

The Longwood Herbal Task Force
(<http://www.mcp.edu/herbal/default.htm>) and
The Center for Holistic Pediatric Education and Research
Rhubarb root (*Rheum officinale* or *R. palmatum*)
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Overview

Chinese herbalists have relied on rhubarb rhizomes (roots) for thousands of years. The rhizomes contain powerful anthraquinones that act as stimulant laxatives and tannins that act as astringents¹. The Chinese also use rhubarb to treat gastric ulcers, chronic renal failure, and pregnancy-induced hypertension. The current practice of using rhubarb to treat cancer (as an ingredient in the herbal Essiac formula) lacks the support of controlled clinical trials². Rhubarb root can cause severe diarrhea and abdominal cramps. Treatment periods as a laxative should not exceed eight to ten days. Persons with a history of renal stones should avoid rhubarb due to its high oxalate content. The high tannin content may cause upset stomach, renal damage, hepatic necrosis and increased risk of esophageal and nasal cancer. Rhubarb root is not recommended during pregnancy or lactation or by children less than 12 years old. There is marked variation in the content of active compounds in commercially available rhubarb products. Consumers should be aware that medicinal rhubarb root is not the same as the garden rhubarb used for food.

Historical and Popular Uses

The roots of medicinal rhubarb have been used in traditional Chinese and Tibetan medicine for 2000 years, gradually spreading to India, Russia, Europe and North America³. Rhubarb arrived in Europe via Turkey, hence the common name, Turkey rhubarb. European herbalists recommended rhubarb as a laxative and diuretic and to treat kidney stones, gout, and liver diseases characterized by jaundice. Externally, it was used to heal skin sores and scabs. Paradoxically, although larger doses were used as a laxative, small doses were used to treat dysenteric diarrhea⁴.

The Chinese use rhubarb as an ulcer remedy and consider it a bitter, cold, dry herb used to “clear heat” from the liver, stomach and blood, to expel helminths and to treat cancer, fever,

upper intestinal bleeding (ulcers) and headache^{5,6}. It is also used to treat toothaches⁷. In Europe, rhubarb is a component of spring tonics or blood cleansing cures, including Swedish bitters⁸. Turkish or medicinal rhubarb is also one of the four major ingredients in the herbal cancer remedy, Essiac.

Botany

Medicinal species: Rheum officinale or *R. palmatum* L. Other rhubarbs from other parts of the world include *R. tanguticum* Maxim. ex. Balf., *R. emodi* and *R. webbianum*, also known as Indian or Himalayan rhubarb. Garden (English) rhubarb or *R. rhaponticum* is considered food rather than medicine. Active ingredients vary by species; different species are frequently substituted for one another in commercially available medicinal rhubarb products, some of which may also be contaminated with heavy metals^{9,10,11,12,13}.

Common names: Canton rhubarb, Chinese rhubarb, chong-gi-huang, da-huang, daio, Japanese rhubarb, medicinal rhubarb, racine de rhubarbee (French), rhabarber, rhei radix, rheum, rhizoma rhei, shenshi rhubarb, tai huang, Turkish rhubarb, Turkey rhubarb.

Botanical family: Polygonaceae, which contains 51 genera and 1150 species, including buckwheat¹⁴.

Plant description: Medicinal rhubarb (*R. palmatum* or *R. officinale*) is a large, leafy perennial with hollow stalks that may reach ten feet in height. The root/rhizome is the part used medicinally; it is thick and branching, with a brown exterior and a yellow interior. The medicinal species are not garden herbs. Garden rhubarb typically grows to about three feet and has reddish to purple stems. It contains similar active ingredients, but is much less potent, so doses would need to be increased for medicinal use. Roots can be harvested as early as the fourth year after planting; the plants are harvested in the spring¹⁵.

Where it's grown: Medicinal rhubarb is native to China and Tibet and is cultivated in Europe, India and Pakistan; imports from developing countries may be contaminated⁸. The most potent products are grown at high altitude such as in eastern Tibet.

Biochemistry

Rhubarb: Active Chemical Constituents

- Anthranoids, especially anthraquinone glycosides: rhein (sennosides A and B), aloe-emodin, physcion^{16,15,17}
- Oxalic acid
- Tannins (5% - 10%): gallotannin, catechin, procyanidin
- Other: pectin, phenolic carboxylic acids

The *anthraquinones* found in rhubarb are also found in other natural stimulant laxatives such as senna, buckthorn, cascara sagrada and the lining of aloe leaves¹⁸. They enhance colonic motility and stimulation of chloride and water secretion into the stool. Quantities of the active ingredients vary during growth, by season and during processing^{19,20}. Tests of the sennoside content of different market rhubarb preparations in China and Japan reveal marked variations in the content of active compounds, with some products containing no active ingredients^{9,21}. The British and European pharmacopeias specify that products must contain not less than 2.2% of the hydroxyanthracene derivatives, calculated as rhein.

