Bloodroot

Species (Family)

Sanguinaria canadensis L. (Papaveraceae)

Synonym(s)

Red Indian Paint, Red Root, Sanguinaria, Tetterwort

Part(s) Used

Rhizome

Pharmacopoeial and Other Monographs

BHP 1983[G7]
Martindale 32nd edition[G43]
PDR for Herbal Medicines 2nd edition[G36]

Legal Category (Licensed Products)

Bloodroot is not included in the GSL.[G37]

Constituents[G22,G41]

Alkaloids Isoquinoline type. 3.0–7.0%.[1] Sanguinarine (approx. 1%), sanguidimerine, chelerythrine, protopine; others include oxysanguinarine, α- and β-allocryptopine, sanguilutine, dihydrosanguilutine, berberine, coptisine and homochelidonine.

Other constituents Resin, starch, organic acids (citric, malic).

Alkaloid content of other plant parts recorded as 0.08% (leaf), 1.8% (root).

Food Use

Bloodroot is listed by the Council of Europe as a natural source of food flavouring (category N3). This category indicates that bloodroot can be added to foodstuffs in the traditionally accepted manner, although there is insufficient information available for an adequate assessment of potential toxicity.[G16]

Herbal Use

Bloodroot is stated to act as an expectorant, spasmolytic, emetic, cathartic, antiseptic, cardioactive, topical irritant and escharotic (scab-producing). Traditionally it is indicated for bronchitis (subacute or chronic), asthma, croup, laryngitis, pharyngitis, deficient capillary circulation, nasal polyps (as a snuff), and specifically for asthma and bronchitis with feeble peripheral circulation.[G7]

Dosage

Rhizome 0.06–0.5 g (1–2 g for emetic dose) three times daily.[G7]

Liquid extract 0.06–0.3 mL (1:1 in 60% alcohol) (1–2 mL for emetic dose) three times daily.[G7]

Tincture 0.3–2 mL (1:5 in 60% alcohol) (2–8 mL for emetic dose) three times daily.[G7]

Pharmacological Actions

Activities documented for bloodroot are principally attributable to the isoquinoline alkaloid constituents, in particular sanguinarine. In the last 10 years, interest has focused on the use of sanguinarine in dental hygiene products. Unless otherwise stated, the following actions refer to sanguinarine.

In vitro and animal studies

Considerable antimicrobial activity has been documented against both Gram-positive and Gram-negative bacteria, *Candida* and dermatophytes (fungi), and *Trichomonas* (protozoa).[2] In addition, anti-inflammatory activity has been described against carrageenan-induced rat paw oedema.[3]

Prolongation of the ventricular refractory period has been attributed to an inhibition of Na^+K^+ ATPase.[4,5] However, a single intravenous injection of sanguinarine to anaesthetised dogs reportedly exerted no effect on cardiovascular parameters monitored.[4]

In vitro inhibition of bone resorption and collagenase has been documented.[2]

Clinical studies

Many studies have investigated the efficacy of bloodroot extracts in oral hygiene.[2] Preparations containing bloodroot extracts, such as oral rinses and toothpastes, have been reported to significantly lower plaque, gingival and bleeding indices.[2] Alteration of the oral microbial flora, or development of resistant microbial strains has not been observed with the use of bloodroot extracts.[2]

Side-Effects, Toxicity

None documented for bloodroot. Much has been documented concerning the potential toxicity of the alkaloid constituents in bloodroot, in particular of sanguinarine.

In the 1920s contamination of cooking oil with *Argemone mexicana* seed oil was proposed as the causative factor for epidemic dropsy and associated glaucoma, with sanguinarine considered the toxic component of the seed oil.[1,6,7] However, subsequent workers disputed this theory and the toxicity of *A. mexicana* oil has been attributed to a fatty acid constituent.[1,7]

Conclusions reached in the 1960s over the carcinogenic potential of sanguinarine have more recently been disproved.[8] In addition, negative mutagenic activity has been observed in the Ames test (microbial, with and without activation).[8]

