

Potential Herb-Drug Interactions for Commonly Used Herbs*

How to Read the Chart

The chart is read from left to right. The information in the Basis of Concern column provides the evidence for the information in the Potential Interaction column. For example, *clinical studies* verify that administration of St John's wort resulted in *decreased levels* of cancer chemotherapeutic drugs. (Italicized words represent the information in the Herb-Drug Interaction chart below.) Sometimes more details are provided in the Basis of Concern column. For example, *a clinical study with healthy volunteers* verified that administration of St John's wort resulted in *increased clearance* of gliclazide, and so *may reduce the drug's efficacy*, however, *glucose and insulin response to glucose loading was unchanged*. A recommended action is suggested on a risk assessment of the information in the Basis of Concern. In these examples:

- It is recommended that St John's wort is contraindicated in patients taking cancer chemotherapeutic drugs.
- In the case of gliclazide, because the trial found little effect on a clinically-relevant outcome, the potential interaction is considered low risk and a caution is recommended: the patient should be monitored, through the normal process of repeat consultations.

Please also see **General Prescribing Guidelines** and **Assessment of Risk & Recommended Action** for further information, [Click Here](#)

Herb	Drug	Potential Interaction	Basis of Concern	Recommended Action†
Baical Skullcap <i>Scutellaria baicalensis</i>	Rosuvastatin	May decrease drug levels.	Clinical study with healthy volunteers using 150 mg/day of isolated constituent (baicalin). ¹	Monitor (low level of risk). ^Δ
Barberry <i>Berberis vulgaris</i>	Drugs that displace the protein binding of bilirubin eg phenylbutazone	May potentiate effect of drug on displacing bilirubin.	Theoretical concern based on <i>in vitro</i> data and <i>in vivo</i> animal study (high dose of berberine by injection) reduced bilirubin serum protein binding. ²	Monitor (low level of risk).
Bilberry <i>Vaccinium myrtillus</i>	Warfarin	Potential of bleeding possible at very high bilberry doses.	Antiplatelet activity observed for high doses of bilberry in volunteers. ³ Case report (extract undefined). ⁴	Monitor at high doses (> 100 mg/dav)

				anthocyanins, low level of risk).
Black Cohosh <i>Cimicifuga racemosa</i>	Statin drugs eg atorvastatin	May potentiate increase in liver enzymes, specifically ALT.	Case report. ⁵	Monitor (low level of risk).
Bladderwrack <i>Fucus vesiculosus</i>	Hyperthyroid medication eg carbimazole	May decrease effectiveness of drug due to natural iodine content. ⁶	Theoretical concern, no cases reported.	Contraindicated unless under close supervision.
	Thyroid replacement therapies eg thyroxine	May add to effect of drug.	Theoretical concern linked to a case report where “kelp” caused hyperthyroidism in a person not taking thyroxin. ⁷	Monitor (low level of risk).
Bugleweed <i>Lycopus virginicus</i> <i>Lycopus europaeus</i>	Radioactive iodine	May interfere with administration of diagnostic procedures using radioactive isotopes. ⁸	Case report.	Contraindicated.
	Thyroid hormones	Should not be administered concurrently with preparations containing thyroid hormone. ⁹	Theoretical concern based on deliberations of German Commission E.	Contraindicated.
Cat's Claw <i>Uncaria tomentosa</i>	HIV protease inhibitors	May increase drug level.	Case report, in a patient with cirrhosis being evaluated for a liver transplant. ¹⁰	Monitor (low level of risk).
Cayenne (Chilli Pepper) <i>Capsicum spp.</i>	ACE inhibitor	Cough induced by topical capsaicin (one case). ¹¹	Theoretical concern since capsaicin depletes substance P.	Monitor (very low level of risk).
	Theophylline	Increased absorption and bioavailability.	Clinical study (healthy volunteers, chilli-spiced meal). ¹²	Monitor (low level of risk).
Celery Seed <i>Apium graveolens</i>	Thyroxine	Reduced serum levels of thyroxine. ¹³	Case reports.	Monitor (very low level of risk).

Coleus <i>Coleus forskohlii</i>	Antiplatelet medication	May potentiate effects of drug.	Theoretical concern based on <i>in vivo</i> animal studies of standardised Coleus extract and the active constituent forskolin. ¹⁴	Monitor (low level of risk).
	Hypotensive medication	May potentiate effects of drug.	Theoretical concern based on ability of high doses of forskolin and standardised Coleus extract to lower blood pressure in normotensive and hypertensive animals. ^{15,16} Clinical data from weight management trials: no effect on blood pressure in three trials, trend toward lower blood pressure in one small study. ^{17,18} No experimental or clinical studies conducted with hypotensive medication.	Monitor (low level of risk).
	Prescribed medication	May potentiate effects of drug.	Theoretical concern based on ability of forskolin to activate increased intracellular cyclic AMP <i>in vitro</i> . ¹⁹	Monitor (low level of risk).
Cranberry <i>Vaccinium macrocarpon</i>	Warfarin	May alter INR (most frequently increase).	Case reports (where reported the dosage was frequently high: up to 2000 mL/day, juice strength undefined; 113 g/day, cranberry sauce). ^{20,21,22,23,24,25} Clinical trials: no significant interaction found in atrial fibrillation patients (250 mL/day cranberry juice cocktail), ²⁶ in patients on warfarin for a variety of indications (8 oz (236 mL)/day cranberry juice), ²⁷ or in healthy volunteers (600 mL/day cranberry juice); ²⁸ but an increase in warfarin response was observed in	Monitor (low level of risk at typical doses).

