Botanical Name: *Chlorella pyrenoidosa*, Oocystaceae

Common names: Chlorella.

Botanical synonyms: *C. vulgaris*

Plant description: Chlorella is a unicellular eukaryotic fresh-water green algae of the order Chlorococcales. It was one of the first organisms to evolve a true nucleus on Earth, over 2.5 billion years ago.

Habitat, ecology and distribution: *Chlorella spp.* are widely distributed in fresh water all over the world, and are often a major component of phytoplankton populations in nutrient-poor waters. *Chlorella spp.* have evolved a variety of efficient nutrient uptake mechanisms and are able to rapidly increase in number and out-compete larger species of phytoplankton in lakes of low to moderate nutrient status. In certain situations Chlorella will form symbiotic relationships with other organisms (e.g. the freshwater polyp *Hydra viridis*). Most commercial sources of Chlorella are cultivated in vats or ponds, indoor or under sunlight, with added nutrients to the water.

Part used: Whole organism, with the cell wall processed and broken down to allow for the absorption of the nutrients and chemical substances contained within. A variety of proprietary techniques are used to break down the cells wall of Chlorella, including pressure steaming, spray drying (dehydration), grinding, and jet (impact) spraying.

History: A Dutch microbiologist, Martinus Beijernick, first discovered Chlorella in 1890. Chlorella underwent some preliminary research in the 1950s and in the following decade showed some beneficial effects to decrease the side effects of chemotherapy. The use of Chlorella however was hampered by the extremely durable cell wall that rendered its constituents indigestible. The Sun Corporation of Japan developed a proprietary processing called Dyno-Mill in the late 1970’s to break down the cell wall, and since then Chlorella has become the most popular supplement in Japan. Other techniques are now used to make the constituents of Chlorella bioavailable, but not all products in the marketplace will have undergone the proper degree of processing. Chlorella was also used as an experimental CELSS (Controlled Ecological Life Support System) in the Soviet Space program in the early 1960s, used to recycle air breathed by humans in a closed system. Chlorella was demonstrated to absorb the carbon dioxide that the humans breathed out and replenished the air with oxygen. The culture of Chlorella was cultivated under artificial light, needing eight square meters of exposed Chlorella per human to achieve a balance of oxygen and carbon dioxide. A
A bioengineered strain is currently being developed to inhibit the development of mosquito larvae that normally feed on pond scum that contains Chlorella, by the expression of trypsin modulating oostic factor (TMOF) in Chlorella, a peptide hormone that shuts off the production of stomach enzymes in mosquitoes.\(^1\)

**Constituents:** Chlorella is so-named because of the exceptionally high amounts of chlorophyll contained within it, including chlorophyll A and B. (2-4\%). Chlorella also contains exceptionally high amounts of protein (58-60\%), on par with animal protein gram per gram, although it cannot be considered a viable alternative, as too great a volume would have to be ingested to account for normal protein needs. Other constituents include beta-carotene (0.18\%), all the B-vitamins (including B-12), vitamins C, D and E, macrominerals (e.g. calcium, magnesium, iron, phosphorus) and trace minerals, chlorella growth factor (CGF), chlorellan, dextran sulfate, fatty acids (e.g. linolenic acid, palmitinoileic acid, palmatic acid), nucleic acids and fiber (Yance 1999, 230; Willard 1992, 84).

**Medical Research:**

The vast majority of research conducted on the benefits of Chlorella has been performed in Japan, most studies examining the antitumor properties of the extract and its purified components.

**Chlorophyll:** The whole plant is processed for its rich source of chlorophyll as well as other medicinal purposes. The cell wall must be damaged or broken down before it can be digested by humans. Chlorella contains significant amounts of protein, lipid, carbohydrates, fiber, nucleic acids, vitamins, and minerals.\(^1\) There is evidence that consuming chlorella can increase serum vitamin B12 levels.\(^2\) However, the vitamin B12 found in chlorella has been suggested to be an inactive form, which can raise serum levels without contributing biological activity.\(^3\)

**Tumors:** *In vitro* and animal research indicates that substances in chlorella has antitumor, antibacterial, antifungal, and antiviral activities.\(^4,5,6,7\)

Researchers examined the immunostimulatory activity of a high molecular weight polysaccharide preparation isolated from *Chlorella pyrenoidosa*. Immunostimulatory activity was measured using a transcription factor-based bioassay for nuclear factor kappa B (NF-kappa B) activation in THP-1 human monocytes/macrophages. The polysaccharides obtained from *Chlorella* substantially increased mRNA levels of interleukin-1beta (IL-1beta) and tumor necrosis factor-alpha (TNF-alpha), and were found to be up to 1000 times more active for *in vitro* monocyte activation than polysaccharide preparations that are currently used for cancer immunotherapy (Pugh et al 2001). *Chlorella vulgaris* extract (CVE) was examined for its effects on the Ehrlich ascites tumor-induced suppression in the numbers of bone marrow and spleen granulocyte-macrophage progenitor cells (CFU-GM) in mice. CVE was found to significantly prolong the survival of mice inoculated with the Ehrlich ascites tumor,
suggesting a protective antitumor effect thought to be attributable to granulocyte and macrophage stimulation (Justo et al 2001). Researchers assessed the modulatory potential of Chlorella vulgaris on murine skin papillomagenesis, and the role of xenobiotic detoxication system in modulating the papillomagenesis pattern. Topical application during peri-, post- or peri- and post-initiation stages of 7,12-dimethylbenz[a]anthracene (DMBA)-induced papillomagenesis, significantly modulated the tumor burden, the cumulative number of papillomas, and percent incidence of mice bearing papillomas. The results suggest the chemopreventive potential of Chlorella in murine skin papillomagenesis (Singh et al 1999). The intraperitoneal and oral administration of sterilized Chlorella cells was carried out every other day for 10 days before mouse mammary carcinoma (MM-2) or Ehrlich ascites cells were transplanted into the peritoneal cavity, or mouse leukemia cells (EL-4), transplanted subcutaneously. All control mice died within 20 days after each tumor cell transplantation, while 73.3-80% of the treated groups survived over 60 days. Researchers showed that Chlorella cells and derivatives have no direct in vitro cytotoxicity, suggesting instead that the response may be mediated by host immune modulation (Miyaizawa et al 1998). An acidic glycoprotein prepared from a culture of Chlorella vulgaris (CVS) was examined for its protective effect on 5-fluorouracil (5FU)-induced myelosuppression and indigenous infection in mice. Subcutaneous administration of CVS greatly reduced the mortality of non-tumor-bearing mice given a high dose of 5FU, and increased the LD50 value of 5FU for these mice. CVS also reduced the incidence of infection. The early recovery of hematopoietic stem cells, or cells responding to interleukin-3 or granulocyte/macrophage-colony-stimulating factor, was especially observed in the bone marrow of CVS-treated mice on days 4-9 after the injection of 5FU. When tumor-bearing mice were given CVS during treatment with 5FU, CVS prolonged the survival of mice without affecting the antitumor activity of 5FU. In addition, CVS was itself shown to exert an antitumor effect (Konishi et al 1996). The oral administration of a hot water extract of Chlorella vulgaris (CVE) restored immune function in acquired immunodeficiency syndrome in mice infected by LP-BM5 murine leukemia virus. Increases in the number of CD4+ CD8- and CD4-CD8+ alpha beta T-cells were noted (Hasegawa et al 1995). The growth of Meth-A tumor in CDF1 mice was inhibited significantly by injection of a hot water extract of a strain of Chlorella vulgaris (CE) into the tumor or into the subcutaneous tissue near the tumor. The augmentation of resistance by CE is thought to require the participation of T cells and macrophages. Mice treated with CE exhibited antigen-specific augmented resistance against rechallenge with tumor (Tanaka et al 1984). The antitumor activity of a water-soluble substance (PCM-4) extracted from Chlorella regulararis was tested against murine transplanted tumors in rats and mice. The oral administration inhibited both the growth of Sarcoma 180 and Meth A, subcutaneously implanted into mice, and ascites hepatoma AH 44 and AH 41C, intravenously implanted into rats. PCM-4 also showed antitumor activity against Sarcoma 180 and Meth A by intraperitoneal administration. The finding that PCM-4 has no direct growth-inhibition effect on tumor cells in vitro suggests that the antitumor activity may be elicited by host response (Nomoto et al 1983).

