3. Roberts NM, *et al.* Effect of a PAF antagonist, BN52063, on PAF-induced bronchoconstriction in normal subjects. *Br J Clin Pharmacol* 1988; **26:** 65–72.
4. Kleijnen J, Knipschild P. Ginkgo biloba. *Lancet* 1992; **340:** 1136–9.
5. Houghton P. Ginkgo. *Pharm J* 1994; **253:** 122–3.
6. Brochet B, *et al.* The Ginkgolide Study Group in Multiple Sclerosis. Double blind placebo controlled multicentre study of ginkgolide B in treatment of acute exacerbations of multiple sclerosis. *J Neurol Neurosurg Psychiatry* 1995; **58:** 360–2.
7. Maclennan KM, *et al.* The CNS effects of Ginkgo biloba extracts and ginkgolide B. *Prog Neurobiol* 2002; **67:** 235–57.

Preparations

Proprietary Preparations (details are given in Part 3)
Turk. Bilokan; Seremaks; Tebokan.

Ginseng

Ginseng radix; Ginzenggyökér; Jintsam; Ninjin; Panax; Pannag; Renshen; Schinsent; Všehojový kořen; Ženšenių šaknys.

Description. Ginseng is the dried root of *Panax ginseng* (*P. schinseng*) (Araliaceae). Other varieties of ginseng include *Panax quinquefolius* (American Ginseng) and *P. pseudoginseng*. The root commonly known as Siberian or Russian ginseng belongs to the same family, Araliaceae, but is an entirely different plant, *Eleutherococcus senticosus* (see Siberian Ginseng, p.2386). Brazilian ginseng is reported to be derived from another unrelated plant, *Pfaffia paniculata*.
Ginseng contains complex mixtures of saponins termed ginsenosides or panaxosides. At least 13 saponins have been isolated from extracts of *P. ginseng* roots.

Pharmacopoeias. In *Chin.*, *Eur.* (see p.vii), and *Jpn*. Also in *US* (as Asian Ginseng and American Ginseng). *US* includes additionally powdered forms of these two varieties of ginseng.
Jpn also includes Red Ginseng, the dried root of *P. ginseng* which has been steamed.
Chin. and *Jpn* also include Rhizoma Panacis Japonica from *Panax japonicus*. *Eur.* (see p.vii) also includes Notoginseng Root from *P. notoginseng*. *Chin.* also includes Radix Notoginseng from *P. notoginseng*, and Rhizoma Panacis Majoris from *P. japonicus* var. *major* and *P. japonicus* var. *bipinnatifidus*.
Ph. Eur. 6.2 (Ginseng). The whole or cut dried root of *Panax ginseng*. It contains not less than 0.4% of combined ginsenosides, Rg1 ($C_{42}H_{72}O_{14},2H_2O$ = 837.0) and Rb1 ($C_{54}H_{92}O_{23},3H_2O$ = 1163.3), calculated with reference to the dried drug. Protect from light.
USP 31 (Asian Ginseng). The dried roots of *Panax ginseng* (Araliaceae). It contains not less than 0.2% of ginsenoside Rg_1 and not less than 0.1% of ginsenoside Rb_1, both calculated on the dried basis. Store in a dry place at a temperature of 8° to 15°.
USP 31 (American Ginseng). The dried roots of *Panax quinquefolius* (Araliaceae). It contains not less than 4.0% of total ginsenosides, calculated on the dried basis. Store in airtight containers. Protect from light and heat.

Adverse Effects

◊ A 2-year study[1] of ginseng in 133 subjects who had used commercial preparations including roots, capsules, tablets, teas, extracts, cigarettes, chewing gum, and candies reported that the majority of preparations were taken orally, but a few subjects had experimented with intranasal or parenteral routes, and topical preparations had also been used. The stimulant effects of ginseng were confirmed but there was also a high incidence of adverse effects including 47 cases of morning diarrhoea, 33 of skin eruptions, 26 of sleeplessness, 25 of nervousness, 22 of hypertension, 18 of euphoria, and 14 of oedema. The 'ginseng abuse syndrome' defined as hypertension together with nervousness, sleeplessness, skin eruptions, and morning diarrhoea was experienced by 14 subjects who took ginseng orally in an average daily dose of 3 g. Abrupt withdrawal precipitated hypotension, weakness, and tremor in 1 user. About 50% of the subjects had stopped the use of ginseng within the 2 years. Oestrogenic effects have also been reported from the use of ginseng,[2-4] and a case of Stevens-Johnson syndrome has also occurred.[5]
A systematic review[6] of some of these and other studies and case reports concluded that single-ingredient preparations of ginseng were well tolerated when data from clinical studies were examined. Adverse effects were generally mild and reversible, the most common being headache, sleep disturbances, and gastrointestinal disorders. It was more difficult to determine causality from the evidence given in isolated case reports; likewise, interpretation of data involving combination products was difficult.

