The Royal New Zealand College of General Practitioners
Te Whare Tohu Rata o Aotearoa

CONTINUING PROFESSIONAL DEVELOPMENT

POTION OR POISON?

Borage

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Borage (*Borago officinalis*) is an annual herb traditionally cultivated for its culinary and medicinal purposes. Native to the Middle East, Mediterranean, and North Africa, borage leaves have been used in a variety of dishes in fresh or dried form. Flowers are edible and are commonly used as a garnish or decoration in cocktails and desserts. The plant is also commercially cultivated for borage oil extracted from the seeds. In traditional medicine, borage products have been used in the treatment of gastrointestinal, respiratory, cardiovascular, and urinary disorders. Purported to be effective in the treatment of inflammatory skin disorders, rheumatoid arthritis, depression, diabetes, premenstrual syndrome, alcoholism, and attention-deficit hyperactivity disorder, borage oil has also been used to enhance breast milk production and added to infant formula to promote neurodevelopment in preterm infants.

COMMON NAMES: Bee Plant, Beebread, Borage Oil, Borage Seed Oil, Borago, Common Borage, Cool Tankard, Ox's Tongue, Starflower, Starflower Oil, Talewort.

PREPARATIONS: Borage leaves and flowers are available as a herbal tea; borage seed oil is available as liquid drops, capsules, and softgels. Borage is also formulated into skincare products including essential oil, body lotion, hand, foot and eye cream, and soap.

MEDICAL CLAIMS: Borage has been reputed to play a role in maintaining heart, skin, cell membrane and nerve health. Borage seed oil is claimed to have anti-inflammatory, antioxidant, anticancer, anti-atopic, and antioestrogenic effects with blood pressure lowering, antiplatelet and cardiovascular benefits. It is also touted as a restorative agent on the adrenal cortex.

ACTIVE CONSTITUENTS: Borage is a source of gamma-linolenic acid (GLA), an omega-6 fatty acid. Borage seed oil contains between 18–26% GLA as well as

Summary message

Some evidence exists for the use of borage in inflammatory diseases such as rheumatoid arthritis. However, results are inconsistent due to variability in products, dosing and duration of use. Furthermore, individual genetic variation may influence the efficacy of GLA-containing seed oils. Supplementation should be discouraged in pregnancy and lactation due to limited evidence, and risk of hepatotoxicity in the mother due to harmful PA compounds. PAs may also be excreted through breast milk. Borage supplements are generally well tolerated with gastrointestinal effects most commonly reported. PAs may cause hepatotoxicity when used in high doses over a prolonged period of time and only PA-free products should be consumed orally. Borage may increase bleeding time if used concomitantly with anticoagulants and antiplatelet agents. Caution is advised with CYP3A4 inducers and hepatotoxic drugs. It is advised borage supplementation is stopped 2 weeks before surgery.

Herbal medicines are a popular health care choice, but few have been tested to contemporary standards. POTION OR POISON? summarises the evidence for the potential benefits and possible harms of well-known herbal medicines.

stearic, oleic, linoleic, eicosanoic, erucic and nervonic acid. Flowers and leaves do not contain GLA. GLA is metabolised to dihomo-gamma-linolenic acid (DHLA), the metabolites of which are responsible for the anti-inflammatory, antiproliferative, antiatherogenic and vasodilatory effects.

Borage leaves, flowers, seeds and roots contain unsaturated pyrrolizidine alkaloids (PAs), which are hepatotoxic and are usually removed in commercial borage seed oil products through processing.

EVIDENCE: Studies evaluating GLA-containing oils have shown GLA to have a modest effect in human inflammation models and diseases such as rheumatoid arthritis, atopic dermatitis and asthma. A 2011 Cochrane Systematic Review investigating GLA efficacy in rheumatoid arthritis, found moderate reduction in pain intensity, morning stiffness and joint tenderness at 6–12 weeks, with greatest benefits seen at 6 months with doses >1.4 g/day. However, from the 22 studies included in the review, only two included borage seed oil. Although borage seed oil is estimated to contain the highest GLA content among seed oils, studies often report findings from other sources (eg evening primrose, blackcurrant, hemp seed), limiting interpretation of results due to variability in products, dosing and duration, as well as poor reporting quality. Furthermore, in human studies, borage seed oil is often evaluated in combination with other ingredients, resulting in inadequate evidence for the use of borage seed oil/GLA alone, and poor external generalisability of the results. Available data therefore provides only a small insight into the long-term efficacy and harm profiles of these treatments.

Increasingly, research suggests that inconsistent study findings of natural products may be due to genetic variations in the user. While GLA is postulated to block inflammatory processes by conversion to DGLA and subsequent metabolism to potent anti-inflammatory compounds (including prostaglandin E1), DGLA can also be metabolised via an arachidonic acid pathway that is encoded by a fatty acid desaturase gene cluster (FASDS1). Compounds derived through the latter pathway are proinflammatory, suggesting that GLA may have opposing actions depending on the FADS1 variant-associated metabolic efficiency, and a generalised approach may not be appropriate or safe for all consumers.

ADVERSE EFFECTS: Borage oil supplements are generally well tolerated, and borage seed oil has been used in doses up to 4 g per day for up to 12 weeks with apparent safety. Orally, gastrointestinal side effects may occur with symptoms of bloating, belching, diarrhoea, nausea and vomiting. Hypersensitivity reactions are rare but may occur with topical application.

Rare, but serious adverse effects have been reported with unsaturated PAs when ingested in high doses over a prolonged period of time. Although no case reports specify borage associated with toxicity, PAs can cause significant hepatic veno-occlusive disease with enlargement and induration of the liver within a few weeks. They are also potentially mutagenic, carcinogenic and pneumotoxic. One case report has suggested a possible association between borage oil ingestion and status epilepticus.

DRUG INTERACTIONS: Moderate caution is advised with drugs and herbal supplements that act as anticoagulants and antiplatelets as borage may increase bleeding time. The levels of hepatotoxic PA metabolites may be increased when borage is used with CYP3A4 inducers such as carbamazepine, phenytoin, and rifampin. Due to potential hepatotoxicity, borage should not be used with other hepatotoxic drugs such as anabolic steroids, phenothiazines or ketoconazole. Concomitant use with phenothiazines and tricyclic antidepressants may increase seizure risk, and dosage requirements of antiepileptics may need to be increased.

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