Oxalic acid combines with calcium in blood, forming insoluble calcium oxalate crystals that may be deposited in the kidneys, leading to renal stones. Persons with a history of renal stones should use great caution when consuming oxalate-containing herbs and consider avoiding their use altogether²².

Rhubarb contains 5% - 10% *tannins*. Tannins are phenolic compounds found in many herbs and common foods, such as sorrel and tea. Plants that contain more than 10% tannins have potential adverse effects including upset stomach, renal damage, hepatic necrosis, and an increased risk of esophageal and nasal cancer. Tannins are astringent and are traditionally used topically for a variety of wet or oozing skin conditions such as poison ivy. Therapeutically, tannins have been used to treat diarrhea and inflamed mucus membranes²². It is thought that at low dosages, the tannin activity in rhubarb supersedes the anthraquinone activity, thus leading to

decreased number and lower water content of stool. At higher doses, the anthraquinone activity is thought to predominate, resulting in more watery and more frequent stools.

Pectin tends to be antidiarrheal. In conjunction with tannins, its effect may supersede the effect of anthraquinones when rhubarb is given in small doses.

Experimental Studies

Rhubarb: Potential Clinical Benefits

1. Cardiovascular: Pregnancy-induced hypertension (PIH), myocardial contractility
2. Pulmonary: none
3. Renal and electrolyte balance: Diuretic, diabetic nephropathy and chronic renal failure, renal protectant
4. Gastrointestinal/hepatic: Diarrhea, constipation, liver disease, ulcers, pancreatitis
5. Neuropsychiatric: none
6. Endocrine: none
7. Hematologic: none
8. Rheumatologic: none
9. Reproductive: Uterine tonic
10. Immune modulation: Immunostimulant, anti-inflammatory
11. Antimicrobial: Antiviral, antibacterial, molluscicidal, antitrichomonal
12. Antineoplastic: Ingredient in Essiac remedy
13. Antioxidant: none
14. Skin and mucus membranes: none
15. Other/miscellaneous: Toothache

1. **Cardiovascular:** Pregnancy-induced hypertension (PIH), myocardial contractility
 - a. Pregnancy-induced hypertension (PIH)
 - i. *In vitro data:* none
 - ii. *Animal data:* none
 - iii. *Human data:* In a randomized, controlled trial of 265 Chinese women at risk for PIH, rhubarb extract (0.75 grams po daily for 9 – 10 weeks) resulted in a significantly

- lower rate of PIH (5.7% vs. 20.8% in controls), as well as significantly lower levels of plasma fibronectin, plasminogen activator inhibitor (PAI) and anti-thrombin III²³.
- b. Myocardial contractility
 - i. *In vitro data*: Some of rhubarb's polysaccharides displayed a dose-dependent inhibition of calcium influx, while others promoted influx of extracellular free calcium²⁴.
 - ii. *Animal data*: *In vivo* studies in cat hearts showed a significant dose-dependent effect of alcoholized extracts of rhubarb on contractility and monophasic action potentials: low doses (1.0 – 1.5 g/kg) had an excitatory effect, while higher doses (2.0 gm/kg) had an inhibitory effect²⁵.
 - iii. *Human data*: none
 2. **Pulmonary**: none
 3. **Renal and electrolyte balance**: Diuretic, diabetic nephropathy and chronic renal failure, renal protectant
 - a. Diuretic
 - i. *In vitro data*: none
 - ii. *Animal data*: Rhubarb has proven effective as a diuretic in rabbit models, apparently by blocking sodium-potassium ATPase in the renal medulla²⁶.
 - iii. *Human data*: none
 - b. Diabetic nephropathy and chronic renal failure¹
 - i. *In vitro data*: Cultures of rat renal tubules showed a dose-dependent inhibition of growth proliferation as measured by the uptake of radiolabelled thymidine²⁷. Rhubarb extracts markedly diminished DNA synthesis in rat renal tubular cells in vitro²⁸.
 - ii. *Animal data*: In diabetic rats, renal hypertrophy and declines in GFR were reduced in those given rhubarb extracts²⁹. In rats submitted to partial nephrectomy, those given rhubarb root extracts (150 mg/day) in their drinking water had significantly less proteinuria and less severe glomerulosclerosis than untreated rats; renal function and hypertension were comparable in the two groups³⁰. Among rats with adenine-

- induced renal failure, rhubarb tannins significantly improved BUN and creatinine, glomerular filtration rate, renal plasma flow and renal blood flow^{31,32,33,34}.
- iii. *Human data*: A case series of 50 Chinese patients with chronic renal failure reported marked improvement in the quality of life of those taking rhubarb supplements³⁵. In a randomized, controlled trial of 30 Chinese adults with chronic renal failure, rhubarb extracts were superior to Captopril over 6 – 22 months of follow-up in terms of uremic symptoms (such as nausea and anorexia) and serum albumin level^{36,37}.