**Immune System:** Chlorella can stimulate the immune system by increasing the number and activity of macrophages and polymorphonuclear leukocytes. It might also stimulate
 interleukin production. A polysaccharide from the cell wall of chlorella can induce production of interferon.

**Fibromyalgia.** Preliminary clinical research shows subjective improvements in general symptom and pain scores in people with fibromyalgia taking chlorella tablets plus a liquid extract containing malic acid daily for two months. Clinical trial similarly examined the benefit of *Chlorella pyrenoidosa* in patients with moderately severe symptoms of fibromyalgia, consuming 10 g of 'Sun Chlorella' tablets and 100 mL of liquid 'Wakasa Gold,' each day for 2 months. The amelioration of symptoms was validated and quantified using semi-objective and subjective outcome measures systematically administered at clinic visits on days 0, 30 and 60 of the therapy. Eighteen of the 20 patients enrolled completed the 2 month trial. Overall, there was a 22% average decrease in pain intensity observed among the subjects. Blood samples taken on each occasion indicated no significant alterations in serum chemistries, formed elements, and circulating lymphocyte subsets. Compilations of the results of patient interviews and self-assessment questionnaires revealed that seven patients felt that the dietary supplement had improved their fibromyalgia symptoms, while six thought they had experienced no change, and five believed the symptoms had worsened over the time of the trial.

**Glioma.** Are tumors arising from glial cells, most commonly found in the brain. Early research suggests chlorella tablets plus chlorella liquid extract can help people with glioma better tolerate chemotherapy and radiotherapy, possibly by improving immune system function; however, there appears to be little effect on tumor progression or survival. In North America however, a 1990 clinical trial of 20 patients with glioblastoma (a kind of malignant brain cancer) were administered 20 grams of powdered Chlorella and 150 mL of liquid Chlorella, some in conjunction with conventional chemotherapy and radiation treatment. There was a striking improvement in overall health and immune status, with 7 out of 20 patients still alive two years later, compared with the 10% usually experienced with conventional treatment (Merchant et al 1990).

Chlorella has also shown benefit in a few other conditions as well. One recent double-blind, placebo-controlled, randomized clinical trial examined the efficacy of 10 g of pure chlorella in tablet form and 100 mL of a liquid containing an extract of chlorella each day for 2 or 3 months, in 55 patients with fibromyalgia, 33 patients with hypertension, and 9 patients with ulcerative colitis. The overall results showed that daily dietary supplementation with Chlorella tended to reduce high blood pressure, lower serum cholesterol levels, accelerate wound healing, and enhance immune functions (Merchant 2001).

**Peptic ulcer:** The oral administration of dry powder of *Chlorella vulgaris* (CVP) showed prophylactic effects in water-immersion restraint stress-induced and in cysteamine-induced peptic ulcer models. The effects were suggested by the authors to be mediated by the "immune-brain-gut" axis (Tanaka et al 1997).

**Heavy metal toxicity:** There are several published papers investigating the effects of Chlorella as a remedial agent to treat toxic waste water. Willard reports some German studies from the early 1950s that indicate that Chlorella demonstrates this effect in the human body. In one study, Chlorella was seen to significantly enhance Cadmium excretion from the body via the urine. Similar effects have been observed for mercury, copper lead, uranium, insecticides, pesticides and polychlorinated biphenyl (PCBs) levels (1992, 85).
**Toxicity:** None. ¹²,¹³

**PREGNANCY AND LACTATION:** Insufficient reliable information available; avoid using.

**Herbal action:** antitumor, immunomodulant, alterative

**Indications:** cancer, immunosuppression, chronic infection, heavy metal toxicity, radiation poisoning, autotoxicity, hepatitis, constipation, dyslipidemia, obesity

**Contraindications and cautions:** Some individuals have difficulty digesting the cellulose in Chlorella products and may experience gastrointestinal problems. This can be ameliorated by taking a dietary enzyme that contains cellulase.

**Medicinal uses:** Chlorella is an important remedy to prevent and treat cancer, modulate immune function, and remove toxic substances from the body. Its use in cancer extends to prevention, as an adjunct in conventional treatment to limit the effects of chemotherapy and radiation, or along with other botanicals and supplements used as a primary treatment of cancer when conventional treatments are either refused or will have little benefit. Chlorella is an exceptionally popular supplement in Japan where it is taken by large numbers of the populace to protect against environmental toxins so prevalent in this highly urbanized society. Chlorella is often used as a ‘chelating’ agent in heavy metal toxicity in clinical practice, such as that caused by mercury amalgams, often used in combination with Cilantro (*Coriandrum sativum* fresh herb), herbal cholangogues and sodium 2,3-dimercapto-1-propane sulfonate (DMPS) (Aposhian et al 1997). Herbalist Terry Willard mentions a few Japanese studies in which Chlorella was found to be helpful in the treatment of acute pancreatitis, often caused by alcoholism or gall stone obstruction (1992, 84-85). The mechanism of action appears to be chlorophyll, inhibiting the protease enzymes involved in inflammation (1992, 85). In a similar vein, Chlorella is often taken before a night of drinking to prevent hangover. Willard also mentions that Chlorella has been shown to treat periodontal disease, tightening the gums and promoting the growth of new gum tissue when used as an oral mouth rinse (1992, 85). In regard to digestive function, the fiber in Chlorella helps to modulate the gut ecology, promoting the growth of ‘friendly’ bacteria such as *Acidophilus* and *Bifidus*. Although tablets are often prepared from Chlorella, they may contain an unacceptable level of stabilizers and ‘glues’ to hold the Chlorella powder together, and may interfere with absorption. As a result, pure Chlorella powder or liquid Chlorella preparations are preferable.

Orally, chlorella is used as a food supplement and source of nutrients, including protein, nucleic acids, fiber, vitamins, and minerals. Chlorella is also used orally for cancer prevention, stimulating the immune system, improving response to flu vaccine, increasing white blood cell counts (e.g., in people with HIV infection or cancer), preventing colds, to protect the body from the effects of radiation (e.g., during cancer therapy), to protect the body from toxic metals such as lead and
mercury, and to slow aging. It is also used orally to increase beneficial flora in the gastrointestinal tract in order to improve digestion, and to help treat ulcers, colitis, Crohn's disease, and diverticulosis. Chlorella is also promoted for the prevention of stress-induced ulcers; treatment of constipation, bad breath, and hypertension; as an antioxidant; to reduce serum cholesterol; to increase energy; to detoxify the body; and as a source of magnesium to promote mental health, relieve premenstrual syndrome (PMS), and reduce asthma attacks. It is also used orally for fibromyalgia.

Topically, chlorella is used for treating ulcers, postirradiation dermatitis, vulval leukoplakias, and trichomoniasis.

**Pharmacy and dosage:**

- **Powder:** ‘cracked’ cell wall, 1-10 g
- **Liquid extract:** ‘cracked’ cell wall, 100-150 mL

**Licensing:** As of April, 01 2011 there are 32 licensed products that contain Chlorella in Canada.

**REFERENCES**


Cancer Immunol Immunother. 17(2):90-4

---

3 Davis DR. Some algae are potentially adequate sources of vitamin B-12 for vegans (letter, comment). J Nutr 1997;127:378,380
Chlorella pyrenoidosa
OOCYSTACEAE
Botanical Name: *Phytolacca decandra*, Phytolaccaceae

**Common names:** Pokeroot, Pokeweed, Score, Garget, Coakum, Cocum, Pigeonberry, Red plant, Virginian poke, Gargetweed, Scokeweed, Mechoacan, Cancer root, Jalap cancer-root, Red nightshade, American nightshade, Redweed, and Scoke jalap, Ink berry.