			healthy volunteers (juice concentrate equivalent to 57 g of dry fruit/day). ²⁹	
Dan Shen <i>Salvia miltiorrhiza</i>	Warfarin	May potentiate effect of drug: increased INR, ^{30,31,32} prolonged APTT.	Case reports.	Contraindicated.
Devil's Claw <i>Harpagophytum procumbens</i>	Warfarin	Purpura ³³ possibly due to increased bleeding tendency.	One case report with very few details. Unlikely to occur.	Monitor (very low level of risk).
Dong Quai <i>Angelica sinensis</i> <i>Angelica polymorpha</i>	Warfarin	May potentiate effect of drug: increased INR and PT; ³⁴ increased INR and widespread bruising. ³⁵	Case reports.	Monitor (low level of risk).
Echinacea <i>Echinacea angustifolia</i> <i>Echinacea purpurea</i>	Immunosuppressives	May decrease effectiveness of drug. ^{36,37}	Theoretical concern based on immune-enhancing activity of Echinacea. No adverse events reported.	Contraindicated.
	Midazolam	Decreases drug levels when drug administered intravenously. ^B	Clinical study (<i>E. purpurea</i> root, 1.6 g/day). ³⁸	Monitor (medium level of risk) when drug administered intravenously.
Evening Primrose Oil <i>Oenothera biennis</i>	Phenothiazines	May decrease effectiveness of drug.	Reports of worsening epilepsy in schizophrenics. No causal association demonstrated and no effect observed in later trials. ³⁹	Monitor (very low level of risk).
Garlic <i>Allium sativum</i>	Aspirin – See Antiplatelet and anticoagulant drugs below			
	Antiplatelet and anticoagulant drugs eg aspirin, warfarin	Aspirin: May increase bleeding time. ⁴⁰ Warfarin: May potentiate effect of drug: increased	Case reports of increased bleeding tendency with high garlic intake. ^{42,43,44,45} Clinical studies with healthy volunteers: no effect on platelet aggregation	Monitor at doses equivalent to < 5 g/day fresh garlic (low level

		INR observed. ⁴¹ Large doses could increase bleeding tendency.	(4.2 g/day, raw garlic), ⁴⁶ inhibited platelet aggregation and increased clotting time at higher doses (8–10 g/day, raw garlic). ^{47,48,49} Aspirin: No studies yet for coadministration. Warfarin: Case report of possible interaction. ⁴¹ Clinical trial: no effect in healthy volunteers for coadministration (enteric-coated tablets equivalent to 4 g/day of fresh garlic, containing 7.4 mg/day of allicin). ²⁹	of risk). Contraindicated for doses equivalent to > 5 g/day fresh garlic unless under close supervision.
	HIV protease inhibitors eg saquinavir	Decreases drug level.	Clinical study. ⁵⁰	Monitor (medium level of risk).
Warfarin – See Antiplatelet and anticoagulant drugs above				
Ginger <i>Zingiber officinale</i>	Antacids	May decrease effectiveness of drug.	Theoretical concern since ginger increases gastric secretory activity <i>in vivo</i> (animals). ³⁶	Monitor (low level of risk).
	Antiplatelet and anticoagulant drugs eg phenprocoumon, warfarin	Phenprocoumon: May increase effectiveness of drug (increased INR reported).	One case reported (dosage undefined). ⁵¹	Monitor at doses equivalent to < 4 g/day dried ginger (low level of risk).
		Warfarin: Increased risk of spontaneous bleeding.	Theoretical concern based on antiplatelet activity and potential to inhibit thromboxane synthetase. Clinical studies: inhibition of platelet aggregation (5 g, divided single dose, dried ginger) in healthy volunteers, ⁵² and coronary artery	Monitor at doses equivalent to < 4 g/day dried ginger (very low risk). Contraindicated

			disease patients (10 g, single dose, dried ginger), ⁵³ but no effect in healthy volunteers (2 g, single dose, dried ginger), ⁵⁴ or coronary artery disease patients (4 g/day, dried ginger); ⁵⁵ inhibition of platelet thromboxane production in healthy volunteers (5 g/day, fresh ginger). ⁵⁵ One case of bleeding reported for warfarin (ginger dosage undefined). ⁵⁶ No pharmacokinetic or pharmacodynamic effect on warfarin demonstrated in a clinical trial (3.6 g/day, dried ginger). ⁵⁷	unless under close supervision at doses equivalent to > 4 g/day dried ginger.
	Nifedipine	May produce a synergistic antiplatelet effect.	Clinical study (1 g/day) in healthy volunteers and hypertensive patients. ⁵⁸	Contraindicated.
	Phenprocoumon - See <i>Antiplatelet and anticoagulant drugs above</i>			
	Warfarin - See <i>Antiplatelet and anticoagulant drugs above</i>			
Ginkgo <i>Ginkgo biloba</i>	Anticonvulsant medication eg sodium valproate, carbamazepine	May decrease the effectiveness of drug.	Theoretical concern based on <i>in vivo</i> animal study (Ginkgo administered by injection). ⁵⁹ Case reports, two with well-controlled epilepsy, ⁶⁰ others anecdotal and uncertain. ^{61,62,63}	Monitor (low level of risk).
	Antiplatelet and anticoagulant drugs eg aspirin, cilostazol, warfarin ^C	Aspirin, Warfarin: Increased bleeding tendency. Ginkgo extract could have clinical antiplatelet activity.	Rare case reports of bleeding: in two cases aspirin and in one case warfarin was also taken. ⁶⁴ Clinical studies (with aspirin): No additional effect on platelet function, platelet aggregation <i>ex vivo</i> or bleeding time. ^{65,66,67} Clinical studies (with warfarin): No additional effect on INR. platelet aggregation <i>ex vivo</i> .	Aspirin: Monitor (low level of risk). Warfarin: Monitor (low level of risk).