1. Siegel RK. Ginseng abuse syndrome: problems with the panacea. *JAMA* 1979; **241:** 1614–15.
2. Palmer BV, *et al.* Gin Seng and mastalgia. *BMJ* 1978; **1:** 1284.
3. Punnonen R, Lukola A. Oestrogen-like effect of ginseng. *BMJ* 1980; **281:** 1110.
4. Greenspan EM. Ginseng and vaginal bleeding. *JAMA* 1983; **249:** 2018.
5. Dega H, *et al.* Ginseng as a cause for Stevens-Johnson syndrome? *Lancet* 1996; **347:** 1344.
6. Coon JT, Ernst E. Panax ginseng: a systematic review of adverse effects and drug interactions. *Drug Safety* 2002; **25:** 323–44.

Interactions

◊ For reports of interactions between *phenelzine* and ginseng, see p.419. For details of an interaction between *warfarin* and ginseng, see p.1431. For a suggestion that ginseng may interfere with *digoxin* assays, see p.1260.

Uses and Administration

Ginseng is reported to enhance the natural resistance and recuperative power of the body and to reduce fatigue. It is available commercially as roots, powdered roots, tablets, capsules, teas, oils, or extracts.

Preparations

USNF 26: American Ginseng Capsules;
USP 31: American Ginseng Tablets; Asian Ginseng Tablets.

Proprietary Preparations (details are given in Part 3)
Arg.: Ginsana; Herbaccion Bioenergizante; Juvitan†; Transformal†; Vitagenol†; ***Austral.:*** Herbal Stress Relief†; ***Austria:*** Ginsana; ***Belg.:*** Ginsana†; ***Braz.:*** Enerseng; Fortilan; Ginsana; Ginsex; ***Canad.:*** Ginsana†; ***Cz.:*** Ginsana; ***Fr.:*** Gerimax Tonique; Ginsana†; ***Ger.:*** Ardey-aktiv; Coriosta Vitaltonikum N†; Ginsana; Hevert-Aktivon Mono†; IL HWA; Orgaplasma; ***Ital.:*** Fon Wan Ginsenergy; Gi-Sen†; Ginsana; ***Malaysia:*** Ginsana; ***Mex.:*** Gincaps†; Raigin†; Rutying; Sanjin Royal Jelly; ***Pol.:*** Ginsana; Ginsenol; Panaxan; ***Port.:*** Ginsana; ***Rus.:*** Gerimax Ginseng (Геримакс Женьшень); Ginsana (Гинсана); ***Singapore:*** Ginsana; ***Spain:*** Bio Star; Ginsana†; ***Switz.:*** Ginsana; Ginsavita†; KintaVital; ***Thai.:*** Ginsana; Ginsroy; ***UK:*** Korseng; Red Kooga.