**Botanical synonyms:** *P. americana*

**Similar species:** *P. acinosa* (*P. esculenta*), *P. bogotensis*, *P. heteropetala*, *P. icosandra*, *P. octandra*, *P. rivinoides*, *P. sandwicensis*

**Plant description:** Pokeroot (*P. decandra*) is an erect, branched, glabrous herbaceous perennial with coarse, succulent, purplish stems attaining a height of between 100 and 300 cm at maturity. The leaves are borne on short petioles, alternate, ovate, margins entire, growing up to 13 cm long. The small white flowers are borne on short flower stalks along separate branches at the growing tip of the plant and in the axils of the leaves, giving way to dark purple, flattened, spherical berry, containing a red colored juice and about 10 seeds each.

**Habitat, ecology and distribution:** The various species of *Phytolacca* genus have a world-wide distribution. Pokeroot (*P. decandra*) is native to North America and occurs in many areas except the drier regions of the Midwest, but in abundance in the southeastern areas of the United States as weed, found in fields and clearings, and along roadsides, often preferring moist areas. Pokeroot is also popular as an ornamental and is often cultivated, especially in Europe.

**Part used:** Root, leaf, seeds.

**History:** The genus name *Phytolacca* is derived from the Greek *phyton*, ‘plant,’ and the Latin *lacca*, meaning lacquer, from ‘lac,’ a reddish resinous pigment obtained from the insect *Laccifer lacca*, in reference to the crimson colored juice of the berries. Pokeroot has a long history of use by First Nations groups, used in the treatment of rheumatic complaints and skin conditions, and used as a purgative and emetic. Pokeroot has a long and important usage in herbal medicine as a cancer remedy. Pokeroot has a history of usage as a food plant, picked young and eaten like asparagus, or the leaves boiled and then prepared as a salad.
Constituents: Pokeroot contains a variety of interesting constituents, including betalain type alkaloids (i.e. betanidine, betanine, isobetanidine, isoprebetanine, phytolaccine, prenetanine), triterpene saponins (phytolaccosides A-1, D2, O and associated aglycones), and at least five mitogenic-acting cysteine-rich glycoprotein lectins also known as pokeweed mitogens (PWM), numbered Pa1 through Pa5. Other constituents include genins (esculentic acid, jaligonic acid and phytolaccagenic acid), as well as histamine (0.13% to 0.16%), GABA, isomamericanin A, PAP (pokeweed antiviral protein), spinasterol, sterols, starch, saccharose, and potassium salts (Duke 2003; Mills and Bone 2000, 516; Newall et al 1996, 215; EMEA 1999).

Medical Research: Pharmacological effects have been observed in both in vitro and in vivo experimental animal models for Phytolacca americana root extracts and isolated constituents. Many of these effects are attributed to the triterpene saponins (EMEA 1999).

• Antiviral: Pokeweed antiviral protein (PAP) is a glycosidase that has been shown to inactivate ribosomes in both eukaryotic and prokaryotic cells, has potent antiviral activity against many plant and animal viruses, including HIV, in vitro, and by injection, in vivo (Mills and Bone 2000, 516; EMEA 1999).

• Immunological: Phytolacca mitogens have demonstrated a stimulating effect on immune function, enhancing hemagglutination, leucagglutination and mitogenicity (proliferation of T and B lymphocytes) (Mills and Bone 2000, 516; EMEA 1999). Mills and Bone report that children that have consumed the berries have demonstrated an increase in peripheral blood plasma cells, attributed to poke root mitogen (Mills and Bone 2000, 516).

• Anti-inflammatory: In vivo studies have demonstrated an anti-inflammatory activity for the water insoluble triterpene saponin fractions of Phytolacca in carrageenan-induced acute edema in rats and in mice (Mills and Bone 2000, 516; Newall et al 1996, 215; EMEA 1999).

Toxicity: The acute intraperitoneal toxicity of Phytolacca saponin is stated to have an LD50 value in the mouse and of 208 mg/kg in rats (EMEA 1999). The LD50 for isolated pokeweed antiviral protein is stated as 1.2 mg/kg for female mice, 2 days after intraperitoneal application. Case reports of human toxicity have been reported with the consumption of Pokeroot as a food and medicinal remedy. Although fatalities have occurred, they are rare (EMEA 1999). The toxicity of Pokeroot is cumulative and insidious, beginning with gastrointestinal symptoms of a burning sensation in the mouth and throat, nausea, vomiting, and diarrhea, followed by prostration, hypotension, dizziness, tachycardia, and unconsciousness, secondary to increased vagal tone (Mills and Bone 2000, 517). Irritation and inflammation have been reported with topical exposure (Mills and Bone 2000, 517). Poisoned patients demonstrate an unspecific increase of immunoglobulins and eosinophil granulocytes, with phagocytosis of thrombocytes (EMEA 1999). Although preferred among many herbalists, fresh plant preparations are considerably more toxic than dry plant preparations (Mills and Bone 2000, 517).
**Herbal action:** lymphagogue, alterative, anti-tumor

**Indications:** lymphadenitis, tracheitis, laryngitis, tonsillitis, pharyngitis, chronic catarrh, mumps, orchitis, ovarian, mastitis, skin diseases (eczema, psoriasis), uterine fibroids, breast lumps, cancer (breast, uterus, throat)

**Contraindications and cautions:** lymphatic cancer, metastasis; pregnancy, lactation (except mastitis)

**Medicinal uses:** Pokeroot is among the most powerful and active lymphatic remedies in the materia medica, acting chiefly on the skin, mucus membranes and glandular structures. Taken in large doses Pokeroot slows cardiac contraction, reduces the force of the pulse, and decreases respiratory activity, and acts to paralyze the central nervous system. Such doses will almost always produce a profound emetic or cathartic activity, although this may only occur after a few days of ingestion – any gastrointestinal irritation is an immediate indication of toxicity, and usage of the herb should be stopped immediately. Pokeroot is best used in small to moderate doses, usually in formulation, and is particularly suited to any kind of lymphatic stasis or indication of auto-toxicity. It has important applications in rheumatic complaints, and is of great importance in chronic skin problems such as eczema and psoriasis, as well as lingering infections. Pokeroot also comes with high recommendations in both acute and chronic afflictions of the upper respiratory tract, in tracheitis, laryngitis, tonsillitis, pharyngitis and chronic catarrh, particularly when associated with lymphadenopathy. Similarly, Pokeroot was considered a specific in mumps, orchitis, and ovarian, as well as in breast tenderness associated with premenstrual syndrome. Felter and Lloyd state that “…no other remedy equals phytolacca in acute mastitis,” and if applied in the early stages “…prevents suppuration” (1893). For this purpose, Pokeroot is applied both topically and internally. Pokeroot is commonly used in uterine fibroids, taken internally as part of a formulation, and applied topically as the fresh root infused in castor oil, and covered with plastic wrap to hold it in place overnight. Similarly, a Pokeroot cream or infused oil is used in breast lumps. In the treatment of cancer, Pokeroot is used extensively in herbal medicine. Eli Jones suggested that Pokeroot is particularly indicated in breast cancer, “…when the breast is hard and painful and of a purple hue,” given in doses of five drops of the fresh root tincture once every three hours. Jones also mentions Pokeroot in the treatment of throat and uterine cancer. Jones utilized Pokeroot in his ‘Compound Syrup of Phytolacca’ in breast cancer and other cancers, indicated especially in older patients, comprised of 2 parts *Phytolacca* tincture and 1 part each *Gentiana* and *Taraxacum*, to which is added equal parts simple syrup. The dose is one teaspoon (5 ml) after each meal. Jones also utilized Pokeroot in his ‘Cancer Drops’ (containing equal parts with *Thuja* and *Baptisia*), and in his ‘Compound Syrup Scrophularia’, comprised of *Scrophularia* leaves (32 parts), *Juniperus* berries (13 parts), *Phytolacca* root (8 parts), *Rumex crispus* root (8 parts), *Celastrus scandens* bark and root (4 parts), *Podophyllum* root (4 parts), *Corydalis*
formosa root (2 parts), Guaiacum wood (2 parts) and Zanthoxylum berries (1 part). These ingredients are mixed together and tinctured, to which is added equal parts syrup. Pokeweed root is also an important ingredient in the Hoxsey formula.