			coagulation parameters or plasma drug level. ^{57,68,69} See also note below. ^D	
		Cilostazol: May prolong bleeding time.	Pharmacodynamic interaction observed in clinical trial (Ginkgo 50:1 extract: single dose 120 mg, equivalent to 6 g of dried leaf), but no change in platelet aggregation or clotting time, and no significant correlation between prolongation of bleeding time and inhibition of platelet aggregation. ⁷⁰	Monitor (low level of risk).
	Antipsychotic medication eg haloperidol, olanzapine, clozapine	May potentiate the efficiency of drug in patients with schizophrenia.	Randomised, controlled trials (Ginkgo 50:1 extract: 120-360 mg/day, equivalent to 6-18 g/day of dried leaf). ^{71,72,73,74}	Prescribe cautiously. Reduce drug if necessary in conjunction with prescribing physician.
	Benzodiazepines eg midazolam	May alter effectiveness of drug.	Clinical trials: effect on drug levels conflicting – increased (defined as a weak interaction) ^{E,75} and decreased (most rigorous results; Ginkgo 50:1 extract: 240 mg/day, equivalent to 12 g/day of dried leaf). ⁷⁶	Monitor (low level of risk).
Glipizide - See Hypoglycaemic drugs below				
Haloperidol - See Antipsychotic medication above				
	Hypoglycaemic drugs eg glipizide, metformin, nio ^g litazone.	Glipizide: May cause hypoglycaemia.	Observation from aborted trial: hypoglycaemia occurred in volunteers with normal glucose tolerance within 60 minutes. ⁷⁷ Ginkgo 50:1 extract was	Monitor (low level of risk).

	tolbutamide		administered as a single dose of 120 mg, equivalent to 6 g of dried leaf. ⁷⁸	
		Metformin: May enhance effectiveness of drug.	Clinical trial: elimination half-life was increased at doses of metformin 850 mg, three times a day. Effect not significant at doses to 500 mg, twice a day. Ginkgo 50:1 extract was administered as a single dose of 120 mg, equivalent to 6 g of dried leaf. ⁷⁷	Monitor at doses of metformin > 1 g/day (medium level of risk). Reduce drug if necessary in conjunction with prescribing physician.
		Pioglitazone: May enhance effectiveness of drug.	Clinical trial with healthy volunteers (Ginkgo 50:1 extract: 120 mg/day, equivalent to 6 g/day of dried leaf). ⁷⁹	Monitor (low level of risk).
		Tolbutamide: May decrease effectiveness of drug.	Clinical trial with healthy volunteers (high dose of Ginkgo 50:1 extract: 360 mg/day, equivalent to 18 g/day of dried leaf). ⁷⁵	Monitor (low level of risk at recommended doses of 120 mg/day, equivalent to 6 g of dried leaf).
Metformin - See Hypoglycaemic drugs above				
	Nifedipine	May increase drug levels or side effects.	Clinical studies: ^{80,81} mixed results found for mean plasma drug level – increase (120 mg/day, equivalent to 6 g/day of dried leaf) and no effect (240 mg/day, equivalent to 12 g/day of dried leaf). However, at the higher dose, maximal plasma drug level and heart rate was increased with adverse drug reactions for	Monitor at doses < 240 mg/day, equivalent to < 12 g/day of dried leaf (medium level of risk). Contraindicated for higher doses.

			participants with highest plasma drug levels (headache, dizziness, hot flushes).	
	Omeprazole	May decrease effectiveness of drug.	Clinical trial (high dose of Ginkgo 50:1 extract: 280 mg/day, equivalent to 14 g/day of dried leaf). ⁸²	Monitor (low level of risk at recommended doses of 120 mg/day, equivalent to 6 g of dried leaf).
Tolbutamide - See Hypoglycaemic drugs above				
Golden Seal <i>Hydrastis canadensis</i>	Drugs which displace the protein binding of bilirubin eg phenylbutazone	May potentiate effect of drug on displacing bilirubin.	Theoretical concern based on <i>in vitro</i> data and <i>in vivo</i> animal study (high dose of berberine by injection) reduced bilirubin serum protein binding. ²	Monitor (low level of risk).
	Midazolam	May increase drug level.	Clinical trial (defined as a weak interaction ^E). ⁸³	Monitor (low level of risk).
Green Tea <i>Camellia sinensis</i>	Statin drugs	May increase plasma level and side effect of drug.	One case reported of muscle pain (side effect). Pharmacokinetic evaluation indicated green tea (1 cup) increased the bioavailability of simvastatin in this patient. ⁸⁴	Monitor (low level of risk).
	Warfarin	May inhibit effect of drug: decreased INR.	Case report (brewed green tea: 0.5–1 gallon/day). ⁸⁵	Monitor (very low level of risk).
Hawthorn <i>Crataegus monogyna</i> <i>Crataegus laevigata</i> (<i>Crataegus oxyacantha</i>)	Digoxin	May increase effectiveness of drug.	Clinical studies indicate a (beneficial) synergistic effect. ^{86,87} Pharmacokinetics not affected in a clinical study. ⁸⁸	Monitor (low level of risk).
	Hypotensive drugs including beta-blockers	May increase effectiveness of drug.	Three controlled clinical trials: two demonstrate hawthorn causes a slight reduction in blood pressure in patients	Monitor (low level of risk).

