

GINKGO

Ginkgo biloba L.

Family

Ginkgoaceae. This family is said to have originated in the early Permian geologic period, approximately 280 million years ago, when dinosaurs were still roaming the earth. At their height the family consisted of at least 16 genera that were distributed in temperate forests. *Ginkgo biloba* is the only species of this genus which has survived until today. It is an oddity in nature because it is a single species with no known living relatives. Cycads are widely accepted to be the most closely related lineage but the debate continues. Human history appears insignificant when compared with the genealogy of this tree.^{1,2}

Parts Used

Leaf.

Description

Also known as maidenhair tree (based on its resemblance to the foliage of the maidenhair fern (*Adiantum spp.*)), ginkgo is a living fossil that has remained essentially unchanged for more than 200 million years which is nothing short of a miracle. Native to China it is a large, deciduous tree revered for its elegant appearance and longevity. The legendary resilience of ginkgo has enabled it to become a widespread and popular ornamental tree across the world. This expert in survival defies pests and thrives in a modern urban environment which many other trees cannot tolerate. This resilience includes an outstanding resistance or tolerance to both herbivores and pathogens, accounting in part for the longevity of individual trees and also for the longevity of the species. Individual trees can live to be 1000 years old or more and are able to withstand



intense natural disasters and events. An amazing example of the superhero powers of this plant relates to the 6 August 1945 Hiroshima bombing of Japan in World War II. The atomic bomb created a fireball 365 metres wide. An estimated 150,000 people were killed and the landscape was levelled but somehow six ginkgo trees were able to weather one of the most destructive moments in human history. By the next spring, in March, the surviving ginkgos bloomed again and continued to do so every spring after that. Those trees, now dubbed A-bombed trees, phoenix trees or hibakujumoku, are still in Hiroshima today, monuments to both humanity's capacity for destruction and nature's ability to withstand humans at their worst. They are seen as symbols of strength, hope and resilience by the communities left behind.³

Perennial ginkgo grows slowly up to a height of about 40 metres. The seeds are naked like other gymnosperms such as pines. The male and female flowers are borne on separate trees and hence only the female tree bears a seed with an inedible fruit (which smells strongly of rancid butter due to butyric acid) and an edible nut which is the inner kernel. The species name *biloba* refers to the green leaves, that are often two lobed in appearance with parallel venation, that turn golden in autumn.⁴



Traditional Use

"It appeals to the historic soul: we see it as an emblem of changelessness, a heritage from worlds too remote for our human intelligence to grasp, a tree which has in its keeping the secrets of the immeasurable past." Sir Albert Seward 1938⁵

Ancient ginkgo is one of the most distinctive trees and the most famous of the memory herbs.

In traditional medicine the use of the leaves and seeds of the ginkgo tree to treat respiratory and cardiovascular disorders, sexual dysfunction and loss of hearing dates back thousands of years. In Chinese medicine ginkgo seeds (which can be toxic in large doses) have been used to treat respiratory illness, such as asthma and bronchitis, cardiovascular diseases, pulmonary symptoms, alcohol abuse and bladder infections while ginkgo leaves came into use later to treat skin infections, as well as heart and lung disease.^{6,7}

Ginkgo was first introduced into Europe in 1690 by the botanist Engelbert Kaempfer, who described it as the 'tree with duck feet'. Currently ginkgo is used clinically to treat a range of circulatory disorders and dementia. Modern research suggests that ginkgo extracts have the ability to positively effect blood rheology (flow) and therefore increase blood flow and nutrient delivery to poorly perfused tissues. This is especially true of the microvasculature, such as the capillaries, which is the site of most nutrient delivery and waste disposal.^{8,9}

In these times of evidence-based medicine, where a drug is only seen as being active if the molecular mechanism has been unravelled and the efficacy has been proven in double blind, placebo controlled and randomised studies, traditional ways of healing are becoming forgotten. One example is the doctrine of signatures, which traces back to antiquity. Most, if not all, traditional medicines are rooted in empirical healing practices, which also contain non-rational and mystical elements. This is also true for European phytotherapy which developed the doctrine of signatures. For centuries it was believed that plants were signed by the Creator with some visible or other clue that would indicate their therapeutic use. For example a similarity in shape to various parts of the body meant the herb could be used to treat ailments of these parts of the body. Ginkgo is often used as a fine example of the doctrine of signatures.