Orally, pokeweed root is used as an emetic, for rheumatism, mucous membrane inflammation of upper and lower respiratory tract, tonsillitis, laryngitis, adenitis, mastitis, mumps, skin infections (scabies, tinea, sycosis, ringworm, acne), mammary abscesses, edema, skin cancers, dysmenorrhea, and syphilis.

In foods, pokeweed berry is used as red food coloring and as a wine coloring agent.

In manufacturing, pokeweed berry is used to make ink and dye.

**Pharmacy and dosage:**

- **Fresh Plant Tincture:** fresh green root, 1:2, 95% alcohol, 3-10 gtt
- **Dry Plant Tincture:** recently dried root, 1:5, 50% alcohol, 3-15 gtt.
- **Decoction:** recently dried root, 1:20, 15-30 ml
- **Medicated oil:** fresh green root, 1:7, castor oil

**Licensing:** As of March 01, 2011 there are 38 licensed products that contain Phytolacca in Canada.

**REFERENCES**


2 Lewis WH, Smith PR. Poke root herbal tea poisoning. JAMA 1979;242:2759-60
Botanical Name: *Sanguinaria canadensis*, Papaveraceae

**Common names:** Blood root, Puccoon, Red Puccoon, Indian Paint, Redroot, Pauson, Tetterwort, Red Turmeric.

**Plant description:** Blood root is a herbaceous perennial arising from a creeping rhizome, reaching a height of up to 25 cm. The rhizome emits an acrid bright orange-colored juice when cut or bruised. The leaves are basal, up to 20 cm wide, usually with only one open leaf, with five to nine lobes, becoming progressively larger as the plant matures through the season. The flower is solitary, scentless, with 8-16 white petals, sometimes with a purplish or rosy tint. The stamens are short with oblong yellow anthers, ovary oblong and compressed, style absent, the stigma two-lobed with a yellow center. The flower gives way to an elongated two-valved capsule with numerous, dark red seeds.

**Habitat, ecology and distribution:** Blood root is native to North America, found east of the Rocky Mountains in open woods and cleared areas, preferring a rich loamy or clay soil, usually away from water. It can be locally abundant but for the most part is quite rare. Although cultivated sources exist overharvesting is common and wild Bloodroot stands are currently designated as “at risk” by United Plant Savers (http://unitedplantsavers.org).

**Part used:** Rhizome, root; best harvested in autumn.

**History:** The first mention of Bloodroot was made by Jaques Cornuti in his *Canadensium Plantarum Historia* (1635), which placed it in the genus Chelidonium (Papaveraceae). The genus name *Sanguinarium* was first applied by the French botanist Pierre Morin in 1651, derived from the Latin term *sanguis* meaning ‘blood,’ a name given because the plant exudes a blood-like sap when bruised or
cut. Blood root was well known to the First Nations who used it as a dyeing agent and body paint, as well as an alterative, respiratory and digestive remedy. It attracted the attention of the Europeans early on when local First Nations groups presented a young woman as a bedmate to a colonist in Jamestown, wearing nothing except a coat of Bloodroot paste. According to Felter and Lloyd Bloodroot was first mentioned as a medicine in Schoepf’s *Materia Medica Americana*, a Latin work published in Germany in 1787, used in small doses as an emetic and in the treatment of gonorrhea (1893).

**Constituents:** Bloodroot is noted for its isoquinoline alkaloids (up to 70,000 ppm), which include sanguinarine (>85%), sanguidaridine, sanguidimerine, sanguirubine, sanguilutine, dihydrosanguilutine, oxysanguinaridine, oxysanguinarine, berberine, coptisine, protopine, chelerythrine, pseudochelerythrine, chelilutine, alpha and beta allocryptopine, beta homochelidonine, chelirubine and porphyroxin. Other constituents that have been identified included malic acid, a resin and starch (Duke 2003).

**Medical Research:** The vast majority of research on *Sanguinaria* concerns a proprietary toothpaste and mouthrinse marketed under the name Viadent, that at one time contained sanguinarine and zinc chloride. In 2001 Allen et al reported an association between the use of Viadent toothpaste and/or mouthwash and the development of potentially preneoplastic leukoplakia oral mucosal lesions, and since this time the manufacturers of Viadent removed these constituents from the products.1

**Antimycobacterial:** Based on the traditional usage of *Sanguinaria canadensis* in tuberculosis and leprosy, researchers examined the efficacy of a methanolic extract of the roots in an *in vitro* screening assay using two model species of mycobacteria, *M. aurum* and *M. smegmatis*. The crude methanolic extract of *S. canadensis* was found to have significant antimycobacterial activity against *M. aurum*. A bioassay guided fractionation of this extract led to the isolation of two benzophenanthridine alkaloids, sanguinarine and chelerythrine, the latter being the most active against both *Mycobacteria aurum* and *M. smegmatis* (Newton et al 2002). The isoquinolone alkaloid constituents, primarily sanguinarine, appear to have antimicrobial, antifungal, anti-inflammatory, and antihistamine activity.2

**Gingivitis and periodontal disease:** A 14-week controlled clinical trial of sixty patients diagnosed with adult periodontitis assessed the efficacy of a toothpaste and oral rinse
containing Sanguinaria extract, after scaling, root planing and a chlorhexidine regimen. The results showed that sanguinarine-containing toothpaste and oral rinse significantly inhibited the redevelopment of gingivitis through the 12 weeks following the chlorhexidine phase compared to the control toothpaste and rinse, with 26% fewer bleeding sites at 8 weeks, and 32% fewer at 14 weeks (Tenenbaum et al 1999). A randomized double-blind parallel study of 34 subjects examined the efficacy of a dentifrice and oral rinse containing Sanguinaria extract and zinc chloride in gingival inflammation following initial hygiene and scaling therapy. Results demonstrated that the use of a dentifrice and oral rinse containing Sanguinaria did not improve the efficacy of initial therapy (Cullinan et al 1997). A 6-month, double-blind, placebo-controlled, parallel investigation involving 120 subjects examined the efficacy of Sanguinaria-containing dental hygiene regimens with and without fluoride. Test subjects were divided into four groups: group 1 received a dentifrice containing 0.075% Sanguinaria extract (SaE) and 2.0% zinc chloride (ZnCl2) in a dicalcium phosphate base, plus an oral rinse containing 0.03% SaE and 0.2% ZnCl2; group 2 received identical products without SaE or ZnCl2; group 3 received a dentifrice containing 0.8% sodium monofluorophosphate, 0.075% SaE, and 0.05% ZnCl2 in a silica base, plus an oral rinse containing 0.03% SaE and 0.2% ZnCl2; group 4 products were identical to those of Group 3 but without SaE and ZnCl2. Supragingival plaque and gingival inflammation were scored at 0, 1, 2, 1.5, 3, 4.5, and 6 months; bleeding upon probing was measured at 1, 1.5, 3, and 6 months. Microbiological samples were taken from plaque, tongue, and cheek areas. The active products produced statistically significantly lower scores than the placebo agents for all indices. Six-month plaque scores were 13.1% lower for Group 1 and 17.4% lower for Group 3 compared to placebo products. When the Plaque Severity Index was applied, the percentage reductions were 33% for Group 1 and 41% for Group 3 compared to placebos. Gingival inflammation scores were 16.7% lower for Group 1 and 18.1% lower for Group 3 at 6 months compared to placebo scores (Kopczyk et al 1991). Researchers examined the of twice daily brushing with a dentifrice containing 0.075% Sanguinaria extract and 2% zinc chloride, followed by use of a mouthrinse containing 0.03% Sanguinaria extract and 0.2% zinc chloride upon the oral flora. Sixty subjects were randomly assigned to treatment or placebo groups and monitored in a 6-month double-blind clinical trial. Total Gram-negative counts in supragingival plaque samples decreased 83% in the active group compared to a 232% increase for the control group. Populations of Bacteroides intermedius in supragingival plaque were significantly lower in the active group at 3 months. Significantly lower counts of Fusobacterium spp. were observed at 3 and 6
months. Results indicate that use of the test products did not promote opportunistic overgrowth of pathogens in the oral flora (Harper et al 1990a). The efficacy of combined use of toothpaste and oral rinse containing *Sanguinaria* extract and zinc chloride was compared to placebo products in a 6-month clinical trial. Sixty subjects with moderate levels of plaque and gingivitis were randomly assigned to active and placebo groups. Noninvasive measures of plaque and gingivitis were assessed at baseline and at 2, 6, 8, 14, 20, and 28 weeks. Bleeding on probing was measured at baseline and 6, 14, and 28 weeks. Active group scores were significantly lower than placebo scores at each post-baseline time point for all indices, with the exception of plaque at 2 weeks. The 28 week active group scores were 21% lower than the placebo group for plaque, 25% lower for gingivitis, and 43% lower for bleeding on probing. No dental staining or taste alteration was reported in the active group. Three of 30 active group subjects exhibited minor soft tissue irritations that resolved spontaneously without discontinuation of product use (Harper et al 1990b). *In vitro* studies indicate that the anti-plaque action of *Sanguinaria* is due to its ability to inhibit bacterial adherence to newly formed pellicle (a clear, thin covering containing proteins and lipids found in saliva). Long term use of *Sanguinaria*-containing toothpaste and oral rinse products does not predispose users to detrimental shifts in oral flora (Godowski 1989).

