-to-day activities.

B) PREMENSTRUAL SYNDROME

In a study undertaken by Japanese researchers L-theanine appears to be of value for women with premenstrual syndrome. 20 women suffering with PMS were given 200mg of L-theanine per day and were assessed using a distress questionnaire. Theanine caused documented reductions in mental, social and physical symptoms associated with PMS, and was significantly better than placebo.

C) CARDIOVASCULAR HEALTH

Researchers had previously identified a link between sub-optimal serotonin levels and high blood pressure, with nutrients such as 5-hydroxytryptophan being used in some studies as a blood pressure-lowering agent. This led some researchers to propose a potential role for L-theanine in the maintenance of normal blood pressure. Preliminary

studies have provided encouraging results, but more research is required before this theory can be confirmed.

In another study, the vascular-protective effects of green tea were investigated. Three major constituents of green tea, theanine, caffeine and polyphenols, were studied in relation to their ability to inhibit LDL cholesterol oxidation.

Although the polyphenols were found to be better than L-theanine in this regard, the L-theanine performed better than caffeine.

D) MENTAL ENHANCEMENT

Theanine appears to increase levels of both dopamine and serotonin in the brain and therefore may be valuable in increasing learning and memory. However, further studies are required to elucidate these areas.

Potential Applications of L-theanine

- Anxiety
- Panic attacks
- Depression
- Insomnia
- Cardiovascular health
- Premenstrual syndrome
- Emotional balance
- Memory/learning enhancement

Typical intake range of L-theanine

50 to 600mg per day.

Contraindications/drug interactions

L-theanine appears to increase the activity of chemotherapeutic agents in tumor cells. L-theanine appears to be well tolerated, with no human adverse events being reported to date. Although there is no evidence of problems at present, it is advisable not to use L-theanine during pregnancy or lactation. Similarly those taking antidepressant/ anxiolytic medication and other drugs that alter brain chemistry should use theanine under medical supervision only.

L-Theanine

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Trimethylglycine (TMG)

TMG provides three methyl donors, each of which can be given (donated) to enable chemical interactions to take place. By donating one methyl group it becomes DMG (Dimethylglycine), further methylation produces SAME

(S-adenosylmethionine), which may have potent anti-aging effects, and has been shown to alleviate depression, remyelinate nerve cells, improve Alzheimer's and Parkinson's disease patients, and protect against alcohol-induced liver injury.

A) HOMOCYSTEINE LOWERING

Also known as betaine, TMG donates methyl groups to the vascular-damaging compound homocysteine, which converts it back to harmless methionine. High homocysteine levels are linked to various disorders including heart disease, Alzheimer's Disease and osteoporosis.

B) CARDIOVASCULAR TONIC

In addition to its homocysteine-lowering effect, TMG, after conversion into Dimethylglycine (DMG), has been shown to lower cholesterol and to reduce angina and heart arrhythmias.

C) ANTI-DEPRESSANT

TMG also donates methyl groups in the brain to make SAME and aid in the resynthesis of mood elevating brain compounds such as serotonin and dopamine from their degraded by-products.

D) OXYGENATING EFFECTS

DMG appears to increase oxygen levels in body tissues, a function that is especially pertinent in sports nutrition and in theory may be beneficial for altitude sickness.

E) ANTI-CONVULSIVE

TMG, due to its conversion to DMG and glycine, may reduce susceptibility to seizures.

F) AUTISM

There are reports of both TMG and DMG being of benefit in autism.

Potential health applications of TMG

- atherosclerosis
- depression
- Alzheimer's Disease
- sports nutrition
- fatigue

Contraindications/Drug Interactions

None noted.

angina and heart arrhythmia

autism

osteoporosis

epilepsy

Trimethylglycine (TMG)

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L-Tryptophan

Tryptophan converts into L-5-Hydroxytryptophan in the body, subsequently 5HTP is more active and less is required in supplementation ie. 1,000mg of Tryptophan is equal in activity to 100mg of 5HTP.