Ginkgo's signature is its curious fan shaped leaves with two hemispheres as the name biloba suggests. They resemble the outline of a brain, especially when grouped together. This coupled with its long life, resistance to the environment and its being the world's oldest living tree species help explain why this plant has been seen as a brain food for centuries. The doctrine of signatures may be a fancified romantic notion, and is not supported by scientific evidence, but there's no denying ginkgo can be useful in increasing the quality of life in the elderly. The doctrine can, at the very least, be used as a learning aid to assist in remembering the materia medica. This elder tree is full of secrets and we're lucky it can pass a small amount of wisdom to us in the form of herbal medicine.¹⁰

Constituents

The chemical composition of ginkgo is very complex and so far more than 170 compounds have been isolated. The flavone glycosides (quercetin, kaempferol, rutin) and the terpene lactones (ginkgolide A, B, C, J and bilobalide) are considered active constituents. It also contains bioflavonoids, ginkgolic acids, sterols, procyanidins and polysaccharides. The total extract has been found to be more active than any single isolated component which suggests synergism among the various components. Attempts to isolate the active principles may be ultimately self-defeating since the overall effects rely on synergistic interactions between all the plant components. In the book *Principles and Practice of Phytotherapy* the author Kerry Bone writes: "When standardised ginkgo was originally manufactured to contain 24% ginkgo flavone glycosides there was no unequivocal evidence that these compounds conferred the various and exciting therapeutic activities that had been discovered for the extract". Later research suggested that a different group of phytochemicals, the ginkgolides and bilobalide, were more important and ginkgo is now standardised to contain these as well. But in terms of, for example, its effects in Alzheimer's disease, the active compounds are not known. Even if the ginkgolides and bilobalide were found to be important (this could be achieved by a clinical trial comparing two ginkgo extracts with high and low levels of these compounds which were otherwise identical), it would be unlikely

that they were the only compounds important for activity."^{11,12,13,14,15}

Actions

Antioxidant, anxiolytic, nootropic (cognitive enhancer), neuroprotective, cardioprotective, anti-inflammatory, circulatory stimulant (cerebral), peripheral vasodilator, antiplatelet, vasoprotective, anticoagulant, antimicrobial, decongestant, antiasthmatic.

Pharmacological Activity

Ginkgo is one of the top selling botanicals and most well researched herbs in the world. Numerous pharmacological studies have demonstrated that ginkgo and its constituents display many properties, and works by means of multiple mechanisms, *in vivo* and *in vitro*. A systematic review of this vast amount of studies will not be attempted here. A selection of recent important publications, with an emphasis on unique human studies with relevance for clinical efficacy, will be reviewed in this monograph. Isolated constituent studies will not be included.

There is a dearth of recent clinical trial data for whole herb, full spectrum ginkgo used alone and not in combination with other substances. The majority of studies are performed on patented, standardised products which have a large evidence base. This monograph will mention EGb761, and other patented extracts, with caveats about extrapolation to full spectrum extracts following. The majority of the clinical trials on ginkgo employ a daily dose of 120 to 240mg a day of a 50:1 standardised extract which equates to about four to 16g a day of original dried herb.¹⁶

