

Medical Attributes of *Sanguinaria canadensis* - Bloodroot

By Abigail Redmond
Wilkes University
Wilkes-Barre, PA
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Sanguinaria canadensis L., commonly known as bloodroot, red puccoon, Indian paint, redroot, pauson, or tetterwort, is found throughout most of North America east of the Rocky Mountains (Reed 1999). This herbaceous perennial is a member of the Papaveraceae (poppy family) (Reed 1999). It reaches a maximum of ten inches in height, has basal leaves that can be as wide as eight inches, and a white and yellow flower appearing in late winter continuing into early spring (Reed 1999). This species is found in rich woods, usually on banks or slopes (Anon 2003).

Rhizomes of *Sanguinaria canadensis* produce an extract that is a mixture of benzophenanthride alkaloids, most notably sanguinarine (Godowski 1989). American Indians used the rhizome in treatment of: rheumatism, asthma, bronchitis, lung ailments, laryngitis, fevers, and warts (Anon 1995).

Alkaloid production in *S. canadensis* was noted to increase with decreased light intensity and fertilizer levels and decline with topographic elevation (Salmore and Hunter 2001).

S. canadensis extracts have antibiotic activity. A study conducted by Ignatov et al (1994) found that the enzyme-specific activity of *S. canadensis* used in defense against pathogens may depend on the presence of methyl jasmonate and acetylsalicylic acid. They found that enzyme-specific activity could be increased up to 4- to 14- fold when cultured cells were treated with methyl jasmonate and acetylsalicylic acid (Ignatov et al 1994). Therefore, less sanguinarine is needed if it is given with methyl jasmonate and acetylsalicylic acid, than if it given alone.

Antimicrobial effectiveness of extracts of *S. canadensis* in traditional treatment of leprosy and tuberculosis was tested using two model species of mycobacteria, *Mycobacterium aurum* and *M. smegmatis* (Newton 2001). *S. canadensis* was found to have significant antimycobacterial activity against *M. aurum* only (MIC=62.5 microg/ml) which supports the traditional uses of this plant against those diseases (Newton et al 2001).

Effects on white blood cells are also dependent on the dosage of extracts of *S. canadensis*. Sanguinarine extracts are not lytic to neutrophils but even at very low concentrations (0.001%) will inhibit neutrophil chemotaxis, oxidative metabolism and degranulation within 5 minutes (Agarwal et al 1997). Therefore, both the length of exposure and the dose of the drug both are critical while considering the effectiveness of

the extract in the treatment of infections (Agarwal et al 1997). An in vitro analysis of fifteen strains of *Helicobacter pylori*, bacteria that cause common gastrointestinal upset, were growth inhibited by a methanol extract of *S. canadensis*, with a MIC₅₀ range of 12.5-50.0 microg/ml (Mahady et al 2003).

Sanguinaria has been investigated as an anti cancer treatment. The activation of human myeloid cells with tumor necrosis was completely suppressed by sanguinarine in a dose- and time-dependent manner (Chaturvedi et al 1997). Uterine cervical cancer treatment with 2.12 or 4.24 microM sanguinarine induced cell death in most pathogenic cells, providing first evidence that sanguinarine is effective against cervical cancer cells via cell death (Ding et al 2002). Sanguinarine showed no specificity for cancer cells in human prostatic adenocarcinoma cells, inhibiting the growth of all cells tested, suggesting clinical usefulness is limited in cancer treatment (Debiton et al 2003). Four cases in which patients had used sanguinarine extracts in lieu of the recommended conventional treatment for basal cell carcinomas showed that scarring ensued. One patient had a residual tumor, and another "healed" for several years but then had deeply recurring basal cell carcinomas (McDaniel and Goldman 2002).

The commercially marketed product Viadent mouthrinse and toothpaste both contain sanguinarine, commonly used to treat adult periodontitis. A comparison study shows that doxycycline hyclate (a synthetic) is superior to sanguinarine chloride in treatment of adult periodontitis (Drisko 1997). In a double-blind parallel study, people using sanguinaria extract oral rinse did not show improvement (Polson et al 1990). A 14-week controlled clinical trial supported the combined use of chlorhexidine mouthrinse for 2 weeks followed by sanguinaria mouthrinse and toothpaste up to three months in treating periodontitis (Tenenbaum et al 1999). The MIC of sanguinarine ranges from 1 to 32 micrograms/ml for most species of plaque (Godowski 1987). A match case-controlled study including 58 patients diagnosed with oral leukoplakia showed that Viadent product use may cause oral leukoplakia (Mascarenhas et al 2002). Based on reviews and discussions of the database on *Sanguinaria* extract, the Expert Panel declared Viadent products to be safe in present use (Frankos et al 1990).

Benefits of *Sanguinaria canadensis* extract include leprosy and tuberculosis treatment, antimicrobial treatment for the gastrointestinal system, cervical cancer and tumor treatments, and adult periodontitis treatment. Risks include a dose and time dependent treatment that is not well understood or proven, no specificity in growth inhibition of cells (normal or cancerous), and proven harm in abandoning traditional treatments in basal cell carcinomas. More research is necessary to determine whether *Sanguinaria canadensis* is effective as an anticancer treatment.

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