A) ANTI-DEPRESSANT

Tryptophan is involved in the production of serotonin. Studies suggest that tryptophan depletion can lead to reduced serotonin levels, therefore potentially increasing a person's susceptibility to depression. Studies have demonstrated that as little as 500mg twice daily can, in some depressed individuals, raise blood levels of tryptophan up to two times above normal if used over a prolonged period of time. A more typical intake for alleviating depression appears to be 3g daily.

B) SLEEP PROMOTING

Tryptophan converts efficiently in the brain to serotonin, which is a potent tranquillising agent. Serotonin is a precursor to melatonin, a sleep-promoting hormone that is involved in setting the circadian (sleep-wake) cycle. Some researchers consider tryptophan to be the most efficacious natural sleep-promoting agent available. A recent study demonstrated that the administering of tryptophan promoted sleep even in patients whose insomnia had been instigated by the use of the antidepressant medication Fluoxetine (Prozac).

C) APPETITE AND WEIGHT CONTROL

Tryptophan has been shown to have appetite-regulating properties and 1 to 15g a day has been used successfully as an aid to weight reduction. Tryptophan is also effective in reducing binge eating (a habit that results in the depletion of tryptophan by using up serotonin) which may be a further obstacle to successful weight loss. Studies also suggest that tryptophan may inhibit insulin release and decrease the appetite for carbohydrates.

D) BEHAVIOURAL DISORDERS

Serotonin levels in the brain are often depressed in those with disturbances such as obsessive-compulsive disorder, aggressive behaviour and eating disorders (e.g. bulimia and anorexia). Epidemiological studies suggest that in areas where dietary intake of tryptophan is consistently low, there is increased rate of homicide. Several studies show impaired serotonin metabolism in suicidal patients. In one study, a violent and aggressive patient was given 2g of tryptophan daily. Over a period of one month, his behaviour improved and his violent outbursts diminished.

E) PAIN RELIEF

Low serotonin levels are associated with decreased pain tolerance. Due to its serotonin enhancing properties, tryptophan has been shown alleviate or relieve pain associated with headaches, arthritis and dental work. In one study, tryptophan administered at a total dose of 3g a day resulted in a 50% reduction in pain intensity.

Potential Applications of 5-HTP:

- Depression
- Insomnia
- Anxiety and nervous tension
- Eating disorders (e.g. anorexia and bulimia)
- Obsessive-compulsive disorder
- Aggressive behaviour
- Pain relief
- Appetite control
- Weight loss

Food Sources:

Soya protein, cottage cheese, fish, beef, liver, lamb, peanuts, pumpkin seeds, sesame seeds, lentils

Typical intake range of 5-HTP (L-Tryptophan is not available commercially):

100-300 mg per day or as needed (taken on an empty stomach)

Contraindications/Drug Interactions:

- May increase risk of scleroderma-like symptoms in susceptible individuals.
- May cause serotonin syndrome if combined with antidepressant drugs that increase serotonin levels - avoid concurrent use.
- Best avoided by pregnant women and nursing mothers.

Tryptophan

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Turmeric Root

curcuma longa

A) ANTI-INFLAMMATORY

Turmeric's active curcuminoids have been found in studies to possess considerable antiinflammatory

activity, in part due to their ability to inhibit the synthesis of inflammatory prostaglandins. In fact, when compared to corticosteroids, turmeric extract displays an equal anti-inflammatory capability in acute inflammation and is approximately 50% as potent as corticosteroids in chronic inflammation.

B) ANTI-MICROBIAL

Current scientific research shows that turmeric powerfully inhibits pathogenic bacteria, viruses and fungi (including *Candida albicans*, *Candida krusei*, and *Candida parasilosis*).

C) LIVER TONIC

Traditionally, turmeric was used to support liver function and to treat jaundice in both Ayurvedic and Chinese herbal medicine. Turmeric enhances glutathione content and glutathione-S-transferase activity in the liver. These substances are key protectors against the damaging effects of toxins and free radicals.

D) CELL PROTECTIVE

Curcuminoids exhibit various cell-protective actions including prevention of free radical damage and initiating the destruction and inhibiting the replication of damaged cells. In fact, studies have highlighted the ability of curcuminoids to inhibit chemically-induced cell damage by an average of 75%.