Multi-ingredient: ***Arg.:*** Dynamisan; Energy Plus; Galenic Restaurador Capilar; Ginseng Bioplus Diates; Herbaccion Ginseng Y Magnesio; Holomagnesio Vital; Inteligen Ginseng†; Neuroton; Optimina Plus; Top Life Memory†; Total Magnesiano con Ginseng; Total Magnesiano con Vitaminas y Minerales; Vifortol; ***Austral.:*** Bioglan Ginsynergy; Clements Tonic; Extralife Extra-Brite; Ginkgo Biloba Plus†; Ginkgo Complex†; Glycyrrhiza Complex†; Infant Tonic†; Irontona; Nervatona Focus; Panax Complex†; Vig; Vitatona; ***Austria:*** Gerimax Plus; ProAktiv; ***Braz.:*** Gerin; Poliseng; ***Canad.:*** Damiana-Sarsaparilla Formula†; Energy Plus†; Ginkoba†; ***Chile:*** Gincosan; Mentania; Nectaday; ***Cz.:*** Gincosan; ***Fr.:*** Gintonal†; Nostress; Notabac; Thalgo Tonic; Tonactil†; ***Ger.:*** Cardibisana†; Doppelherz Ginseng Aktiv†; Ginseng-Complex "Schuh"†; Peking Ginseng Royal Jelly N; ***Hong Kong:*** Cervusen; GinsengSure†; Sanjukei Panax Ginseng; ***Indon.:*** Armovit; Cerebrovit Active; Ginokan; Hemaviton Brain Nutrient; Hemaviton Energy Drink; Hemaviton Jreng; Instink; Maxirex; Menolia; Neo Hormoviton; Neo Hormoviton Greng; Procur Plus; Proseval; Provital; Provital Plus; Ratax; Sirec; Tripid; Tristan; ***Ital.:*** Alvear con Ginseng; Apergan; Bioton; Fon Wan Ginsenergy; Forticrin; Fosfarsile Forte; Four-Ton; Ginsana Ton; Neoplus; Ottovis; Pollingel Ginseng†; ***Jpn:*** Eki Cabe; ***Malaysia:*** 30 Plus; Adult Citrex Multivitamin + Ginseng + Omega 3; Cerestar†; Ginsomin; Imuvit; Total Man†; ***Philipp.:*** BSI Medicated Spray; Ginsomin; Homtamin-G Plus; Immuvit; K-A Plus; Korgivit-E; Nutrotal; ***Pol.:*** Bioginko; Doppelherz Vital Kapseln; Ginjal; Intelektan; ***Rus.:*** Doppelherz Ginseng Aktiv (Доппельгерц Женьшень Актив); Doppelherz Vitalotonik (Доппельгерц Виталотоник); ***S.Afr.:*** Activex 40 Plus; ***Singapore:*** Gin-Vita; Immuvital; ***Spain:*** Energysor†; Esforza†; Redseng Polivit; Ton Was; Vigortonic; ***Switz.:*** Biovital Ginseng; Burgerstein TopVital; Geri; Gincosan; Imuvit; Supradyn Vital 50+; Triallin; Vigoran†; ***Thai.:*** Imugins; Imuvit; Multilim RG; Revitan; ***UK:*** Red Kooga Co-Q-10 and Ginseng; Regina Royal Concorde; ***Venez.:*** Hivit; Pharmorat; Sengobil; Vigoran.

Glatiramer Acetate *(BAN, USAN)*

COP-1; Copolymer 1; Glatirameeriasetaatti; Glatiramer, acetato de; Glatiramer Asetat; Glatirameracetat; Glatirameri Acetas. L-Glutamic acid polymer with L-alanine, L-lysine and L-tyrosine, acetate.

Глатирамер Ацетат

CAS — 28704-27-0 (glatiramer); 147245-92-9 (glatiramer acetate).
ATC — L03AX13.
ATC Vet — QL03AX13.

Adverse Effects and Precautions

Immediate post-injection reactions are common with glatiramer acetate and include chest pain, palpitations or tachycardia, dyspnoea, throat constriction, urticaria, flushing (vasodilatation), and anxiety. These reactions are generally short-lived and resolve spontaneously. They have generally occurred only some months after treatment with glatiramer was started. Other common adverse effects include asthenia, nausea, constipation, diarrhoea, rash, sweating, arthralgia, hypertonia, and dizziness. Convulsions and anaphylactoid reactions have been reported rarely. Antibodies to the drug develop with chronic therapy but are of unknown clinical significance. Pain, erythema, inflammation, mass, pruritus, and induration may occur at the injection site; localised lipoatrophy and, rarely, skin necrosis has also been reported.

Glatiramer acetate should be given with caution to patients with pre-existing cardiac disorders; such patients should be followed up regularly during treatment.

◊ References.

1. Ziemssen T, *et al.* Risk-benefit assessment of glatiramer acetate in multiple sclerosis. *Drug Safety* 2001; **24:** 979–90.

Anaphylaxis. A systemic anaphylactic reaction to glatiramer acetate developed in a patient who showed a strong immunoglobulin response including specific immunoglobulin E.[1]

1. Rauschka H, *et al.* Severe anaphylactic reaction to glatiramer acetate with specific IgE. *Neurology* 2005; **64:** 1481–2.

Effects on the skin. Localised lipoatrophy at the injection site developed in 6 patients receiving glatiramer acetate.[1] Examination of 76 patients over a 6-month period in one centre[2] revealed evidence of lipoatrophy in at least one injection site in 34 patients; of these, 5 cases were severe. Prevalence of lipoatrophy was much higher than expected, and in some cases, it occurred only a few months after treatment started.[2]
Erythema nodosum confirmed by biopsy has been reported in one patient;[3] spontaneous resolution occurred without stopping treatment.

1. Drago F, *et al.* Localized lipoatrophy after glatiramer acetate injection in patients with remitting-relapsing multiple sclerosis. *Arch Dermatol* 1999; **135:** 1277–8.
2. Edgar CM, *et al.* Lipoatrophy in patients with multiple sclerosis on glatiramer acetate. *Can J Neurol Sci* 2004; **31:** 58–63.
3. Thouvenot E, *et al.* Erythema nodosum and glatiramer acetate treatment in relapsing-remitting multiple sclerosis. *Multiple Sclerosis* 2007; **13:** 941–4.