Sanguinarine is poorly absorbed from the gastrointestinal tract. This is reflected in stated acute oral LD_{50} values (rat) of 1.7 g/kg (sanguinarine) and 1.4 g/kg (sanguinaria extract), compared with an acute intravenous LD_{50} (rat) value of 28.7 mg/kg (sanguinarine).[1] Symptoms of diarrhoea, ataxia and reduced activity were observed in animals receiving high oral doses of sanguinarine.[5] The acute dermal toxicity (LD_{50}) of sanguinarine is stated to be greater than 200 mg/kg in rabbits.[1] The first experimental study of sanguinarine toxicity (1876) reported prostration and severe respiratory distress as the most marked signs of oral toxicity.[1] However, in more recent short-term toxicity studies no toxic signs were observed in the fetuses of rats following maternal administration of 5–30 mg/kg/day of sanguinarine [1]

The reproductive and developmental toxicity potential of an *S. canadensis* extract has been evaluated in rats and rabbits.[8] Developmental toxicity (increase in postimplantation loss, slight decrease in fetal and pup body weights) was only evident at maternally toxic doses. No effect was reported on reproductive capabilities, on parturition or on lactation. It was concluded that oral ingestion of sanguinaria extract has no selective effect on fertility, reproduction, or on fetal or neonatal development.[8]

Hepatotoxicity has been documented in rats following a single intraperitoneal administration (10 mg/kg) of sanguinarine.[5] Toxicity was indicated by an increase in serum alanine aminotransferase and serum asparate aminotransferase activity, and by a significant reduction in microsomal cytochrome P450 and benzphetamine *N*-demethylase activities.[5] Macroscopic lesions were also observed but the authors stated that the two events could not be conclusively directly related.[5] No hepatotoxicity has been observed in short-term toxicity studies involving oral administration of sanguinarine.[1]

Animal studies have indicated sanguinarine to be non-irritant and to exhibit no allergenic or anaphylactic potential.[4] Human patch tests have shown sanguinarine to be non-irritant and non-sensitising.[4]

Contra-indications, Warnings

None documented.

Pregnancy and lactation Animal studies have indicated bloodroot to be non-toxic during pregnancy (see above). However, in view of its pharmacologically active constituents, use of bloodroot during pregnancy and lactation is best avoided.

Pharmaceutical Comment

Bloodroot is characterised by isoquinoline alkaloid constituents (benzophenanthridine-type), predominantly sanguinarine. A wide range of pharmacological activities has been documented for this class of compounds including antimicrobial, anti-inflammatory, antihistaminic, cardiotonic and antiplaque.[1,8] Other benzophenanthridine alkaloids have been associated with cytotoxic activities. However, recent interest over the potential use of bloodroot in oral hygiene has stimulated considerable research into both sanguinarine and bloodroot extracts. Results have indicated that products such as oral rinses and toothpastes containing either sanguinaria extracts or sanguinarine may be of value in dental hygiene, and are of low toxicity.

References

See also General References G7, G16, G22, G31, G36, G37, G41 and G43.

1 Becci PJ *et al.* Short-term toxicity studies of sanguinarine and of two alkaloid extracts of *Sanguinaria canadensis*. *J Toxicol Environ Health* 1987; 20: 199–208.

2 Godowski KC. Antimicrobial action of sanguinarine. *J Clin Dent* 1989; 1: 96–101.

3 Lenfield J *et al.* Antiinflammatory activity of quaternary benzophenanthridine alkaloids from *Chelidonium majus*. *Planta Med* 1981; 43: 161–165

4 Schwartz HG. Safety profile of sanguinarine and Sanguinaria extract. *Compend Cont Educ Dent Suppl* 1986; 7: S212–S217.

5 Dalvi RR. Sanguinarine: its potential as a liver toxic alkaloid present in the seeds of *Argemone mexicana*. *Experientia* 1985; 41: 77–78.

6 Sood NN *et al.* Epidemic dropsy following transcutaneous absorption of *Argemone mexicana* oil. *Trans R Soc Trop Med Hyg* 1985; 79: 510–512.

7 Lord G *et al.* Sanguinarine and the controversy concerning its relationship to glaucoma in epidemic dropsy. *J Clin Dent* 1989; 1: 110–115.

8 Keller KA. Reproductive and developmental toxicological evaluation of Sanguinaria extract. *J Clin Dent* 1989; 1: 59–66.