E) DIGESTIVE TONIC

Turmeric has also been used since ancient times for digestive problems such as gastritis and hyperacidity, a practice that is backed up by reports that it helps to increase mucous production and protects the stomach lining. Curcuminoids also increase bile flow into the intestines, thus improving the breakdown of dietary fat.

Potential Applications of Turmeric:

- Arthritis • liver detoxification
- Rheumatism • cell protection
- sports injuries • hepatitis
- viral infections • jaundice
- general liver support • bacterial infections
- protection against free radical damage

Principle actives:

Curcuminoids

Contraindications/Drug Interactions:

Caution with anticoagulants, immunosuppressants and NSAIDS - check with doctor

Turmeric

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L-Tyrosine

A) ANTI-DEPRESSANT

Tyrosine is a precursor to the mood elevating compound dopamine, thus mild depression may be alleviated with the administration of this amino acid. A number of studies conducted in the 1970's demonstrated tyrosine's ability to lessen symptoms of depression. The most impressive results were seen when tyrosine and 5-hydroxytryptophan were combined.

B) APPETITE SUPPRESSION

Research has demonstrated that in large doses (more than 20g daily) tyrosine has an appetite suppressing property. Its use has been proposed as an alternative to amphetamines or phenylpropanolamine, two medicines prescribed for appetite control. Tyrosine status within the body is closely linked to appetite - a deficiency may increase appetite, whereas excess tyrosine may decrease appetite.

C) COGNITIVE PERFORMANCE

Aside from dopamine, tyrosine converts into other stimulatory brain chemicals, such as noradrenaline (norepinephrine), which may ultimately enhance mental alertness.

Tyrosine levels typically decline with age and low levels of tyrosine-derived neurotransmitters are seen in patients with Alzheimer's disease. Researchers have seen improvements in cognitive function among patients who took supplements, including tyrosine.

D) ANTI-STRESS EFFECT

Human research suggests that tyrosine has adaptogenic properties, helping the body to adapt and cope with various types of stress. Tyrosine is required to manufacture stressregulating hormones such as adrenaline and noradrenaline (which are depleted during times of stress). According to research, most of the tyrosine taken in the form of nutritional supplements is converted into these adrenalin-related products. In one controlled, double-blind study, military personnel given tyrosine daily, performed significantly better in cognitive and performance tests conducted under stress, in comparison to non-supplemented subjects.

E) THYROID HORMONE SYNTHESIS

Tyrosine is required to manufacture the thyroid hormones, thyroxine and triiodothyronine and may be of value as part of a programme in the management of hypothyroidism.

Potential Applications of L-tyrosine:

- Depression
- Appetite control
- Cognitive performance
- Stress-related anxiety, mental fatigue or exhaustion
- Hypothyroidism

Typical intake range:

500-2000 mg per day (taken on an empty stomach)

Food sources

Soybeans, cheddar cheese, cottage cheese, ricotta, tuna, beef, pork, chicken, turkey, spirulina

Contraindications/Drug Interactions:

- Not to be used with MAO inhibitor drugs without the consent of a qualified medical health practitioner.
- Should be avoided by pregnant women and nursing mothers and those with melanoma.
- Use with caution in hypertension

Tyrosine

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Valerian Root

valeriana officinalis

A) SEDATIVE

Due to its action on the central nervous system, many studies have demonstrated the effectiveness of valerian in improving sleep quality and sleep induction, without the risk of dependency and without drowsiness the following morning.

B) NERVE RELAXANT

In addition to improving sleep patterns, the unique normalising effect of valerian on the central nervous system is also valuable in calming the nerves in cases of nervous tension or agitation.

C) ANTI-SPASMODIC

Research confirms that valerian is beneficial in relieving intestinal cramps associated with nervous conditions. This would be of enormous value in many cases of irritable bowel syndrome.

D) PAIN RELIEVER

As is the case with several other sedating and nerve-calming herbs, valerian has also been found to relieve pain.

Potential Applications of Valerian Root:

- insomnia
- anxiety
- irritability
- nervous tension
- muscle spasms
- irritable bowel syndrome
- general pain relief
- headache

Principle actives:

Valerenic acid

Contraindications/Drug Interactions:

Caution with sedatives, tranquillisers, anti-depressants, anti-convulsants and anticoagulants - check with doctor.