In a prospective clinical trial, 151 Chinese adults with chronic renal failure were assigned to treatment with either rhubarb, Captopril or a combination of rhubarb and Captopril; in follow-up over 2-4 years, progression to end-stage failure occurred in 26% of the rhubarb treated patients, 13% of those receiving combination therapy and 54% of those receiving Captopril alone (P<0.01). Rhubarb treatment was also associated with lower triglyceride and cholesterol levels³⁸.

- c. Renal protectant
- i. *In vitro data*: none
 - ii. *Animal data*: In mice treated with cisplatin, co-therapy with rhubarb significantly reduced the lethal toxicity and renal toxicity of this common chemotherapeutic agent; the combination did not interfere with the chemotherapeutic effect of cisplatin³⁹.
 - iii. *Human data*: none
4. **Gastrointestinal/hepatic**: Diarrhea, constipation, liver disease, ulcers, pancreatitis
- a. Diarrhea: Historical and traditional use; no clinical studies.
 - b. Constipation
 - i. *In vitro data*: Anthraquinone glycosides are hydrolyzed in the gut to aglycones which are reduced by bacteria to anthranols and anthrones (the active compounds). The laxative effect is due to inhibition of water and electrolyte reabsorption in the large colon and to a stimulant effect on intestinal motility^{8,40}.
 - ii. *Animal data*: In rats, rhubarb extracts increased electrical excitatory activity in the colon and duodenum; this effect could be blocked by atropine^{41,42}; on the other hand, rhubarb extracts also had spasmolytic qualities in guinea pigs^{43,44}.

- iii. *Human data*: Rhubarb has historically been used as a laxative. It is often used to soften stool in the presence of anal fissures and hemorrhoids and post-operatively for recto-anal operations. It is so effective as a cathartic that rhubarb is included in some standard bowel preparation programs for colonoscopy in China⁴⁵.
 - c. Liver disease: Traditional use; no studies.
 - d. Ulcers
 - i. *In vitro data*: Rhubarb root's anthraquinones inhibited *H. pylori* growth *in vitro*⁴⁶.
 - ii. *Animal data*: none
 - iii. *Human data*: In a Chinese case series of 312 adults with bleeding ulcers, alcoholic extracts of rhubarb root (dose unknown) were associated with improved symptoms in 90% of patients within three days^{47,7}. In another case series of 400 Chinese patients hospitalized with acute upper GI bleeding, 97% were effectively treated by 3 grams of rhubarb given two to four times daily⁴⁸. No controlled trials have been reported.
 - e. Pancreatitis
 - i. *In vitro data*: Rhubarb extracts inhibited several pancreatic enzymes *in vitro*⁴⁹.
 - ii. *Animal data*: In rats with experimentally induced necrotizing pancreatitis, 1.5 ml of a 10% rhubarb decoction resulted in significantly decreased mortality and improved gut motility compared with saline treated controls⁵⁰.
 - iii. *Human data*: Rhubarb is used for pancreatitis in China; no controlled studies have been reported.
- 5. **Neuropsychiatric**: none
- 6. **Endocrine**: none
- 7. **Hematologic**: none
- 8. **Rheumatologic**: Rhubarb is traditionally used for pain in rheumatic conditions⁵¹; no studies have been reported.
- 9. **Reproductive**: Historically, cathartic herbs like rhubarb have also been considered uterine stimulants; there are no data to evaluate this effect with rhubarb.
- 10. **Immune modulation**: Immunostimulant, anti-inflammatory
 - a. Immunostimulant
 - i. *In vitro data*: none

ii. *Animal data*: In mice, oral administration of rhubarb increased delayed hypersensitivity response to bovine serum albumin and the proliferation of spleen cells in response to Con A and lipopolysaccharide⁵².

iii. *Human data*: none

b. Anti-inflammatory

i. *In vitro data*: Some tannins in rhubarb have anti-inflammatory actions⁵¹.

ii. *Animal data*: In rabbit's renal medulla, rhubarb inhibited the metabolism of arachidonic acid to prostaglandins E2 and F2 and thromboxane in a dose-dependent fashion⁵³.