Interactions

UK licensed product information reports that an increased incidence of injection-site reactions to glatiramer acetate has been seen in patients also given corticosteroids.

Pharmacokinetics

A substantial fraction of a subcutaneous dose of glatiramer is believed to be hydrolysed locally. Some of the injected dose is also presumed to enter the lymphatic system, either intact or partially hydrolysed.

Uses and Administration

Glatiramer acetate, a random polymer of L-alanine, L-glutamic acid, L-lysine, and L-tyrosine, is a polypeptide that has some structural resemblance to myelin basic protein, and is used to reduce the frequency of relapses in the management of relapsing-remitting multiple sclerosis (p.892). It is given by subcutaneous injection in a dose of 20 mg daily. It should not be given by the intravenous or intramuscular route. An oral formulation has been investigated with disappointing results.

Multiple sclerosis. Reviews[1,2] and a meta-analysis[3] of controlled studies of glatiramer acetate in the treatment of multiple sclerosis concluded that it is of benefit, although one systematic review[4] questions this and failed to find evidence to support its routine use. The mechanism of glatiramer acetate has also been reviewed.[5]

1. Simpson D, *et al.* Glatiramer acetate: a review of its use in relapsing-remitting multiple sclerosis. *CNS Drugs* 2002; **16:** 825–50.
2. Ruggieri M, *et al.* Glatiramer acetate in multiple sclerosis: a review. *CNS Drug Rev* 2007; **13:** 178–91.
3. Boneschi FM, *et al.* Effects of glatiramer acetate on relapse rate and accumulated disability in multiple sclerosis: meta-analysis of three double-blind, randomized, placebo-controlled clinical trials. *Multiple Sclerosis* 2003; **9:** 349–55.
4. Munari L, *et al.* Therapy with glatiramer acetate for multiple sclerosis. Available in The Cochrane Database of Systematic Reviews; Issue 4. Chichester: John Wiley; 2003 (accessed 09/01/08).
5. Schrempf W, Ziemssen T. Glatiramer acetate: mechanisms of action in multiple sclerosis. *Autoimmun Rev* 2007; **6:** 469–75.

Preparations

Proprietary Preparations (details are given in Part 3)
Arg.: Copaxone; ***Austral.:*** Copaxone; ***Austria:*** Copaxone; ***Belg.:*** Copaxone; ***Braz.:*** Copaxone; ***Canad.:*** Copaxone; ***Cz.:*** Copaxone; ***Denm.:*** Copaxone; ***Fin.:*** Copaxone; ***Fr.:*** Copaxone; ***Ger.:*** Copaxone; ***Gr.:*** Copaxone; ***Hung.:*** Copaxone; ***Irl.:*** Copaxone; ***Israel:*** Copaxone; ***Ital.:*** Copaxone; ***Mex.:*** Copaxone; ***Neth.:*** Copaxone; ***Norw.:*** Copaxone; ***NZ:*** Copaxone; ***Pol.:*** Copaxone; ***Port.:*** Copaxone; ***Rus.:*** Copaxone (Копаксон); ***Spain:*** Copaxone; ***Swed.:*** Copaxone; ***Switz.:*** Copaxone; ***Turk.:*** Copaxone; ***UK:*** Copaxone; ***USA:*** Copaxone.

Glicofosfopeptical

AM-3; Fosfoglicopeptical; Glycophosphopeptical; Immunoferon.

Иммуноферон

CAS — 87139-86-4.

Profile

Glicofosfopeptical is a polysaccharide-protein complex that is reported to possess immunostimulant properties. It has been given orally in doses of 1 g every eight hours.

◊ References.

1. Alvarez-Mon M, *et al.* Treatment with the immunomodulator AM3 improves the health-related quality of life of patients with COPD. *Chest* 2005; **127:** 1212–18.

Preparations

Proprietary Preparations (details are given in Part 3)
Mex.: Inmunol; ***Port.:*** Imunoferon; ***Spain:*** Inmunoferon.

Glucomannan

E425; Glucomanano; Harina de Konjac; Konjac Flour; Konjac Mannan.

Profile

Glucomannan, a powdered extract from the tubers of *Amorphophallus konjac*, has been promoted as an anorectic. It has been claimed to reduce the appetite by absorbing liquid in the gastrointestinal tract. It is also used in the treatment of constipation and hyperlipidaemia. Glucomannan has been investigated as a dietary adjunct in the management of diabetes mellitus.

There is a risk of intestinal or oesophageal obstruction and faecal impaction, especially if it is swallowed dry. Therefore, it should always be taken with sufficient fluid and should not be taken