Valerian Root

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Whey Protein

Protein contains amino acids, which are the building blocks of our bodies. They fortify and form the many tissues that make up our structure, and in addition, the amino acids are distributed throughout the body to aid in synthesis of enzymes, hormones and neurotransmitters, as well as supplying metabolic energy. Whey protein has the highest Biological Value of any natural protein (BV is the most widely used method for measuring protein quality), it is higher than eggs, fish and meat. Many whey protein powders go through processes such as ion exchange and microfiltration - these are low temperature processes, which filter off the fat and lactose leaving the protein - also hydrolysis, which makes the whey easier to digest.

A) BLOOD SUGAR CONTROL/SYNDROME X

Blood sugar levels can be controlled by ensuring that simple carbohydrates are always consumed in the presence of protein (or fibre), as this slows down the release of sugar into the blood stream, thereby protecting the insulin producing cells of the pancreas from undue stress. Such stress could otherwise lead to Diabetes Type II or its predecessor, Syndrome X, whereby the insulin mechanism is compromised, leading to permanently raised levels of insulin and increased weight.

B) CONVALESCENCE

Sufficient protein is necessary to help aid recovery from illness.

C) DIETARY WEIGHT CONTROL

Reduced food intake can mean that protein intake is compromised, which could lead to a reduction in muscle protein and loss of strength. Since muscle is also more metabolically active than fat, it may mean that the original objective of the diet, weight loss, is actually less effective.

D) IMMUNE SYSTEM

Whey is a good source of lactalbumin and immunoglobulins, both of which are known to be important for immune function. There is also 1-2% of lactoferrin present - an iron carrying protein, it also inhibits the growth of harmful bacteria and fungi, whilst

promoting the growth of some probiotics.

E) REQUIREMENT

Protein requirement varies, depending on age and activity levels. Different sources vary in their opinions on levels, but the requirement for females over 25 is probably between 40 and 50g per day, depending on their level of exercise, for males over 25, probably between 50 and 60g. Athletes, however, may need as much as 2g per kilo of body weight.

Children must have sufficient protein in order to grow, probably between 20 and 30g per day, depending on age.

Those over 65, who tend to eat less calories, must ensure that they keep up their levels of good quality protein.

F) SPORT

Whey is one of the richest, natural sources of Branched Chain Amino Acids (BCAA's). These three amino acids are involved in supplying alternative fuel to help preserve muscle tissue during exercise, thereby decreasing the breakdown of muscle under strenuous conditions. In addition, whey protein taken post work out, helps to repair muscle and maximise lean body mass and strength. Whey protein also aids the synthesis of glutathione, an important antioxidant that has been found to be decreased by exercise.

G) TISSUE REPAIR

Protein is necessary for the repair of any damage to the tissues, including osteoarthritis. It is particularly important for burn injuries and will greatly benefit any patients who have undergone surgery.

Potential health applications of Whey Protein

- blood sugar control
- convalescence
- immune support
- sports
- tissue damage repair
- weight control

Contraindications/Drug Interactions

Kidney disease, check with a doctor regarding levels of protein intake

Caution

Do not use protein powder as a meal replacement

Whey Protein

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Bounous G., Batist G., Gold P., Clin Invest Med 1989; 12:154-161
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Melichar V., Mikova M., Cesk Pediatr 1989; 44: 1-5
Zawadzki KM., Yaspelkis BB 3d, Ivy JL., J Appl Physiol 1992; 72:1854-1859. ATC

Yucca

yucca schidigera, *yucca spp.*

A) ANTI-ARTHRITIC

Research suggests that the use of yucca can be of value in treating arthritis (particularly osteoarthritis), however, the mechanism has not been clearly elucidated by scientists. It has been proposed that yucca may inhibit certain bacterial endotoxins in the intestines, which are associated with arthritic damage.

B) MILD LAXATIVE

The saponin content of yucca has been associated with mild laxative effect, thus explaining its use in traditional herbal medicine as a treatment for constipation.