			with heart conditions. ^{89,90,91}	
Hypoglycaemic herbs eg <i>Gymnema sylvestre</i> , goat's rue (<i>Galega officinalis</i>), fenugreek (<i>Trigonella foenum-graecum</i>)	Hypoglycaemic drugs and insulin	Enhanced reduction of blood glucose.	Theoretical concern, no documented case histories. In uncontrolled trials, high dose, long-term administration of <i>Gymnema</i> extract (equivalent to 10–13 g/day dried leaf) reduced insulin and hypoglycaemic drug requirements in diabetics. ^{92,93}	Prescribe cautiously and monitor blood sugar regularly. Warn patient about possible hypoglycaemia. Reduce drug if necessary in conjunction with prescribing physician.
Kava <i>Piper methysticum</i>	CNS depressants eg alcohol, barbiturates, benzodiazepines	Potential of drug effects.	Theoretical concern based on deliberations of German Commission E ⁹ and the anxiolytic activity of kava. ³⁶ Two apparent case reports (kava + benzodiazepines). ^{94,95} Clinical trials with healthy volunteers: no additional side effects observed for kava (extract containing 240 mg/day of kava lactones) + benzodiazepine, ⁹⁶ and kava (extract containing 210 mg/day of kava lactones) + alcohol. ⁹⁷	Monitor (low level of risk).
	L-dopa and other Parkinson's disease treatments	Possible dopamine antagonist effects.	Cases suggestive of dopamine antagonism reported. ⁹⁸	Contraindicated unless under close supervision.
Korean Ginseng <i>Panax ginseng</i>	Antihypertensive medications including nifedipine	General: May decrease effectiveness of drug.	Theoretical concern since hypertension is a feature of GAS. Clinical significance unclear. ³⁶	Monitor (very low level of risk).

		Nifedipine: May increase drug levels.	Clinical trial. ⁸¹	Monitor (low level of risk).
	CNS stimulants	May potentiate effects of drug. ³⁶	Theoretical concern since CNS stimulation is a feature of GAS. Clinical significance unclear.	Monitor (low level of risk).
	Hypoglycaemic drugs, including insulin	May potentiate hypoglycaemic activity of drug. ³⁷	Theoretical concern based on clinically observed hypoglycaemic activity of ginseng. ⁹⁹ Clinical significance unclear. Korean red ginseng (2.7 g/day) reduced the requirement for insulin in about 40% of diabetics in a small uncontrolled trial. ¹⁰⁰	Monitor (low level of risk).
	MAO inhibitors eg phenelzine	Headache and tremor, mania.	Case reports. ^{101,102}	Contraindicated.
Nifedipine – See <i>Antihypertensive medications above</i>				
	Sildenafil	Potentiation of drug possible.	Theoretical concern based on <i>in vitro</i> studies which show ginseng increases nitric oxide release from corpus cavernosum tissue. ^{103,104}	Monitor (very low level of risk).
	Warfarin	May decrease effectiveness of drug: decreased INR reported. ¹⁰⁵	One case reported ¹⁰⁵ but clinical significance unclear. No effect demonstrated in two clinical trials for INR, prothrombin time and platelet aggregation. ^{106,107} A small, probably not clinically significant, effect for increased clearance found in one trial. ¹⁰⁸	Monitor (low level of risk).
Laxative (anthraquinone-containing) herbs eg aloe resin (<i>Aloe</i>)	Antiarrhythmic agents	May affect activity if potassium deficiency resulting from long-term	German Commission E and ESCOP recommendation. ^{2,109}	Avoid excessive doses of laxatives.

<i>barbadensis</i>), senna (<i>Cassia</i> spp.), cascara (<i>Rhamnus purshiana</i>), yellow dock (<i>Rumex crispus</i>)		laxative abuse is present.		Maintain patients on a high potassium diet.
	Cardiac glycosides	May potentiate activity, if potassium deficiency resulting from long-term laxative abuse is present.	German Commission E and ESCOP recommendation. ^{9,109}	Monitor (low level of risk at normal doses).
	Potassium depleting agents eg thiazide diuretics, corticosteroids, licorice root (<i>Glycyrrhiza glabra</i>)	May increase potassium depletion.	German Commission E and ESCOP recommendation. ^{9,109}	Avoid excessive doses of laxatives. Maintain patients on a high potassium diet.
Licorice - deglycyrrhizinized <i>Glycyrrhiza glabra</i>	Nitrofurantoin	May alter effectiveness of drug.	Clinical study: significantly increased the rate of excretion of drug in patients. No effect in healthy volunteers. Number of patients with sterile urine at day 5 was greater when herb and drug combined. ¹¹⁰	Do not take simultaneously with medication.
Licorice – full root <i>Glycyrrhiza glabra</i>	Antihypertensive medications	May decrease effectiveness of drug when consumed in high doses. Licorice can cause pseudoaldosteronism and high blood pressure. ³⁶ ACE-inhibitor may mask the development of pseudoaldosteronism.	Case report for enalapril (ACE-inhibitor). High dose of licorice consumed (200–240 mg/day glycyrrhizin), drug dosage was reduced, causing adverse reaction. ¹¹¹ Theoretical concern for other drugs based on case reports of hypertension following intake of licorice-containing candy. ³⁶	Avoid long-term use at doses > 100 mg/day glycyrrhizin unless under close supervision. ^F Place patients on a high potassium diet.
	Cilostazol	May cause hypokalaemia, which can potentiate the	Case report (patient taking 150 mg/day of glycyrrhizin). ¹¹²	Monitor (medium level of