There may be differences in composition of ginkgo preparations, depending on the manufacturing process used, so different effects can result. Ginkgo standardised extracts are commonly prepared by solvent extraction such as water, methanol, ethanol or acetone. The European Pharmacopoeia recommends extraction of ginkgo powder with acetone twice for 30 minutes. Standardised extracts are made from dried leaves and, during a multi-step procedure, unwanted constituents are eliminated and the active principles are enriched. Finally the liquid extract is dried to give

one part extract from 50 parts raw drug (leaves). In some countries (i.e. Japan) the allowed amount of solvent used in supplements is limited to ethanol so acetone is not used. Most pharmacological studies have been performed using a refined and quantified dry extract of ginkgo (EGb761 which has different brand names). EGb761 is a standardised extract of *Ginkgo biloba* leaves extracted with acetone which contains approximately 24% flavone glycosides (primarily quercetin, kaempferol and isorhamnetin) and 6% terpene lactones (2.8-3.4% ginkgolides A, B and C and 2.6-3.2% bilobalide). Ginkgolide B and bilobalide account for about 0.8% and 3% of the total extract, respectively. Other constituents include proanthocyanadins, glucose, rhamnose, organic acids, D-glucaric and ginkgolic acids. The process involves 27 different steps and requires 50kg of herb to produce 1kg of extract. This product was created by Dr Willmar Schwabe Pharmaceuticals (Dr Willmar Schwabe Group) and has been available in Europe as a herbal extract since the early 1980s. This company has sponsored most of the research on ginkgo. At the time of writing in November 2019 a PubMed search of EGb761 returns more than 1700 studies. It is now one of the most widely used medications in Europe and is considered the best researched "herb" in the world today. Evidence from studies on this product may only be partially relevant to the whole leaf extract and results cannot be extrapolated to full spectrum, whole herb ginkgo products. Some herbalists believe that moderate doses of the whole leaf extract, taken over a long period, can have a positive cumulative effect. A 2019 study found that ethanol and acetone extracts show comparable anti-inflammatory and antioxidant activity in human endothelial cells. Experienced and respected clinical naturopath Leah Hechtman says in her seminal textbook *Clinical Naturopathy*: "The conundrum for the clinician is whether to ignore the favourable *in vitro* and *in vivo* evidence in the face of lack of high quality and conflicting human research, or to also consider the wealth of clinical experience supporting the efficacy of ginkgo...the principles of evidence based practice must come into play, the definition of which is 'the integration of the best research evidence with our clinical expertise and our patient's unique values and circumstances.' In the face of inconclusive research evidence due

consideration must be given to clinical experience which generally supports the safe and efficacious use of medicine such as ginkgo (in peripheral arterial disease)." ^{17,18,19,20,21}

The popularity of ginkgo, and its value, has led to a high frequency of adulteration in standardised products. The most common form of economically motivated adulteration is the addition of a less expensive flavanol, or flavanol glycoside, to the extract to achieve the desired 24% flavanol glycoside concentration, although full-scale substitution has been reported. While the addition of flavanols is not considered a safety problem the health benefits of sub-standard ginkgo extracts spiked with pure flavanols or flavanol-rich extracts have not been established. The World Health Organization and China have recognised chromatographic fingerprinting for identification and quality control of whole botanical materials. Use of fingerprinting methods becomes problematic, however, when the botanicals are processed to produce supplements such as a standardised product. The production process may concentrate the components of interest but the addition of excipients to tinctures, capsules or tablets can produce dramatically different chemical fingerprints. Commercial standardised ginkgo extracts are prepared through a complex series of extractions and back extractions using different solvents. The purpose is to purify the flavanol glycosides and terpene lactones, and to remove unwanted compounds. Thus, it is to be expected that the commercially prepared supplements would have a different chemical profile compared to an extract of the raw leaves (such as used in The Herbal Extract Company's full spectrum fluid extract made from only the dried leaf, ethanol and water). The addition of extraneous flavanols can be detected by high-performance liquid chromatography (HPLC) with ultra-violet (UV) or mass spectrometry (MS) detection. Considering this adulteration has been reported for decades and that methods for the detection of adulteration have been available, there is little excuse for this to continue to occur. It is suggested that contract manufacturers, independent analytical laboratories and manufacturers with internal analytical capabilities need to take the lead in preventing low cost adulterated extracts from unscrupulous extract

manufacturers, most of which appear to originate from China, from entering the global market.^{22,23}