**Toxicity:** Reproductive and developmental toxicology studies were conducted with orally administered *Sanguinaria* extract in rats and rabbits. Researchers concluded that the oral intake of *Sanguinaria* extract has no selective effect on fertility, reproduction or fetal and neonatal development in rats or rabbits (Keller and Meyer et al 1989). The acute oral LD50 in rats for sanguinarine was calculated to be 1658 mg/kg. No toxic effects were observed in rats fed up to 150 ppm sanguinarine in the diet for 14 days and in rats treated by gavage with up to 0.6 mg/kg body weight for 30 days. The acute dermal LD50 in rabbits was found to be greater than 200 mg/kg (Becci et al 1987). Recent concern about the association of *Sanguinaria* and oral leukoplakia is somewhat suspect, considering that all the studies that looked at the potential association of Bloodroot and leukoplakia concerned the usage of a *Sanguinaria* and zinc chloride formulation (Viadent). The 1968 edition of the Merck Index however describes zinc chloride (butter of zinc) as a caustic, with moderately irritating effects on the skin and mucus membranes. Nonetheless, Bloodroot does have a history of usage as an escharotic and should be used in smaller doses and under professional supervision.
**Herbal action:** alterative, antitumor, antimicrobial, expectorant, cholalgogue, emmenagogue

**Indications:** atonic dyspepsia, chronic hepatitis, coughs, laryngitis, pharyngitis, chronic catarrh, bronchitis, asthma, hayfever, nasal polyps, male and female reproductive deficiency, skin cancer

**Contraindications and cautions:** Large doses promote nausea and emesis, vertigo, gastritis, cardiac excitiation soon followed by depression and irregularity, pupil dilation and paralysis of the spinal nerves (Felter and Lloyd 1893). Despite no indication of any kind of toxic effects in pregnant experimental animals, tradition states that Bloodroot is strictly avoided in pregnancy.
**Medicinal uses:** Based on the doctrine of signatures, and inferred from its name, Bloodroot is particularly suited to problems with the blood, as is one the most important alteratives in the materia medica, indicated in particular by states of irritation and inflammation, with signs of redness and heat, characterized by bleeding and acrid mucosal discharges. As a fresh plant remedy, Cook states that Bloodroot is rather acrid and harsh, but in dried form acts as a “…slow relaxant and stimulant, influencing the mucous membranes, gall-ducts, and secreting organs in general” (1869). Bloodroot has long been considered to be an important remedy for the lungs, stated to be somewhat similar to Lobelia in effect, with a similar acrid sensations noticed upon ingestion. It was used as a stimulating expectorant, more often in atonic conditions to normalize bronchial secretions, but is used equally in states of irritation and inflammation. It is especially indicated in irritation and inflammation of the throat and larynx, and in irritative, tickling coughs, bronchitis and in chronic nasal catarrh. Similarly, it was used in allergic reactions such as hayfever to control the inflammatory response and alleviate itching or tickling sensations in the ear and Eustachian tubes. Combined with Bayberry and applied as an errhine or snuff, Bloodroot was traditionally used to treat chronic catarrhal affictions as well as to destroy nasal polyps, but only if the secretions were free and abundant. In digestive disorders, Bloodroot is used in small doses as a chologogue, used in congestive states and chronic hepatitis, especially with cold extremities and nauseating headaches. As a stomachic Bloodroot is similarly used in drop doses to enhance gastric secretion and improve the appetite, useful in atonic dyspepsia. In reproductive disorders Bloodroot is stated as being useful in seminal weakness, impotence, with seminal incontinence, and is was considered equally useful in gynecological disorders such as amenorrhea and dysmenorrhea, particularly when associated with debility and anxiety. Bloodroot is stated to be an efficacious remedy in a variety of skin diseases, applied topically as an antisyphilitic remedy in chancrees, as well as ringworm, eczema and warts. Bloodroot was at one time extensively used in the treatment of cancer and ulcerous conditions as an escharotic paste. Herbalist Donald Yance states that alkaloids of Bloodroot possesses antitumor, antiviral and antimicrobial properties, and have been shown to be effective in Ehrlich carcinoma.
and sarcoma 37 (in mice) (1999, 129). Eli Jones mentions Bloodroot internally as a specific for cancer of rectum. Jones also used Bloodroot as an escharotic paste on occasion, along with internal therapies, in the treatment of skin cancer. In his text, *Cancer: It’s Causes, Symptoms and Treatment* (1911), Jones offers several escharotic formulas, some of these pastes use containing Bloodroot in combination with zinc chloride. A typical escharotic paste can be prepared by mixing equal parts finely sieved Bloodroot powder, zinc chloride and some kind of paste, an ointment, or a little hypoallergenic flour (e.g. rice, arrowroot) mixed with water. The paste should be thoroughly mixed with a spatula. Adhesive strips should then be laid around the tumor to protect the healthy adjacent tissue, and the paste is spread on a piece of sterile cotton sheet and placed over the tumor. Over this adhesive strips are laid to keep the paste in place. The paste is retained for 24 hours, after which it is removed and then reapplied, after washing the tumor clean with warm water. Jones counsels that the treatment should be repeated until “…the patient tells you that the growth feels heavy, like a dead weight,” adding further that the growth should feel hard when pressing down on it, “…like the sole of your shoe.” Yance states that this treatment should not exceed two applications, or it may cause scarring (1999, 173). Once the escharotic paste is discontinued, Jones recommends the application of a poultice comprised of equal parts of ground Slippery Elm, Flaxseed, Lobelia seed and Bayberry bark mixed smooth with warm water, applied onto a piece of clean cloth, and changed every two hours, cleaning the tumor with equal parts of distilled extract of Witch Hazel and warm water. After this Jones states that the growth should eventually break loose, on its own, after which he typically applied his “Yellow Healing salve,” comprised of Burgundy pitch (*Abies excelsa*), White Pine (*pinus monticola*) turpentine, beeswax, mutton tallow, and Olive oil to heal the tissues and draw out the remaining necrotic tissue. To this end any healing and drawing salve can be used. This salve is applied thrice daily on the wound until it has healed well.

Orally, bloodroot is used as an emetic, cathartic, antispasmodic, and expectorant. Bloodroot is also used orally for bronchitis, asthma, croup, laryngitis, pharyngitis, deficient capillary circulation, nasal polyps, rheumatism, warts, cancer (Fell technique), dental analgesic, fever, and as a general tonic.

Topically, bloodroot is used as an irritant and debriding agent.