		toxicity of the drug.		risk). Place patients on a high potassium diet.
	Digoxin	Excessive licorice intake causes hypokalaemia which can potentiate the toxicity of the drug. ⁹	Clinical studies of active constituents and case reports of hypokalaemia from candy intake (large doses). ³⁶ One case report of drug interaction for ingestion of herbal laxative containing licorice (1.2 g/day) and rhubarb (4.8 g/day). ¹¹³	Avoid long-term use at doses > 100 mg/day glycyrrhizin unless under close supervision. ^F Place patients on a high potassium diet.
	Diuretics	Spironolactone (potassium sparing diuretic): Reduces side effects of drug.	Clinical study: in women with PCOS addition of licorice (containing about 463 mg/day glycyrrhizin) reduced side effects related to the diuretic activity of drug. ¹¹⁴	Monitor (low level of risk at normal doses).
		Thiazide diuretics and other potassium depleting drugs: Combined effect of licorice and the drug could result in excessive potassium loss. ⁹	Clinical studies of active constituents, case reports from candy intake (large doses), ³⁶ and case reports of ongoing treatment with glycyrrhizin (80–240 mg/day). ¹¹⁵	Avoid long-term use at doses > 80 mg/day glycyrrhizin. Place patients on a high potassium diet.
	Prednisolone	May potentiate or increase levels of drug.	Two clinical studies (oral administration of the constituents glycyrrhizin (GL) or glycyrrhetic acid (GA); prednisolone administered intravenously): increased drug level ¹¹⁶ and increased	Monitor (low level of risk) when drug administered intravenously.

			prednisolone/prednisone in urine and plasma. ¹¹⁷ Dosage was high: 200 mg/day GL, ¹¹⁶ and 400 mg/day GA (= 700 mg/day GL). ¹¹⁷ See also note below. ^G	
Thiazide diuretics and other potassium depleting drugs – See <i>Diuretics</i> above				
Marshmallow Root <i>Althaea officinalis</i>	Prescribed medication	May slow or reduce absorption of drugs.	Theoretical concern based on absorbent properties of marshmallow root.	Take at least 2 hours away from medication.
Meadowsweet <i>Filipendula ulmaria</i>	Warfarin	May potentiate effects of drug.	Theoretical concern based on <i>in vivo</i> animal study demonstrating anticoagulant activity (details of dosage unavailable). ¹¹⁸	Monitor (very low level of risk).
Polyphenol-containing^H or Flavonoid-containing herbs especially cayenne (<i>Capsicum annuum</i>), chamomile (<i>Matricaria recutita</i>), green tea (<i>Camellia sinensis</i>), lime flowers (<i>Tilia cordata</i>), rosemary (<i>Rosmarinus officinalis</i>), St Mary's thistle (<i>Silybum marianum</i>), vervain (<i>Verbena officinalis</i>) (See also Tannin-containing herbs)	Immunosuppressives eg cyclosporin	Decreases drug levels, due to impaired absorption or increased metabolism.	Three case reports, in transplant patients (2 L/day of herbal tea; 1-1.5 L/day of chamomile tea; 'large quantities' of fruit tea containing hibiscus extract, black tea). Confirmed by rechallenge in one case, but no signs of rejection. ¹¹⁹	Monitor (medium level of risk). Also advisable not to take simultaneously.
	Iron	Inhibition of non-haem iron ^J absorption.	Clinical studies (cayenne (high dose: 14.2 g, fresh weight ^K), chamomile, green tea, lime flowers, peppermint, rosemary, vervain), polyphenol-containing vegetable, red wine, coffee): ^{120,121,122,123,124,125} (polyphenols per serving: approx. 25 mg, ¹²⁵ 30 mg ¹²¹ and 50-200 mg ¹²⁰). Results for green tea have been conflicting. ^{121,126,127,128} A cross-sectional study found healthy. French adults are	In anaemia and where iron supplementation is required, do not take simultaneously with meals or iron supplements.

			not at risk of iron depletion due to drinking green or herbal tea. ¹²⁹ Turmeric (2.8 g, fresh weight, containing 50 mg polyphenols) did not inhibit iron absorption. It is not only the quantity of polyphenol present that determines the inhibition, but also for example, the structure of the polyphenol (and hence mechanism of iron binding). ¹²⁵ An iron chelating activity for the flavanolignan silybin is the suggested mechanism for the protection against iron-induced hepatic toxicity demonstrated <i>in vivo</i> (animals, 100 mg/kg). ^{130,131}	
Psyllium <i>Plantago ovata</i> <i>Plantago psyllium</i> <i>Plantago indica</i>	Carbamazepine	Decreases plasma concentration of drug.	Clinical study (psyllium husk), ¹³² although no adverse effect observed in one case report. ¹³³	Take at least 2 hours away from medication.
	Digoxin	May decrease absorption of drug.	Decreased bioavailability found for digoxin and 'crude' (undefined) dietary fibre, ¹³⁴ but no effect was found on digoxin levels in two clinical studies (psyllium husk). ^{135,136}	Take at least 2 hours away from medication.
	Lithium	May decrease absorption of drug.	Case report (psyllium husk). ¹³⁷ Hydrophilic psyllium may prevent lithium from ionising.	Take at least 2 hours away from medication.
	Prescribed medication	May slow or reduce absorption of drugs.	Theoretical concern based on absorbent properties of psyllium.	Take at least 2 hours away from medication. ^L
Schisandra <i>Schisandra chinensis</i>	Immunosuppressives eg tacrolimus	May increase drug levels.	Observations in some renal and liver transplanted recipients. Increased drug	Monitor (low level of risk at