Ginkgo fossil from the Palaeocene period 66 MILLION years ago at the Lisbon National Museum of Natural History and Science

Cognitive-Enhancing Activity

There is clear evidence to support the efficacy of ginkgo for mild cognitive impairment and dementia. Numerous clinical trials demonstrate that ginkgo improves memory loss, and concentration, and decreases anxiety in patients with dementia and/or vascular dementia.²⁴

The available evidence suggests that ginkgo has potentially beneficial effects over placebo on cognitive performance, activities of daily living and clinical global impression (a measure of symptom severity, treatment response and the efficacy of treatments in treatment studies of patients with mental disorders) in the treatment of dementia at doses greater than 200mg/day (usually 240mg/day) administered for 22 weeks or longer.²⁵

Twenty two to twenty four week treatment with EGb761 improved behavioural and psychological symptoms of dementia (BPSD) (except psychotic-like features) and caregiver distress caused by such symptoms. A 2017 meta-analysis assessed the effects of EGb761 on specific BPSD and analysed data from all randomised, placebo-controlled, at least 20 week trials of EGb761 enrolling patients

with dementia (probable Alzheimer's disease (AD), probable vascular dementia or probable AD with cerebrovascular disease) who had clinically significant BPSD. Four trials involving 1628 patients (EGb761, 814; placebo, 814) were identified. Treatment duration was 22 or 24 weeks and the daily dose of EGb761 was 240mg in all trials. Pooled analysis, including data from the full analysis sets of all trials (EGb761, 796 patients; placebo, 802 patients) revealed significant superiority of EGb761 over placebo in total scores and 10 single symptom scores. Regarding caregiver distress scores, EGb761 treated patients improved significantly more than those receiving placebo in all symptoms except delusions, hallucinations and elation/euphoria.²⁶

A recent systemic analysis found that ginkgo is potentially beneficial for the improvement of cognitive function and activities of daily living in patients with mild cognitive impairment or Alzheimer's disease. Twenty one trials with 2608 patients met the inclusion criteria.²⁷

A randomised, double blind, placebo controlled trial of 216 participants with Alzheimer's disease or vascular dementia showed a significant improvement in attention and memory function in the standardised ginkgo treated group after 24 weeks treatment. In a more recent trial 404 people with dementia were treated with 240mg standardised ginkgo or placebo over 24 weeks. The results demonstrate that ginkgo treatment significantly improves cognitive function and neuropsychiatric symptoms.^{28,29}

A 2018 trial found that the standardised ginkgo extract EGb761 can shorten the course of postoperative delirium in elderly patients. Twenty nine elderly patients undergoing tumour surgery received EGb761 drops oral treatment (three times a day, 80mg each time) in addition to oxygen inhalation and appeasement treatment.³⁰

As an adjunctive treatment ginkgo can effectively improve depressive symptoms and reduce expression of serum S100B, which is a marker of brain injury, a 2018 trial discovered. This suggests that ginkgo restores neurologic function during the treatment of depression in elderly patients and S100B participates in the therapeutic mechanism. Ginkgo, combined with depressive drugs, plays a synergistic role and the time of onset of efficacy

is faster than single antidepressants. There were 136 elderly patients with depression who were divided into a ginkgo and citalopram (a selective serotonin reuptake inhibitor antidepressant) group and citalopram only group. The time of onset of efficacy was significantly shorter in the ginkgo and citalopram group. After treatment the S100B level was decreased and S100B levels change in the ginkgo and citalopram group was greater than in the citalopram only group.³¹

A 2017 study found that people who take ginkgo have a lower risk of dying before dementia and a longer lifetime without dementia than participants taking other drugs for the same indication. This was a population based cohort with regular follow up screenings up to 22 years and systematic detection of incident cases of dementia. There were 3,777 participants aged 65 years or older who were living at home.³²