Potential Applications of Yucca:

- osteoarthritis

- rheumatism
- rheumatoid arthritis
- constipation

Principle actives:

Saponins

Contraindications/Drug Interactions:

None noted.

Yucca

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Zinc

A) ENZYME FUNCTION AND METABOLISM

One of the primary catalytic nutrients in the body, zinc is an essential coenzyme (nonprotein portion of an enzyme) in over 200 enzymes. Included among the countless functions of zinc-dependent enzymes are energy production; metabolism of proteins, fats and carbohydrates; protein synthesis and digestion; amino acid synthesis; detoxification of alcohols; and bone metabolism.

B) ANTIOXIDANT ACTIVITY

As with copper and manganese, zinc is an essential mineral component of the enzyme superoxide dismutase (SOD). SOD is one of the most powerful substances manufactured by the body for the purpose of protecting cells. The protective mechanism of SOD relates to its function as an antioxidant which neutralises superoxide free radicals. Although many parts of the body are adversely affected by superoxide radicals, they are particularly associated with tissue damage within the joints (i.e. arthritis) and eyes (i.e. cataracts). Interestingly, scientists have demonstrated a strong statistical association in mammalian species between tissue SOD levels and life expectancy.

C) IMMUNE SUPPORT AND FUNCTION

Although a deficiency in *any* essential nutrient can compromise immunity, zinc is considered by many authorities to be the most important of all nutrients in this respect. It is involved in practically every facet of immunity, including thymus function (the master gland of the immune system) and white blood cell (i.e. T-cell and lymphocyte) production and activity. Regarding thymus function, zinc supplementation has a dramatic impact on the secretion of the thymus hormone thymulin. Although this factor would benefit all ages, it is especially critical to restoration of immunological strength within the elderly. Zinc also possesses direct anti-viral properties - a fact which probably accounts for much of the localised anti-infective activity of lozenges containing zinc. According to research, zinc lozenges are an effective treatment for common cold symptoms. For example, in a double-blind placebo-controlled clinical trial employing 23mg zinc lozenges every two waking hours, 86% of the zinc users were symptom-free after one week compared to 46% of those taking the placebo (see Contraindications/Cautions below).

D) SKIN HEALTH AND HEALING

Zinc's influence on protein synthesis and related biological processes would encourage skin tissue regeneration, and in individuals who are deficient in zinc, supplementation has been shown to accelerate wound healing and treat skin ulcerations. Several double-blind clinical trials also report zinc's effectiveness in acne therapy. In fact, zinc has achieved benefits comparable to the antibiotic drug tetracycline in cases where acne only affects the surface tissue of the skin. In patients with deeper acne lesions, zinc supplementation has been generally found to be more effective than tetracycline. (Most participants have needed around 3 months of supplementation before achieving significant results.) It is worth noting that clinical benefits in acne of the poorly absorbed sulphate form of zinc have been inferior to the better absorbed forms such as

zinc gluconate or citrate. It is likely that the zinc's benefits in acne therapy are not only due to its influence on tissue regeneration and healing.

Its immunological properties, influence on hormones and retinal-binding protein and encouragement of anti-inflammatory prostaglandins probably also play a significant role. Not surprisingly, zinc is often deficient in patients with acne, as well as various other skin disorders such as psoriasis, eczema and dermatitis herpetiformis.

E) REPRODUCTIVE HORMONE INFLUENCE

In men, a lack of zinc is associated with lower testosterone, and in such cases, levels of this hormone improve with zinc supplementation [which, in turn, can have a considerable impact on sperm counts and male fertility (see MALE FERTILITY below)]. Testosterone is essential for male sexual function, however the enzyme 5-alpha reductase converts it into the more powerful androgen dihydrotestosterone (DHT), which is associated with certain health disorders. For example, elevated DHT is linked to conditions such as prostate disease and male pattern baldness in men, and polycystic ovaries, infertility, hair loss and excessive body and facial hair in women. Zinc lowers 5-alpha reductase activity (thus lowering DHT levels), reduces cellular binding of androgens and lowers levels of the hormone prolactin. These properties account for much of its value in the hormone-related disorders listed above.