In dentistry, bloodroot is used topically to reduce plaque...
Pharmacy and dosage:

- *Dry Plant Tincture*: dried root, 1:5, 60% alcohol, 5-10 gtt; 1:10, up to 20 gtt. • *Powder*: finely sieved, 60-500 mg

**Licensing**: As of March 01, 2011 there are 35 licensed products that contain Blood Root in Canada.

---


Botanical Name: *Thuja occidentalis*, Cupressaceae

**Common names:** Northern White Cedar, Arbor vitae, Thuja

**Similar species:** *Thuja plicata*; oriental species *T. koraiensis* and *T. standishii* may also be similar. *T. orientalis* has since been reclassified as *Platycladus orientalis*.

**Plant description:** The Northern White Cedar is a monoecious conifer attaining a height of between 15 and 38 m, tending to be stunted or prostrate in harsh, frigid environments. Occasionally the trunk is divided into two to three secondary stems, often reproducing from fallen trunks. The bark is reddish or grayish brown, 6-9 mm thick, fibrous, and fissured. The leaves of the branchlets are 1.5 to 3-5 mm in length, acute, dull yellowish green on both surfaces. The pollen cones are 1-2 mm and reddish, the seed cones ellipsoid, 9-14 mm in length and brown. The very similar Western Red Cedar (*Thuja plicata*) can be a much larger tree, up to 60 m in height, larger trees fluted or buttressed at the base, branches tending to droop and then turn upwards at the ends. The bark is grey to reddish-brown, tearing in long fibrous strips. The entire tree is highly aromatic. The leaves are scale-like, in opposite pairs in four rows, the leaves in one pair folded, the others not, closely pressed to the stem in an overlapping arrangement that looks like a flattened braid, newer branchlets are glossy yellowish-green. The pollen cones are reddish, small and numerous, seed cones ovate with 8-12 scales about 1 cm long, green when immature but becoming woody, brown, winged and upright when mature.

**Habitat, ecology and distribution:** *Thuja occidentalis* is indigenous to North America, occurring in southeastern Canada and the adjacent northern United States, as far west as northern southern Manitoba, and as far south as the Appalachian Mountains in Tennessee, but centralized around the Great Lakes region and the Saint Lawrence seaway. *Thuja plicata* (Western Red Cedar) is widespread and common to the coastal Pacific Northwest, from Alaska in its most northern extent southwards to Oregon. Western Red Cedar is also widespread and abundant in the Columbia Mountains and Kootenay region of British Columbia, eastern Washington, northern Idaho and Northwestern Montana.

**Part used:** Leaf.

**History:** Both the Northern White Cedar and the Pacific Red Cedar grow to become an ancient trees at maturity, the oldest living cedar (*T. occidentalis*) found in the Niagara escarpment, determined to be 1051 years old, with similarly aged specimens found in
coastal British Columbia (e.g. *T. plicata*). Dead specimens have been found to contain upwards of 1653 annual rings, with estimated ages of up to 1890 years due to the fact that the inner pith tends to rot away and become hollow as the tree matures, giving an incomplete picture of its age (Larson 2001). Biologists report that these ancient trees maintain an internal architecture that creates functionally independent units, allowing it to withstand a variety of injuries (Larson 2001). The ancient stands of Western Red Cedar were highly valued by First Nations people all over Canada, the energy of it said to be so strong that many groups believed that they could receive great strength simply by standing with their back against the tree. The Kakawakawakw of the Pacific Northwest call it the ‘tree of life,’ and it is similarly revered today by all First Nations groups as a tree of healing and great power. A Coast Salish myth states the Great Spirit created Thuja in honor of a man who was always helping others: 'When he dies and where he is buried, a cedar tree will grow and be useful to the people -- the roots for baskets, the bark for clothing, the wood for shelter' (Stewart 1984, 27). According to Gunther coastal First Nations groups chewed the buds of *T. plicata* for sore lungs and toothaches, and boiled the leaves for coughs, consumption and kidney problems. Externally, the decoction was used to wash sores and ulcers. The inner bark was boiled or chewed to treat amenorrhea. Apart from its usage as a medicine, Thuja was an important plant used in construction, of everything from buildings, totem poles and dug out canoes, to clothing and cooking utensils. The water resistant wood and antifungal properties of its essential oils make it an ideal building material in the temperate rain forest of the Pacific Northwest. Thuja was also used as an important ceremonial medicine, to bring good luck and ward off negative influences (Gunter 1945, 1-62; Pojar and MacKinnon 1994, 42). The homeopathic usage of Thuja was introduced by Samuel Hahnemann.

**Constituents:** The primary constituents of interest in *T. occidentalis* are the essential oils, between 0.01% in the leaves, but in some dried leaf specimens upwards of 4%. The oils are comprised primarily of terpenes with thujone being the primary constituent, consisting of 85% alpha-thujone and 15% of the more toxic beta-thujone. Other monoterprenoids include alpha-pinene, gamma-terpinene, terpinolene, fenchone, sabinene, camphene, camphor, borneol, isovaleric acid and thulylalcohol. Other constituents of interest in Thuja include lignans, flavonoids (e.g. quercitin, quercitrin), kaempfer glycosides and myricetine, and as well tannins, inositol, polysaccharides (4%) and proteins (Duke 2003; EMEA 1999). *T. plicata* contains a similar range of constituents (Moore 1993, 211).

**Medical Research:** The pharmacological properties of *Thuja occidentalis* are typically attributed to the essential oils, especially thujone, which has irritant, cytotoxic, antimicrobial, anthelmintic, uterine stimulant and psychotropic properties (EMEA 1999). Water soluble extracts of *Thuja occidentalis* containing both a high content of thuja polysaccharides as well as proteins have been reported to have immune stimulating properties, *in vitro* studies demonstrating the proliferation of T-lymphocytes, enhancement of cytokine release, and antiviral properties (EMEA 1999). *In vivo* thuja
polysaccharides have been shown to enhance the recovery of hematopoietic progenitor cells in sub-lethally irradiated mice (EMEA 1999).

**Anti-tumor:** Three labdane-type diterpenoids, labda-8(17),13-dien-15,12R-olid-19-oic acid (1), 12S-hydroxylabda-8(17),13(16),14-trien-19-oic acid (2) and 13-ethoxylabda-8(17),11,14-trien-19-oic acid (3), along with known diterpenoids, trans-communic acid (4), totarol (5), 12-methoxyabieta-8,11,13-trien-11-ol (6), and 7 alpha,8 alpha-epoxy-6 alpha-hydroxyabieta-9(11),13-dien-12-one (7) were isolated from the stem bark of *Thuja standishii*. The structures of 1–3 were established by spectroscopic methods and chemical conversion. These compounds together with standishinal (8), 12-hydroxy-6,7-seco-abiesta-8,11,13-trien-6,7-dial (9) and 6 alpha-hydroxysugiol (10) were tested for their inhibitory effects on Epstein-Barr virus early antigen (EBV-EA) activation induced by 12-O-tetradecanoylphorbol-13-acetate (TPA), as a test for potential cancer chemopreventive agents. Compound 10 showed strong inhibitory effect on EBV-EA induction (100% inhibition at 1000 mol ratio/TPA), and compounds 2 and 6 showed moderate inhibitory effects on EBV-EA induction. In addition, 15-oxolabda-8(17),11Z,13E-trien-19-oic acid (11) was found to exhibit the anti-tumor promoting activity in two-stage mouse skin carcinogenesis test using 7,12-dimethylbenz[a]anthracene and TPA (Iwamoto et al 2001). Seven labdane-type diterpenoids from the stem bark of *Thuja standishii* and their analogues showed strong inhibitory effects on Epstein-Barr virus early antigen (EBV-EA) activation induced by 12-O-tetradecanoylphorbol-13-acetate (TPA). Among these compounds, 15,16-bisnor-13-oxolabda-8(17), 11E-dien-19-oic acid was revealed to have the strongest inhibitory effect on the EBV-EA activation, being stronger than that of beta-carotene which has been intensively studied in cancer prevention using animal models. 15,16-bisnor-13-Oxolabda-8(17), 11E-dien-19-oic acid was also found to exhibit the excellent anti-tumor promoting activity in two-stage mouse skin carcinogenesis test using 7,12-dimethylbenz[a]anthracene and TPA (Tanaka et al 2000). Seven labdane-type diterpenoids from the stem bark of *Thuja standishii* and their analogues showed strong inhibitory effects on Epstein-Barr virus early antigen (EBV-EA) activation induced by 12-O-tetradecanoylphorbol-13-acetate (TPA). Among these compounds, 15,16-bisnor-13-oxolabda-8(17), 11E-dien-19-oic acid was revealed to have the strongest inhibitory effect on the EBV-EA activation, being stronger than that of beta-carotene which has been intensively studied in cancer prevention using animal models. 15,16-bisnor-13-Oxolabda-8(17), 11E-dien-19-oic acid was also found to exhibit the excellent anti-tumor promoting activity in two-stage mouse skin carcinogenesis test using 7,12-dimethylbenz[a]anthracene and TPA (Tanaka et al 2000).