A recent study showed that eight weeks of treatment with ginkgo in people with multiple sclerosis with memory impairment may improve memory and quality of life. Thirty patients received 240mg per day of ginkgo three times a day except one that received 120mg per day due to history of gastritis.³³

Many double blind studies have investigated the effects of ginkgo (120 to 600mg per day) on cognitive function in younger and older healthy subjects. Some studies have evaluated the effects of a single dose, whereas others are long term studies (two days to 13 weeks). For example a benefit was found in 188 healthy middle aged volunteers who were given placebo or EGb761 240mg once daily for six weeks. There was significant improvement on the demanding standardised free recall test but no benefit in another memory test on recalling a driving route. This confirms previous evidence suggesting a role for ginkgo in retrieval of learned material, which is known to be sensitive to ageing.³⁴

A recent open label clinical study enrolled 34 irradiated brain tumour patients who were given 120mg per day of ginkgo for 24 weeks and found some improvement in quality of life and cognitive function.³⁵

One study of 80 patients diagnosed with vascular cognitive impairment compared conventional treatment with antiplatelet medication to treatment

with adjunctive ginkgo and the antiplatelet medication. The three month trial found addition of ginkgo improved the therapeutic effect with increases in cerebral blood flow and cognitive enhancement observed.³⁶

A review of controlled studies on the use of medicinal plants for generalised anxiety disorder found only a small number of studies on ginkgo but in those studies ginkgo showed an effect similar to or better than anxiolytic drugs.³⁷

Antioxidant Activity

Standardised ginkgo has potential therapeutic usefulness as an adjunctive treatment to 5-fluorouracil (5FU: a medication used to treat cancer also known under the brand name Adrucil among others) in patients with colorectal cancer (CRC). A 2018 study found that combined ginkgo and 5FU treatment significantly elevated the chemosensitivity of CRC cells to 5FU in 5FU-resistant (5FUR) CRC cells. The results of the study demonstrated that ginkgo can chemosensitise 5FUR CRC cells and reduce drug resistance.³⁸

Clastogenic factors (markers of oxidative stress) are found in the plasma of people irradiated accidentally or therapeutically. They persisted in the plasma of atom bomb survivors for more than 30 years and were found in 33 of 47 Chernobyl reactor accident recovery workers in a previous study. In a following study 30 Chernobyl accident recovery workers were treated with standardised ginkgo (three 40mg tablets daily) for two months. The clastogenic activity of the plasma was reduced to control levels on the first day after the end of the treatment. A one year follow up showed that the benefit of the treatment persisted for at least seven months. One third of the workers had clastogenic factors again after one year, demonstrating that the process which produced clastogenic factors continued. However, the observation that antioxidants do not have to be given continuously was encouraging. The study demonstrated that markers of oxidative stress can be influenced successfully by appropriate antioxidant treatment and implies radioprotective activity.³⁹

Although the mechanism of action responsible is unknown, antioxidant activity is thought to be important in the common hypopigmentation

disorder vitiligo. An open-label trial of 12 participants reported repigmentation with 120mg per day of ginkgo taken over 12 weeks.⁴⁰

Ischaemic Shock

Animal and human research has demonstrated that ginkgo is indicated for ischaemic stroke due to its antioxidant, antiplatelet, neuroprotective, antidepressant, nootropic and anticholinergic actions. Much of the research has been conducted on the standardised and concentrated extract mentioned above, EGb761, and similar extracts.⁴¹

Ginkgo, in combination with aspirin treatment, alleviated cognitive and neurological deficits after acute ischaemic stroke without increasing the incidence of vascular events in a 2017 randomised controlled trial. In the ginkgo group (450mg ginkgo with 100mg aspirin daily) there were 179 patients with an onset of acute stroke within seven days.⁴²