F) PROSTATE HEALTH

The proliferation of prostate gland cells is triggered by the hormone dihydrotestosterone (DHT). In puberty this process is necessary for normal sexual development, however when prostate tissue growth is over-stimulated by DHT in adulthood then benign prostate hyperplasia or BPH (prostate enlargement) can result. It has been reported that more than half of all men are affected by BPH at some point during their life. Interestingly, in older males the elevation of prostate DHT (and thus the increased risk of BPH) coincides with an overall reduction in the body's testosterone levels and an increase in female hormones such as oestrogen and prolactin. As mentioned above, zinc reduces the activity of 5-alpha reductase, the enzyme responsible for the conversion of testosterone into dihydrotestosterone (DHT). Zinc also reduces cellular binding of androgens and reduces prolactin levels. Oestrogen antagonises zinc uptake, which may cause 5-alpha reductase levels to rise if intake of the mineral is not increased sufficiently to compensate. Not surprisingly, clinical trials demonstrate that zinc supplementation reduces both symptoms of prostate enlargement and prostate size in most patients with BPH.

G) MALE FERTILITY

Zinc deficiency is associated with reduced testosterone levels in men, and it has been established that testosterone depletion improves with zinc supplementation. Zinc is also critical to the production and motility of sperm. As such, zinc status has a significant impact on male fertility. This fact is underlined by a clinical trial highlighting that in men with both low testosterone and low sperm counts, testosterone levels increased and average sperm counts were 2.5 times higher after 6-7 weeks of zinc supplementation (60mg per day). In fact, 41% of the men successfully impregnated their partners during the course of the study - which is even more remarkable considering that the couples had been incapable of achieving pregnancy for at least 5 years prior to the study.

H) BLOOD SUGAR BALANCE

Glucose metabolism and general blood sugar balance is dependent on adequate zinc status. Among other relevant functions, zinc is needed in order for insulin to be manufactured and secreted by the pancreas. Zinc also works along with chromium and various other nutrients to facilitate the cellular utilisation of insulin. While zinc is eliminated from the body more rapidly in diabetics than in non-diabetics, an important 1992 study reported that zinc supplements increase insulin levels in both insulin-independent and non-insulin dependent diabetic patients.

I) EYE HEALTH

As mentioned above, zinc is an essential mineral component of the cell-protective antioxidant enzyme superoxide dismutase (SOD), which protects the cells from superoxide free radicals. Although this type of free radical adversely affects cells throughout the body, the eyes are especially susceptible to superoxide damage, which often manifests as cataracts. In fact, blood levels of zinc are often deficient in cataract patients, leading among other problems, to impaired glucose metabolism in the lens. Zinc supplements have been shown to aid glucose utilisation in the eye tissue. Lack of retinal zinc is also linked to low levels of the antioxidant enzyme catalase, which when deficient, is associated with the development of macular degeneration. A double-blind clinical trial published in the journal *Archives in Ophthalmology* reported that macular degeneration patients taking 100mg of zinc per day over 1-2 years had considerably less vision loss than those taking a placebo (see Contraindications/Cautions below).

J) MENTAL HEALTH AND FUNCTION

Zinc status can have a considerable influence on many aspects of mental development, function and performance as well as emotional health and psychological balance. For example, zinc deficiency is implicated in learning disorders, Attention Deficit Disorder, hyperactivity, mental retardation, depression, dementia (including Alzheimer's Disease), schizophrenia and organic mental disorder. In the case of children with learning disorders, a build-up of the heavy metal cadmium is often implicated in the development of reading difficulties. Zinc can antagonise cadmium, and a 1984 study reported that the zinc-cadmium relationship significantly reflected on reading performance. Even in adults, zinc can impact on learning; a double-blind trial of 34 women from age 18-40 indicated that zinc supplementation improved performance in both associated learning of word combinations and in reproduction of visual images. In the case of dementia and Alzheimer's Disease, thus far there are only small-scale studies showing clinical improvement. However, it is worth noting that Alzheimer's patients typically have significantly reduced levels of zinc in the brain and cerebrospinal fluid. Scientists have also observed that nerve cell damage and the accumulation of neurofibrillary tangles in the brain increase when zinc is deficient.

