Botanical Briefs: Bloodroot (*Sanguinaria canadensis*)

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**PRACTICE POINTS**
- Bloodroot (*Sanguinaria canadensis*) is a plant historically used in Mohs micrographic surgery as chemopaste.
- Bloodroot has been shown to have remarkable antimicrobial effects.
- The alkaloids of *S. canadensis* are nonspecific in their cytotoxicity, damaging both neoplastic and healthy tissue. They have been shown to cause skin erosions and cellular atypia.

Bloodroot (*Sanguinaria canadensis*) is a plant that historically has been used in medicine for its antimicrobial, antihypertensive, anti-inflammatory, and antineoplastic properties. In dermatology, bloodroot has been utilized for its cytotoxic effects; it has been marketed as black salve as an anticancer treatment, but it does not come without notable toxicities. Unwanted cosmetic outcomes and even irreversible scarring and premalignant conditions have been reported. This article aims to bring awareness to both the therapeutic potential of *S. canadensis* as well as the potential toxicities and risks associated with this North American plant.

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Bloodroot (*Sanguinaria canadensis*) is a member of the family Papaveraceae. This North American plant commonly is found in widespread distribution from Nova Scotia, Canada, to Florida and from the Great Lakes to Mississippi. Historically, Native Americans used bloodroot as a skin dye and as a medicine for many ailments. Bloodroot blooms for only a few days, starting in March, and fruits in June. The flowers comprise 8 to 10 white petals, surrounding a bed of yellow stamens.
Chemical Constituents
Bloodroot gets its colloquial name from its red sap, which is released when the plant’s rhizome is cut. This sap contains a high concentration of alkaloids that are used for protection against predators. The rhizome itself has a rusty, red-brown color; the roots are a brighter red-orange.

The rhizome of *S canadensis* contains the highest concentration of active alkaloids; the roots also contain these chemicals, though to a lesser degree; and the leaves, flowers, and fruits harvest approximately 1% of the alkaloids found in the roots. The concentration of alkaloids can vary from one plant to the next, depending on environmental conditions.

The major alkaloids in *S canadensis* include both quaternary benzophenanthridine alkaloids (eg, sanguinarine, chelerythrine, sanguilutine, chellilutine, sanguirubine, chelirubine) and protopin alkaloids (eg, protopine, allocryptopine). Of these, sanguinarine and chelerythrine typically are the most potent. Oral ingestion or topical application of these molecules can have therapeutic and toxic effects.

Biophysiological Effects
Bloodroot has been shown to have remarkable antimicrobial effects. The plant produces hydrogen peroxide and superoxide anion. These mediators cause oxidative stress, thus inducing destruction of cellular DNA and the cell membrane. Although these effects can be helpful when fighting infection, they are not necessarily selective against healthy cells.

Alkaloids of bloodroot also have cardiovascular therapeutic effects. Sanguinarine blocks angiotensin II and causes vasodilation, thus helping treat hypertension. It also acts as an inotrope by blocking the Na+/K+ ATPase pump. These effects in a patient who is already taking digoxin can cause notable cardiotoxicity because the 2 drugs share a mechanism of action.

Chelerythrine blocks production of cyclooxygenase 2 and prostaglandin E₂. This pathway modification results in anti-inflammatory effects that can help treat arthritis, edema, and other inflammatory conditions. Moreover, sanguinarine has demonstrated efficacy in numerous anticancer pathways, including downregulation of intercellular adhesion molecules, vascular cell adhesion molecules, and vascular endothelial growth factor (VEGF). Blocking VEGF is one way to inhibit angiogenesis, which is upregulated in tumor formation, thus sanguinarine can have an antiproliferative anticancer effect. Sanguinarine also upregulates molecules such as nuclear factor-κB and the protease enzymes known as caspases to cause proapoptotic effects, furthering its antitumor potential.

Treatment of Dermatologic Conditions
The initial technique of Mohs micrographic surgery employed a chempaste that utilized an extract of *S canadensis* to preserve tissue. Outside the dermatologist’s office, bloodroot is used as a topical home remedy for a variety of cutaneous conditions, including cancer, skin tags, and warts. Bloodroot is advertised as black salve, an alternative anticancer treatment.

As useful as this natural agent sounds, it has a pitfall: The alkaloids of *S canadensis* are nonspecific in their cytotoxicity, damaging neoplastic and healthy tissue. This cytotoxic effect can cause escharification through diffuse tissue destruction and has been observed to result in formation of a keloid scar. The alkaloids in black salve also have been shown to cause skin erosions and cellular atypia. Therefore, the utility of this escharotic in medical treatment is limited. Fortuitously, oral antibiotics and wound care can help address this adverse effect.

Bloodroot was once used as a mouth rinse and toothpaste to treat gingivitis, but this application was later associated with oral leukoplakia, a premalignant condition. Leukoplakia associated with *S canadensis* extract often is unremitting. Immediate discontinuation of the offending agent produces little regression, suggesting that cellular damage is irreversible.

Final Thoughts
Although bloodroot demonstrates efficacy as a phytotherapeutic, it comes with notable toxicity. Physicians should warn patients of the unwanted cosmetic effects of black salve, especially oral products that incorporate sanguinarine. Adverse effects on the oropharynx can be irreversible, though the eschar associated with black salve can be treated with a topical or oral corticosteroid.

REFERENCES