Peripheral Vascular Disease

While there is *in vivo* and *in vitro* evidence that ginkgo possesses relevant actions for peripheral vascular disease (and associated intermittent claudication), such as antioxidant, peripheral and coronary vasodilator, antiplatelet and anti-inflammatory, human clinical trial evidence is often inconclusive. This is in part due to inadequate sample sizes, the possible risk of study bias and the variable doses used.⁴³

Angina

A small group of 54 patients with unstable angina pectoris taking conventional Western medication were divided into two groups: one was treated with conventional Western medication plus ginkgo. Ginkgo was observed to suppress inflammation with these patients. The authors suggested this may be one way in which ginkgo assists patients with angina pectoris.⁴⁴

Tinnitus

A 2018 randomised, double-blind clinical trial showed that the drug EGb761 reduced the suffering of patients with sub-chronic or chronic tinnitus. When compared with pentoxifylline (a drug used to improve blood flow) it showed a more pronounced improvement in patients with elevated depression scores and a higher incidence of improved patients

in anxiety score categories.⁴⁵

Type 2 Diabetes

Standardised ginkgo, as an adjuvant, was effective in improving metformin treatment outcomes in type 2 diabetes patients in a 2018 study. Sixty type 2 diabetes patients were recruited in a randomised, placebo-controlled, double-blinded and multicenter trial. The patients using metformin were randomly grouped into those treated with ginkgo (120mg/day) or placebo for 90 days. Ginkgo improved blood glycated haemoglobin and fasting serum glucose concentration, insulin resistance index, body mass index and visceral adiposity index when used as an adjuvant in type 2 diabetes patients poorly managed by metformin alone.⁴⁶

Schizophrenia

A randomised double blind, placebo controlled trial found benefit when using EGb761 for reducing symptoms of tardive dyskinesia (a side effect of antipsychotic medications that causes stiff, jerky movements of the face and body that can't be controlled) in schizophrenia patients. This trial recruited 157 in a psychiatric hospital and the treatment arm were given 240mg per day of ginkgo or placebo for 12 weeks. The authors hypothesise that the improvement may be due to the antioxidant activity of ginkgo.⁴⁷

Premenstrual Syndrome

A randomised placebo controlled trial in 85 women who took ginkgo (40mg tablets three times a day from the 16th day of the menstrual cycle to the fifth day of the next cycle) showed significant improvements in premenstrual syndrome symptoms. Both the placebo and the treatment groups showed improvements however the treatment group showed a significantly higher decrease in symptom severity than the placebo group.⁴⁸

Coronary Heart Disease

Ginkgo treatment can improve coronary blood flow and circulation in healthy adults as well as those with coronary heart disease. In patients with coronary artery disease coronary blood flow is usually impaired due to imbalanced vasoactive substances such as nitric oxide and endothelin 1. In a human study 42 coronary artery disease patients

who received ginkgo demonstrated a significant improvement in heart function measurements. The results suggested that ginkgo might assist in restoring the delicate equilibrium between nitric oxide and endothelin 1.⁴⁹

Glaucoma

A randomised controlled trial of 30 patients, administered 80mg of ginkgo twice a day over four weeks, found that retinal blood flow increased significantly in the normal tension glaucoma patients.⁵⁰

A retrospective study of 42 patients with a mean follow up time of 12.3 years showed that 80mg of ginkgo, twice daily, slowed visual field defect damage. These findings were also confirmed in a retrospective study with 332 patients who were compared to 97 controls. Of the cohort 132 patients were given bilberry anthocyanins and 103 patients received ginkgo at a dose of one 80mg tablet twice a day. Both treatments were found to improve visual function in some patients with normal tension glaucoma.^{51,52}

Raynaud's Syndrome

Raynaud's syndrome is a common and painful condition characterised by episodic blood vessel spasming in fingers and toes produced by emotion and cold. A double blind placebo controlled trial found that a standardised ginkgo may be effective in reducing the number of Raynaud's attacks per week in patients suffering from Raynaud's disease. Supplementation with ginkgo (120mg three times a day), administered to 11 patients over a 10 week period, was found to significantly reduce the number of attacks experienced by patients per week from 13.2 to 5.8, a reduction of approximately 56% whereas placebo reduced the number by only 27%.⁵³