			levels and decreased clearance found in healthy volunteers, given <i>S. sphenanthera</i> extract, providing 33.75 mg/day of deoxyschisandrin ^M . ¹³⁸	normal doses).
	Prescribed medication	May accelerate clearance from the body.	Theoretical concern based on <i>in vivo</i> animal studies demonstrating enhanced phase I/II hepatic metabolism. ^{139,140}	Monitor (medium level of risk).
Siberian Ginseng <i>Eleutherococcus senticosus</i>	Digoxin	May increase plasma drug levels.	Case report: apparent increase in plasma level, but herb probably interfered with digoxin assay ^N (patient had unchanged ECG despite apparent digoxin concentration of 5.2 nmol/L). ¹⁴¹ In a later clinical trial no effect observed on plasma concentration. ¹⁴²	Monitor (very low level of risk).
Slippery Elm Bark <i>Ulmus rubra</i>	Prescribed medication	May slow or reduce absorption of drugs.	Theoretical concern based on absorbent properties of slippery elm.	Take at least 2 hours away from medication.
	Amitriptyline	Decreases drug levels. ¹⁴³	Clinical study.	Monitor (medium level of risk).
St John's Wort <i>Hypericum perforatum</i>	Anticonvulsants eg phenytoin, carbamazepine, phenobarbitone	May decrease drug levels via CYP induction. ^{144,145,146}	Theoretical concern. An open clinical trial demonstrated no effect on carbamazepine pharmacokinetics in healthy volunteers. ¹⁴⁷ Case report: increase in seizures in patient taking several antiepileptics, two of which are not metabolised by cytochrome P450. ¹⁴⁸	Monitor (low level of risk).
	Antihistamine eg fexofenadine	Decreases drug levels.	Clinical studies. ^{149,150}	Monitor (medium level of

			risk).
Antiplatelet and anticoagulant drugs eg clopidogrel, phenprocoumon, warfarin	Clopidogrel: May potentiate effects of drug.	Preliminary study: increased responsiveness (decreased platelet aggregation) in drug-resistant patients. ¹⁵¹ (St John's wort may have assisted the formation of the active metabolite (via CYP3A4 activity), thus providing a beneficial effect in these patients. This is a complex situation, with the meaning of clopidogrel resistance debated. ^{151,152})	In patients with known clopidogrel resistance: Monitor (medium level of risk). In other patients: Monitor (risk is unknown).
	Phenprocoumon: Decreases plasma drug levels.	Clinical study. ¹⁵³	Contraindicated.
	Warfarin: Decreases drug levels and INR.	Case reports and clinical study. ^{106,108,166}	Contraindicated.
Benzodiazepines eg alprazolam, midazolam, quazepam	Decreases drug levels, and is dependent upon the hyperforin content. ¹⁵⁴	Alprazolam: Two clinical studies: no effect in one trial (dose equivalent to about 1.1 g/day of dried herb, extract low in hyperforin). ^{155,156} Midazolam: Four clinical studies, effect not clinically relevant for low hyperforin extracts. ^{150,154,157,158} Quazepam: Decreased drug levels, but no effect on pharmacodynamics. ¹⁵⁹	Hyperforin-rich extracts: Monitor (medium level of risk). Low-hyperforin extracts: Monitor (low level of risk).
Calcium channel antagonists eg nifedipine, verapamil	Decreases drug levels.	Nifedipine: Clinical studies. ^{81,160}	Contraindicated.
		Verapamil: Clinical study. ¹⁶¹	Contraindicated.
Cancer	Decreases drug	Clinical studies.	Contraindicated.

	chemotherapeutic drugs eg irinotecan, imatinib	levels. 162,163,164		
	Combined oral contraceptives	Breakthrough bleeding reported which was attributed to increased metabolism of drug. 165,166	Clinical significance unclear. Cases of unwanted pregnancies have been reported. 167,168 Contradictory results for effect on bioavailability, hormone levels and ovulation demonstrated in three clinical studies, although some breakthrough bleeding occurred. 169,170,171 In one clinical trial an extract low in hyperforin did not affect plasma contraceptive drug levels or cause breakthrough bleeding. 172,173 Clinical study: antiandrogenic effect of contraceptive not affected. 174	Hyperforin-rich extracts: Monitor (medium level of risk). Low-hyperforin extracts: Monitor (very low level of risk).
	Digoxin	Decreases drug levels, 175,176,177 but is dependent upon dose of herb, and the hyperforin content. 155,177	Clinical studies.	Contraindicated at doses equivalent to > 1 g/day dried herb, especially for high-hyperforin extracts.
	HIV non-nucleoside transcriptase inhibitors eg nevirapine	Decreases drug levels. 178	Case report.	Contraindicated.
	Hypoglycaemic drugs eg gliclazide,	Gliclazide: May reduce efficacy of drug by	Clinical study with healthy volunteers, but glucose and insulin response to	Monitor (low level of risk).