K) GROWTH AND DEVELOPMENT

Zinc is necessary for proper growth and development of the foetus, and appears to play an important part in maintaining biochemical and physiological health and stability in the pregnant woman. Depleted maternal zinc levels are implicated in several pregnancy-related and developmental problems such as premature birth; low birth weights; neural tube defects and other neurological problems; labour problems and abnormalities; and spontaneous abortion. Thus it is urgently important to point out that during pregnancy blood and white blood cell concentrations of zinc decline by almost a third, while at the same time, the average pregnant woman consumes significantly less than the recommended daily allowance for zinc.

Although the results of various zinc studies in pregnancy are less reliable due to inadequate methods of study design, one well-designed placebo-controlled trial showed that the addition of zinc to a prenatal supplement used by zinc-deficient women markedly improved both birth weights and cranial circumference. The women, who were lower than normal in zinc prior to the study, received 25mg per day.

Potential Applications

Immune support (general)
Common cold
Male hormonal health (general)
Prostate enlargement
Male fertility (general)
Low sperm count
Male pattern baldness
Polycystic ovaries
Female infertility

Excessive facial and body hair (women)
Skin health (general)
Acne
Psoriasis
Eczema
Dermatitis herpetiformis
Wound healing
Diabetes
Macular degeneration
Cataracts
Mental health (general)
Learning disorders
Attention Deficit Disorder
Hyperactivity Disorder
Dementia (including Alzheimer's Disease)
Pregnancy
Foetal growth and development
Poor appetite
Copper excess
Wilson's Disease

Typical Supplemental Dosage Range

- 10-50mg per day

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Common Food Sources

- Oysters
- Clams
- Pumpkin seeds
- Beef
- Liver
- Nuts
- Peas
- Whole grains

Contraindications/Drug Interactions

- Long-term intake of more than 100-150mg of zinc per day may suppress immune function, lead to irritation or even damage of the stomach lining and reduce levels of HDL (good) cholesterol (potentially increasing the risk of certain cardiovascular problems).
- Intake of more than 200mg per day may cause nausea, diarrhoea, vomiting and digestive pain or irritation.
- Individuals with stomach or duodenal ulcers should only use zinc supplements on the consent and under the strict monitoring of a physician.
- High doses of zinc can interfere with copper utilization. Unless ingesting copper in doses sufficient to maintain an appropriate ratio between the two minerals (see italics below), long-term zinc intake in doses greater than 50mg per day may cause copper deficiency (and associated problems such as microcytic anemia, low neutrophil count and poor iron utilisation).

Although there are differing scientific views on what constitutes an optimal ratio between zinc and copper, it is thought that a ratio for long-term intake of between 7.5:1 and 10:1 (zinc to copper) is probably appropriate.

- Very high doses of zinc may interfere with iron absorption and utilization.
- Zinc supplements should be avoided if taking the drugs amiloride, penicillamine, tetracycline, warfarin or fluoroquinolone antibiotics, unless on the consent and under the strict monitoring of a physician.
- When taken on an empty stomach, even moderate doses of zinc can cause nausea in the lozenge form or as zinc sulphate. Thus, zinc lozenges and zinc sulphate

should be taken after a meal.

Zinc

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Glossary

Acetylcholine: A neurotransmitter in both the central and peripheral nervous system, formed by the combination of acetate and choline.

Albumin: A type of simple protein, varieties of which are widely distributed throughout the tissues and fluids.

Alkaloids: Any of various organic compounds, occurring chiefly in many vascular plants and some fungi. Many alkaloids, such as nicotine, quinine, cocaine, and morphine, are known for their poisonous or medicinal attributes.

Amine: Nitrogen-containing compound.

Amino acid: The molecule that is the building block of proteins. The 20 different amino acids which make up proteins all have a similar structure, with an amino group, a carboxyl group and one of 20 different chemical side chains, all attached to a central carbon atom.

Amino aciduria: Excess excretion of amino acids in the urine, which indicates possible inborn errors of metabolism caused by specific enzyme deficiency.

Antagonist: refers to nutrient interactions that inhibit one another.

Blood-brain barrier: A barrier between the blood vessels and the brain that is selectively permeable, i.e., allows only certain substances to pass through.