Anticoagulant Activity

Ginkgo is often used for those planning a trip to high altitudes to prevent altitude sickness by helping to provide oxygen rich blood to the brain as well as thinning out the blood with his anticoagulant action (blood tends to thicken at high altitudes). The currently available data from 2018 suggests that ginkgo may tend towards acute mountain sickness prophylaxis. Trials of ginkgo for the prevention of acute mountain sickness have been published since 1996. A recent study provides evidence

supporting the use of ginkgo in the prevention of acute mountain sickness demonstrating that 24 hours of pre-treatment with ginkgo, and subsequent maintenance during exposure to high altitude, are sufficient to reduce the incidence of acute mountain sickness in participants with no previous high-altitude experience. The study investigated the prophylactic effect of ginkgo on 12 people (doses 80mg every 12 hours, 24 hours before high-altitude ascension and with continued treatment) in preventing acute mountain sickness at 3696 metres in participants without high-altitude experience.^{54,55}

Respiratory Activity

Ginkgo inhibits platelet activating factor, a potent mediator of the allergic and inflammatory reaction in asthma. A placebo controlled study showed a significant clinical improvement in FEV1 (Forced Expiratory Volume) at eight weeks when using a concentrated ginkgo leaf liquor (15g three times a day).⁵⁶

Hyperthyroidism

EGb761 supplementation neutralized chromosomal damage induced by radioiodine treatment without affecting the clinical outcome a recent study found. This suggests that ginkgo may prevent genetic effects of radioiodine therapy for hyperthyroid Graves' disease.⁵⁷

Indications

- Elderly patients as a tonic, convalescence, to support cancer patients undergoing conventional treatment such as chemotherapy
- Poor cognitive function, memory and concentration, early stage dementia and Alzheimer's disease, depression, anxiety and related disorders, stress, attention and short term memory loss, support for students during exams and study
- Diabetes related nerve system damage, diabetic retinopathy, macular degeneration, wound healing
- Tinnitus, hearing loss, vertigo (dizziness), headache, migraine, mental fatigue, restless leg syndrome, trigeminal neuralgia
- Altitude sickness and low oxygen levels
- Allergies, asthma, chronic obstructive pulmonary disease

- Fibromyalgia, multiple sclerosis, systemic lupus erythematosus, Raynaud syndrome, repetitive strain injury (RSI)/carpal tunnel syndrome, glandular fever, osteoarthritis, tinea (athlete's foot)
- Poor blood circulation, cerebral insufficiency, peripheral vascular disease (arterial or venous), coronary heart disease, hypotension, palpitations, stroke (of recent onset), atherosclerosis, hypercholesterolaemia, angina, varicose veins, deep vein thrombosis, peptic ulcer
- Erectile dysfunction (impotency), low male fertility, premenstrual syndrome, uterine fibroid pain, breast cyst and mastalgia pain
- Hyperthyroidism
- Protection against radiation-induced injuries

Energetics

Neutral (neither warming or cooling).

Use in Pregnancy

Information on safety and efficacy is lacking.

Contraindications

If unusual bleeding or bruising occurs stop use immediately. Although new clinical evidence suggests that ginkgo does not affect clotting times, it may be prudent to suspend use for one week prior to major surgery in at-risk populations. Ginkgo should be avoided by anyone with a history of seizures.

Drug Interactions

While recent reports have suggested that ginkgo has the potential to increase bleeding in people taking anticoagulant and antiplatelet medication (e.g. warfarin and aspirin) more recent studies have shown this is unlikely. However it is still wise to monitor patients closely.⁵⁸

Administration and Dosage

Liquid Extract:	1:1
Alcohol:	30%
Weekly Dosage: ⁵⁹	20 to 40mL

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