	tolbutamide	increased clearance.	glucose loading was unchanged. ¹⁷⁹	
		Tolbutamide: May affect blood glucose.	Clinical study with healthy volunteers found no effect on pharmacokinetics, but there was an increased incidence of hypoglycaemia. ¹⁵⁷	Monitor (low level of risk).
	Immunosuppressives eg cyclosporin, tacrolimus	Decreases drug levels.	Cyclosporin: Case reports, ^{165,180,181,182,183,184,185,186,187} case series, ^{188,189} clinical study. ¹⁹⁰ Interaction is dependent upon the hyperforin content. ^{182,190} Tacrolimus: Case report and clinical studies. ^{191,192,193}	Contraindicated especially for high-hyperforin extracts.
	Ivabradine	May decrease drug levels.	Clinical trial with healthy volunteers. No pharmacodynamic effect was observed. ¹⁹⁴	Monitor (medium level of risk).
	Methadone	Decreases drug levels, possibly inducing withdrawal symptoms.	Case reports. ¹⁹⁵	Contraindicated.
	Methylphenidate	May decrease efficacy.	Case report, ¹⁹⁶ but clinical significance unclear.	Monitor (low level of risk).
Nifedipine – See <i>Calcium channel antagonists</i> above				
	Omeprazole	May decrease drug levels.	Clinical trial. ¹⁹⁷	Monitor (low level of risk).
	Other HIV protease inhibitors eg indinavir	Decreases drug levels. ¹⁹⁸	Clinical study.	Contraindicated.
Phenprocoumon – See <i>Antiplatelet and anticoagulant drugs</i> above				
Simvastatin – See <i>Statin drugs</i> below				
	SSRIs	Potential effects possible	Clinical significance of case reports	Monitor (very

	eg paroxetine, trazodone, sertraline and other serotonergic agents eg nefazodone, venlafaxine	in regard to serotonin levels. 199,200,201,202,203,204	unclear.	low level of risk).
	Statin drugs	May decrease effect and/or drug levels.	Atorvastatin: Clinical study, serum LDL-cholesterol increased by 0.32 mmol/L which corresponds to a decrease in effect of drug in patients by about 30%. Serum total cholesterol was also increased. 205 Pravastatin: Clinical study, no effect on plasma level in healthy volunteers. 206 Simvastatin: Two clinical studies, decrease in drug levels in healthy volunteers, 206 and small increases in serum total cholesterol and LDL-cholesterol in patients. 207	Monitor blood cholesterol regularly (medium level of risk).
	Talinolol	May decrease bioavailability.	Clinical study with healthy volunteers. 208	Monitor (medium level of risk).
	Theophylline	May decrease drug levels.	Case report. 209 No effect observed in clinical study. 210	Monitor (low level of risk).
	Voriconazole	Decreases drug levels. 211	Clinical study.	Monitor (medium level of risk).
	Warfarin – See Antiplatelet and anticoagulant drugs above			
St Mary's Thistle <i>Silbum marianum</i>	Metronidazole	May decrease absorption of drug. by increasing	Clinical study (silymarin: 140 mg/day).	Monitor (medium level of

		clearance. ²¹²		risk).
	Nifedipine	May delay the absorption rate of drug. ²¹³	Clinical study with healthy volunteers (silymarin: 280 mg/day), but bioavailability unchanged.	Monitor (low level of risk).
Tannin- or OPC-containing herbs eg agrimony (<i>Agrimonia eupatoria</i>), bearberry (<i>Arctostaphylos uva-ursi</i>), cranesbill root (<i>Geranium maculatum</i>), grape seed extract (<i>Vitis vinifera</i>), green tea (<i>Camellia sinensis</i>), hawthorn (<i>Crataegus</i> spp.), lemon balm (<i>Melissa officinalis</i>), meadowsweet (<i>Filipendula ulmaria</i>), peppermint (<i>Mentha x piperita</i>), Pelargonium (<i>Pelargonium sidoides</i>), raspberry leaf (<i>Rubus idaeus</i>), sage (<i>Salvia officinalis</i>), St John's wort (<i>Hypericum perforatum</i>), willow bark (<i>Salix</i> spp.) (See also Polyphenol-containing herbs)	Minerals , especially iron	May reduce absorption of non-haem iron from food.	Clinical studies ^{120,214,215,216,217,218,219} (black tea 2.5 g/150 mL, ²¹⁴ 1:100 infusion containing 78 mg of tannins per 150 mL). ²¹⁹ Iron absorption reduced to a greater extent in those with iron deficiency anaemia. ²¹⁹ Cases of iron deficiency/reduced iron absorption: heavy black tea drinkers ^{220,221} and those ingesting sorghum ^P (0.15% tannins). ²²² But, no effect was found on iron status in adults for consumption of black tea in a cross-sectional study. ¹²⁹ In a clinical study tea (type undefined) consumption showed a small, non-significant adverse effect on zinc bioavailability. ²²³	Take at least 2 hours away from medication.
Turmeric <i>Curcuma longa</i>	Antiplatelet or anticoagulant	May potentiate effects of drug.	Theoretical concern based on <i>in vitro</i> and <i>in vivo</i> animal studies mainly of the	Monitor (low level of risk at