**Antiviral:** The oral administration of an aqueous-ethanolic extract of a mixture of *Thuja occidentalis* herb, *Baptisia tinctoria* root, *Echinacea purpurea* root and *Echinacea pallida* root on the course of Influenza A virus infection in mice was investigated. The extract was administered to mice in the drinking water for 14 days starting 6 days before intranasal infection with Influenza A virus. The data showed that the oral treatment with the extract induced a statistically significant increase in the survival rate, prolonged the mean survival time and reduced lung consolidation and virus titer (Bodinet et al 2002). Six diterpenes, including one new natural product, were isolated from a CHCl3 extract of the stem bark of *Thuja standishii*. The new compound has been characterized as 15-oxolabda-8(17),13 Z-dien-19-oic acid. The known compounds were identified as...
Western Materia Medica
By Terry Willard ClH, PhD; Todd Caldecott ClH

Thuja occidentalis
CUPRESSACEAE

©2011 Wild Rose College of Natural Healing
All Rights Reserved.

ferruginol (2), sugiol (3), isocupressic acid (4), sandaracopimaric acid (5) and 15-oxolabda-8(17),13 E-dien-19-oic acid (6). Compounds 2-5 and the derivatives 4a and 4b were tested for their inhibitory effects on Epstein-Barr virus early antigen (EBV-EA) activation induced by 12- O-tetradecanoylphorbol 13-acetate (TPA). Compounds 2, 3, 4 and 5 showed strong inhibitory effect on EBV-EA induction (100% inhibition at 1000 mol ratio/TPA) (Iwamoto et al 2003). It might inhibit HIV-1-specific antigens and reverse transcriptase activity.

• Antioxidant: Sunburned cells are thought to be ultraviolet B-induced apoptotic keratinocytes. The topical application of beta-thujaplicin derived from Thuja plicata was shown to decrease the number of ultraviolet B-mediated sunburn cells in mouse ear skin by inducing the expression of metallothionein protein, a cytosol protein with antioxidant activity (Baba 1998).

Urinary/Uterine: is a urinary tract irritant, a uterine stimulant, and to affect the menstrual cycle.

Toxicity: In humans the oral intake of 1.25 mg/kg has been reported without adverse effects noted. There are case history reports of healthy and susceptible individuals suffering from seizure disorders related to the absorption of highly reactive monoterpene ketones, such as camphor, thujone, and fenchone (Burkhard et al 1999). The LD50 values for thujone have been demonstrated as 87.5 mg/kg after subcutaneous administration in mice and 240 mg/kg after intraperitoneal administration to rats.

Herbal action: anti-tumor, antifungal, antimicrobial, expectorant, emmenagogue, lymphatic, diuretic,

Indications: coughs and bronchitis, fever, lymphatic stasis, incontinence, chronic prostatitis, cystitis, amenorrhea, leukorrhea, tumors and cancer (rectal, uterine, pharynx), warts, fungal infections, ulcers, vaccinosis

Contraindications and cautions: IgE-mediated hypersensitivities to Thuja pollen have been reported in the literature (Guerin et al 1996). In cases of overdose Thuja extracts have been shown to induce severe metabolic disturbances affecting the liver and kidney, irritant effects upon the mucous membranes of the gastro-intestinal tract, and strong, long-lasting spasmodic effects upon the uterus. In most cases however symptoms of poisoning after oral intake are normally mild, with minor gastrointestinal effects such as vomiting (EMEA 1999).

Medicinal uses: The use of Thuja in Western herbal medicine occurs about the same time as it was introduced into homeopathic practice, despite the fact that it was obviously an important remedy in the First Nations healing tradition. Initially the leaves of Thuja found use as a stimulant in fevers, coughs, and rheumatic complaints, the tincture used topically to remove warts, all of which are important uses today. Later Thuja was employed in fungal infections, and “fungoid and ulcerous epitheliomata” (Felter and Lloyd). Thuja has pronounced antimicrobial properties and can be used topically as a wash, or as a powder in a dressing, in any kind of infection, particularly
those characterized by a foul smelling, necrotic discharge. In the treatment of cancer King’s mentions it in hemorrhaging from “malignant growths” (1893). Given its strong emmenagogue properties, Thuja found use in the treatment of amenorrhea, pelvic congestion, and in catarrhal diseases of the female reproductive tract. Topically, Felter and Lloyd mention it in the treatment of leucorrhea (1893). As an alterative, Thuja was used to influence the blood and glandular structures, with a particular affinity towards the skin (Felter and Lloyd 1893). Boiling the fresh branchlets and then inhaling the fumes is an effective remedy in bronchial congestion and coughs, and is even stated as being effective in hemoptysis (Felter and Lloyd 1893). In the treatment of chronic prostatitis Thuja is mentioned to be of benefit, as it is in “…irritability of the bladder, in gouty and eczematous patients” (Felter and Lloyd 1893). In particular, Thuja is a urinary astrigent with antiseptic properties, strengthening the bladder wall, indicated whenever incontinence is a problem, “…where even a cough or slight muscular exertion causes an expulsion of urine” (Felter and Lloyd 1893). In the treatment of warts the fresh plant tincture can be painted on the wart on a consistent basis after cutting away the crown. For larger warts the tincture may have to be injected right into the wart. In the treatment of cancer Eli Jones utilized Thuja in his “Cancer drops,” with equal parts Phytolacca and Baptisia, 10 gtt, t.i.d., every three hours. Jones considered Thuja a specific in “…cauliflower cancer of the uterus, also in cancerous tumors of the rectum, and fungous growths.” Using a syringe with a long needle, Jones would inject up to 20 drops of the fresh plant tincture into the body of tumorous growths as an absorbent every other day, stating that the tumor “…gradually grows smaller and sometimes sloughs away en masse,” indicating that side-effects are seldom experienced except for “…a slight elevation of temperature and the pulse.” This would sometimes be followed with the application of a tampon infused with the tincture and applied locally over the growth. Jones also mentions Thuja in cancer of the throat. Internally, Jones would often give Thuja in doses of 10 gtt every three hours, to accompany external therapies. In both homeopathic and herbal medicine Thuja is often used in vaccinosis, to combat any of the negative symptoms experienced upon vaccination.

Pharmacy and dosage:
• Fresh Plant Tincture: fresh leaves, 1:2, 95% alcohol, 3-20 gtt.
• Hot Infusion: fresh leaves, 1:20, 30-60 ml

Licensing: As of March 01, 2011 there are 66 licensed products that contain Chlorella in Canada.

REFERENCES

Botanical Name: *Trifolium pratense*, Fabaceae

**Common names:** Red Clover, Cowgrass, Peavine Clover, Purple Clover

**Plant description:** Red Clover is a herbaceous biennial or perennial, slightly pilose to glabrous, with erect stems 1-5 cm long, early leaves arranged in a basal rosette with long petioles, later leaves on the stem are sessile or on moderately long petioles. The compound leaves are arranged in three parts, the leaflets oval to elliptic, 1-3 cm long, and 0.5–1.5 cm wide. Small pointed appendages called stipules are found at the base of the leaf, sometimes forming a tube around the stem. The flower heads are pink or white appearing in globe-like terminal clusters 15-20 mm across, each containing between 20-40 flowers, 7-11 mm long. The flowers are comprised of 5 sepals, 5 petals, 10-15 stamens and one style. The fruit is a tiny oblong to ovoid pod, 4-5 mm long, containing 3-6 seeds.