Catecholamine: A general class of neurotransmitters including dopamine, noradrenaline and adrenalin.

Collagen: A structural protein of the connective tissues.

D-, L- and DL form: Chemical structures in which amino acids occur. Amino acids typically occur in D- and L- forms, and occasionally in DL- form: these terms denote the direction in which the amino acid rotates light. D stands for dextro, meaning right: L stands for levo, meaning left. And DL is a 50/50 mixture of the two forms.

Deamination: Metabolic process where the nitrogen process of an amino acid is removed.

Deoxyribonucleic acid (DMA): DNA molecules carry the genetic information necessary for the organization and functioning of most living cells and control the inheritance of characteristics.

Dipeptide: The substance made from the joining of two amino acids.

Endorphins: Naturally occurring molecules made up of amino acids. Endorphins attach to special receptors in the brain and spinal cord to stop pain messages. These are the same receptors that respond to morphine.

Enzyme: A protein that induces or accelerates a chemical reaction.

Endogenous amino acid: Amino acids that are recycled from the pool of amino acids within the body.

Exogenous amino acid: Amino acids that are derived from the diet.

Glucagon: A hormone that stimulates the liver to release glucose into the blood.

Gluconeogenesis: Formation of glycogen from sugar.

Histamine: A chemical present in cells throughout the body that is released during an allergic reaction.

Homeostasis: The physiological process by which the internal systems of the body (e.g. blood pressure, body temperature, acid-base balance) are maintained at equilibrium despite variations in the external conditions.

Homocysteine: An intermediary compound in the metabolism of the amino acid methionine. High levels in the blood can cause atherosclerosis. Recently it has been suspected that high amounts of homocysteine can also be toxic to neurons. B vitamins, particularly folic acid, B12, and B6, can lower homocysteine levels.

Inborn errors of metabolism: The inability to metabolize or transport an amino acid, due to an inherited defect usually in an enzyme.

Keratin: Insoluble protein that is the major constituent of the outer layer of the skin, nails, and hair.

Ketone: A breakdown product of fat that accumulates in the blood as a result of inadequate insulin or inadequate calorie intake.

Ketosis: Condition marked by excessive production or accumulation of ketone bodies in the body caused by disturbed carbohydrate metabolism.

Kwashiorkor: Severe malnutrition caused by a lack of proteins- especially in young children- characterised by lack of growth, oedema, tissue wasting and lowered resistance to disease.

Levodopa (L-dopa): Drug most commonly used to treat the symptoms of Parkinson's disease that the body converts into dopamine.

Mem/lotion: Modification of a molecule by the addition of a methyl group.

Net protein utilisation (NPU): The way in which protein is utilised by the body.

Neuron: A nerve cell that conducts electric neural impulses from one part of the body to another.

Neuropeptides: Nerve proteins that send chemical messages from the brain to receptor sites in cell membranes.

Neurotransmitter: A chemical "messenger" within the body that carries a message from one nerve cell to another one. A few of the more common ones are acetylcholine, dopamine, noradrenaline and serotonin.

Parkinson's disease: A disease caused by the progressive degeneration of the nervous system, characterised by tremors, muscle weakness and rigidity and a shuffling gait.

Peptide: Chain of amino acids that serves as an intermediary in protein digestion.

Peptide bond: substance that links amino acids together.

Phenylketonuria: An inborn error of metabolism of the enzyme necessary for the conversion of the amino acid phenylalanine to tyrosine that is characterised by mental retardation.

Polypeptides: Protein composed of more than three amino acids.

Protease: Any enzyme that catalyzes the splitting of proteins into smaller peptide fractions and amino acids by a process known as proteolysis.

Purine: Basic constituent of DNA and RNA and of at least fifty other important compounds.

Ribonucleic acid (RNA): A molecule that translates the instructions encoded in DNA to build proteins.

Serotonin: Neurotransmitter formed from the amino acid tryptophan that regulates mood, sleep, appetite and pain.

Tripeptide: Combination of three amino acids.

Urea: A nitrogen-containing waste product from the breakdown of proteins that is excreted in the urine.

Urea cycle: The body's pathway for ammonia and nitrogen metabolism.