	medications		active constituent curcumin demonstrating antiplatelet activity. ^{36,224}	normal doses). Contraindicated in high doses (> 15 g/day dried tuber).
	Talinolol	May decrease bioavailability.	Clinical study with healthy volunteers (300 mg/day of curcumin). ²²⁵	Monitor at high doses (≥ 300 mg/day curcumin, low level of risk).
Valerians (Mexican Valerian, Valerian) <i>Valeriana edulis</i> , <i>Valeriana officinalis</i>	CNS depressants or alcohol	May potentiate effects of drug.	Theoretical concern expressed by US Pharmacopeial Convention. However a clinical study indicated no potentiation with alcohol. ²²⁶	Monitor (very low level of risk).
Willow Bark <i>Salix alba</i> <i>Salix daphnoides</i> <i>Salix purpurea</i> <i>Salix fragilis</i> (See also Tannin-containing herbs)	Warfarin	May potentiate effects of drug.	Clinical study observed very mild but significant antiplatelet activity. ²²⁷	Monitor (low level of risk).

CODE FOR RECOMMENDED ACTION

Contraindicated: Do not prescribe the indicated herb.

Monitor: Can prescribe the indicated herb but maintain close contact and review the patient's status on a regular basis. Note that where the risk is assessed as medium, self-prescription of the herb in conjunction with the drug is not advisable.

NOTES

* This chart contains information the authors believe to be reliable or which have received considerable attention as potential issues. However, many theoretical concerns expressed by other authors have not been included. Due to the focus on safety, positive interactions between herbs

and drugs, and the effect of drugs on the bioavailability of herbs are generally not included.

† For an explanation of the assessment of risk see Herb-Drug Interactions: Assessment of Risk & Recommended Action, [Click Here](#).

A. Analysis of Baical skullcap root samples from Japan found the baicalin content varied from 3.5 to 12%. For a dose of 150 mg/day of baicalin, 1.2–4.3 g/day of dried root would be required.²²⁸

B. No effect overall when midazolam was administered orally: oral clearance and area under the drug concentration-time curve were unchanged.

C. No pharmacodynamic effect found between Ginkgo and clopidogrel⁷⁰ or Ginkgo and ticlopidine²²⁹ and no pharmacokinetic interaction found for ticlopidine²³⁰ in clinical studies.

D. Analysis of over 320 000 patients in a German adverse drug reaction reporting system (1999-2002) found no increase in prevalence of bleeding during Ginkgo intake compared to periods without Ginkgo in those taking anticoagulant or antiplatelet medication.²³¹

E. Refer to Assessment of Risk & Recommended Action for definition of the extent of this interaction. [Click Here](#)

F. This is a guide, based on a recommendation from the German Commission E for long-term consumption of licorice as a flavouring. Glycyrrhizin is also known as glycyrrhizinic acid.

G. A higher prednisolone/prednisone ratio indicates decreased conversion of prednisolone (active) to prednisone (inactive). Glycyrrhetic acid (GA), is the aglycone of glycyrrhizin (GL). GL, is the glycoside and contains the aglycone (GA) and a sugar unit.

H. The word tannin has a long established and extensive usage although it is considered in more recent years to lack precision. Polyphenol is the preferred term when considering the properties at a molecular level. Plant polyphenols are broadly divisible into proanthocyanidins (condensed tannins) and polymers of esters based on gallic and/or hexahydroxydiphenic acid and their derivatives (hydrolyzable tannins).²¹⁶

J. Haem iron is derived from haemoglobin and myoglobin mainly in meat products. Non-haem iron is derived mainly from cereals, vegetables and fruits.

K. Administered in freeze-dried form (4.2 g), which would be expected to have a lower inhibitory effect than with the use of fresh chilli, as freeze drying probably decreased the ascorbic acid content (ascorbic acid enhances iron absorption).¹²⁵

L. This procedure has been adopted in clinical trials where hypocholesterolaemic drugs (statins) were coadministered.^{232,233}

M. Fructus Schisandra is defined as the fruit of *Schisandra chinensis* or *Schisandra sphenanthera* in traditional Chinese medicine. The major constituents are dibenzocyclooctene lignans. Several factors including harvest season, origin of herb and extraction solvent affect the levels of the individual lignans. Aqueous or ethanolic extracts of *S. chinensis* are not likely to contain more than 2.5 mg/g of deoxyschisandrin.^{234,235} A maximum dose of *S. chinensis* extract equivalent to 4 g/day, would provide 10 mg/day of deoxyschisandrin.

N. Eleutherosides (from Siberian ginseng) and ginsenosides (from Korean ginseng) have some structural similarity with digoxin. Because of this similarity interference with serum digoxin measurements is possible, as confirmed when mice fed these herbs demonstrated digoxin activity in their serum. More specific assays are able to negate the interference.²³⁶

P. Sorghum also contains phytate. Both phytate and polyphenol inhibit nutrients such as iron.^{237,238}

ABBREVIATIONS: ACE: angiotensin-converting enzyme; ALT: alanine transaminase, also known as glutamic pyruvic transaminase (GPT);

AMP: adenosine monophosphate; APTT: activated partial thromboplastin time; CNS: central nervous system; CYP: cytochrome P-450; ECG: electrocardiogram/graph; GAS: ginseng abuse syndrome; INR: international normalized ratio; OPC: oligomeric procyanidin; PCOS: polycystic ovary syndrome; PT: prothrombin time; SSRI: selective serotonin reuptake inhibitors; >: greater than; <: less than.

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