**Habitat, ecology and distribution:** Red Clover is native to northern and central Europe, southwards into the Mediterranean and Balkans, and eastward into Asia Minor, Iran, the northern subcontinent of India and into China and Japan. Although not native to North America, it was brought with the first European colonists, where it has since naturalized. It is typically found in wet to dry meadows, open forests and the edges of forests, in fields, pastures and along road sides, and also in lawns (as it is a commonly mixed in with grass seed). Red Clover prefers a well-drained loamy soil, rich in phosphorous and potassium (Duke 1981).

**Part used:** Flowering tops.

**Constituents:** The primary constituents of interest in Red clover are the isoflavones formononetin and biochanin A, as well as smaller amounts of daidzein, genistein, pratensin, trifoside, calycosine galactoside and pectolinarin. Other important constituents include the flavonoids isorhamnetin, kaempferol, and quercitin, the saponins: soyasapogenols B-F, coumaric acid, salicylic acid, phaseolic acid and medicagol, trifolirhizin, and beta sitosterol. Other constituents include allantoin, L-dopa (trans- and cis-clovamide conjugated with caffeic acid), resin, fats, carbohydrates, ascorbic acid, niacin, calcium, iron, magnesium, phosphorus, potassium and protein. The flowers are also stated to contain an essential oil (0.028% dry weight) comprised of furfural (Duke 2003; Newall et al 1996, 227).

**Medical Research:** There is little data on Red Clover, and little that supports its traditional usage as an alterative and anti-tumor agent. Newall et al report a possible

**Estrogenicity:** A Red Clover extract standardized to contain 15% isoflavones was administered by gavage to virgin, ovariectomized 50 day old Sprague-Dawley rats, for 21 days. Estrogenic effects included an increase in uterine weight, vaginal cell cornification and mammary gland duct branching. Red clover produced a dose-dependent increase in uterine weight and differentiated vaginal cells at the two higher doses, but it did not stimulate cell proliferation in the mammary glands. The data suggests that Red Clover extract is weakly estrogenic in the ovariectomized rat model (Burdette et al 2002). A methanol extract of Red Clover showed significant competitive binding to estrogen receptors alpha (ER alpha) and beta (ER beta) *in vitro*. Using ultra filtration LC-MS it was revealed that genistein was the most active component of Red Clover (Liu et al 2001). Researchers examined the effect of dietary isoflavones on prostate growth in intact male mice using an extract of Red Clover. The results demonstrated that prostate size was significantly reduced over 28 days of a Red Clover isoflavone supplemented diet. Histological examination revealed an increase in apoptotic cells, rather than a reduction in proliferative activity in the epithelium (Risbridger et al 2001). Please refer to Lesson 10 Reproduction, Western Materia Medica I for more information.

**Benign prostatic hyperplasia (BPH):** *Trifolium’s* isoflavones 40-80 mg daily for 3 months might improve symptoms of BPH. It seems to decrease nocturnal urinary frequency, international prostate symptom scores (IPSS), and to improve the quality of life in men with BPH. However, red clover isoflavones do not seem to affect urine flow rate, prostatic-specific antigen (PSA) values, or prostate size.

**Toxicity:** Newall et al report urticarial reactions in humans, and infertility in animals that graze on clover (thought to be due to the estrogenic effect of the isoflavone constituents) (1996, 227). In the amounts taken by humans as medicine or food (commonly sold as the sprouted seed), Red Clover is generally recognized as safe.

**Herbal action:** alterative, lymphagogue, expectorant, anti-tumor

**Indications:** pertussis, spasmodic coughs, bronchitis, laryngitis, lymphadenitis, wounds and ulcers, cancer

**Contraindications and cautions:** Caution is warranted with the concomitant use of Red Clover and anti-platelet drugs such as coumadin, due to a synergistic effect with the plant coumarins and isoflavonoid constituents. Red Clover is all right to use a simple herb but some feel the extract (SRSE, see Western Materia Media I lesson 10 Reproduction)) should be contraindicated in estrogen-dependent breast cancer due to its estrogenicity, or it may act as a competitive antagonist of stronger endogenous and exogenous estrogens. I feel there is no problem even with the extract (even though it is 20 – 200 times stronger), as it works as an adaptogenic in this situation.
**Medicinal uses:** Red Clover has long been considered to be a valuable alterative, with exceptionally mild properties than make it a safe remedy for general application. It is particularly recommended in pertussis, spasmodic coughs, bronchitis, and laryngitis, or chronic coughs characterized by a thin clear secretion that irritates the cough reflex. Wood states that Red Clover has an affinity to the glands of the head and neck, particularly when there is only a single swollen gland, rather than several (1997, 475). Wood states that Red Clover is useful in “old leaking cysts.” In the treatment of cancer Red Clover is among the most prominent remedies used, not because it acts powerfully, but by virtue of its mild, long term action to remove toxic accumulations in the blood and glands, and wall off the effects of these accumulations from healthy tissues. King’s states that it “…unquestionably retards the growth of carcinomata, and may be freely administered to those of a cancerous diathesis” (Felter and Lloyd 1893). For this purpose the infusion of the recently dried flowers is used, *ad libitum*. Red Clover has long been used by Western herbalists as a remedy for cancerous ulcers, in which it is concentrated and then applied as a paste (Felter and Lloyd 1893; Wood 1997, 476). Although not typically thought of as a wound-healing herb Red Clover contains appreciable amounts of allantoin, and was commended by the Eclectics in ulcers of every kind as well as burns (Felter and Lloyd 1893; Cook 1869). Red Clover is an important ingredient in the Hoxsey formula attributed to Dr. Harry M. Hoxsey (1901-1974). This famous formula (or infamous, depending upon the perspective) is stated in an autobiographical account to have been developed by Hoxsey’s great-grandfather after he observed a horse which had been afflicted by a cancerous growth become cured after pasturing on field plants such as Red Clover and Alfalfa (Hoxsey 1956, 44-48). These herbs were collected and then prepared as a formulation, and with the addition of other herbs, was used by Hoxsey’s father, a licensed veterinarian, in the treatment of cancer in horses. Increasingly Hoxsey’s father began to treat human patients as well, with apparent success, and charged Harry Hoxsey on his deathbed with the responsibility of using the formula to help cancer patients. Hoxsey was an outspoken advocate of alternative cancer treatments, and equally argued against conventional treatments, and soon both Hoxsey and the formula attracted the scorn and antipathy of the medical profession. Hoxsey’s treatment centers were closed down in the 1950’s by court order, despite the facts that there was never any published data or research to suggest the efficacy of the formula either way, or that it was harmful. Nonetheless, there are countless anecdotal accounts of the benefit of Hoxsey’s formula, and now many variations of the original formula exist, usually containing *Rhamnus purshianus* and potassium iodide, often with *Trifolium, Phytolacca, Arctium, Berberis, Rhamnus frangula, Stillingia sylvatica* and *Zanthoxylum*. Many of these plants have since demonstrated significant anti-tumor properties.

Orally, red clover is used for menopausal symptoms and hot flashes, cyclic breast pain or tenderness (mastalgia), premenstrual syndrome (PMS), cancer prevention, indigestion, hypercholesterolemia, whooping cough, cough, asthma, bronchitis, and sexually transmitted diseases (STDs). Topically, red clover is used for cancer, skin sores, burns, sore eyes, and chronic skin diseases including eczema and psoriasis.

In foods and beverages, the solid extract of red clover is used as a flavoring ingredient.
Pharmacy and dosage:
• *Fresh Plant Tincture*: fresh flowering tops, 1:2, 95% alcohol, 20-60 gtt.
• *Dry Plant Tincture*: recently dried flowering tops, 1:5, 30% alcohol, 20-60 gtt., 1-5 ml
• *Hot Infusion*: recently dried flowering tops, 1:20, 200 ml, *ad libitum*

Licensing: As of March 01, 2011 there are 57 licensed products that contain Red Clover in Canada

REFERENCES


---