iii. *Human data*: none

11. **Antimicrobial**: Antiviral, antibacterial, molluscicidal, antitrichomonal

a. Antiviral

i. *In vitro data*: Rhubarb extracts have had mixed results as antiviral agents in cell culture studies. Anthraquinone extracts were virucidal against HSV I, measles, polio and influenza virus *in vitro*^{54,55,56}; rhubarb extract prevented cells from becoming infected with HSV I⁵⁷. In other studies, rhubarb was not active against HIV1, vaccinia viruses or polio virus^{58,55}.

ii. *Animal data*: none

iii. *Human data*: none

b. Antibacterial

i. *In vitro data*: The rhein component of rhubarb had antibacterial activity against *Bacteroides fragilis* *in vitro*⁵⁹; others reported activity against gram positive bacteria and acid fast bacteria⁶⁰. The antibacterial effects of rhubarb are believed to be due to its inhibition of enzymes in the mitochondrial electron transport system⁶¹.

ii. *Animal data*: none

iii. *Human data*: A series of 157 adults suffering from gonorrhea was treated with Chinese rhubarb tablets; they had a reported cure rate of 66%, but diagnostic criteria and co-therapies were not reported⁶².

c. Molluscicidal

- i. *In vitro data*: A 0.03% rhein solution was molluscicidal against *Oncomelania hupensis*, *Biomphalaria glabrata* and *Bulinus globosus* (vectors of *Schistosoma japonicum*)⁶³
- ii. *Animal data*: none
- iii. *Human data*: none

d. Antitrichomonal

- i. *In vitro data*: none
- ii. *Animal data*: Emodin displayed antitrichomonal activity in mice⁶⁴.
- iii. *Human data*: none

12. **Antineoplastic**: Ingredient in Essiac remedy

- i. *In vitro data*: The antineoplastic activity of rhubarb's anthraquinone constituents is believed to be due to its inhibition of the mitochondrial respiratory chain⁶¹. Rhubarb extracts have shown antimutagenic activity in *S. typhi*⁶⁵.
- ii. *Animal data*: Injections of rhubarb root extract caused damage to sarcoma-27 in mice⁶⁶. Emodin inhibited melanoma growth in mice⁶⁶. Alcoholic extracts of rhubarb root were inactive against sarcoma in cell cultures and in mice^{67,68}.
- iii. *Human data*: none

13. **Antioxidant**: none

14. **Skin and mucus membranes**: none

15. **Other/miscellaneous**: Rhubarb is traditionally used against toothache in China.

Toxicity and Contraindications

All herbal products carry the potential for contamination with other herbal products, pesticides, herbicides, heavy metals and pharmaceuticals. This is particularly concerning with imports from developing countries.

Allergic reactions can occur to any natural product in sensitive persons.

Rhubarb's *leaves* are poisonous, impairing hemostasis and causing nausea and vomiting.

Potentially toxic compounds in rhubarb: Anthraquinones in roots, oxalic acid and tannins in leaves. Products from China may be contaminated with other species or heavy metals.

Acute toxicity: Diarrhea, intestinal cramping. Patients may notice that urine becomes bright yellow or red.

Chronic toxicity: Rhubarb should not be used as a laxative for more than 8 –10 days; chronic use may deplete potassium and potentiate the effects of cardiac glycosides. Chronic use may also lead to pigmentation of the intestinal mucosa (melanosis coli). Rhubarb did not display mutagenicity in the standard Ames test⁶⁹.

Limitations during other illnesses or in patients with specific organ dysfunction: Rhubarb root is traditionally not recommended for patients with chronic intestinal inflammation such as gastric or duodenal ulcers, Crohn's disease or ulcerative colitis. It is contraindicated for patients with intestinal obstruction or ileus. It should be avoided or used with great caution by patients with history of renal stones due to its oxalate content²².

Interactions with other herbs or pharmaceuticals: Rhubarb root may potentiate other laxatives. It may increase potassium loss (e.g. with steroids). Because of its potential to deplete potassium, it should be used cautiously by patients taking cardiac glycosides.

Safety during pregnancy and/or childhood: Because of its putative effect as a uterine stimulant, rhubarb root is not recommended during pregnancy. Because it contains anthraquinone alkaloids, it should not be used by nursing women. It is also not traditionally recommended for children less than twelve years old⁴.

Typical dosages

Provision of dosage information does not constitute a recommendation or endorsement, but rather indicates the range of doses commonly used in herbal practice.

Doses are given for single herb use and must be adjusted when using herbs in combinations. Doses may also vary according to the type and severity of the condition treated and individual patient conditions.

Typical adult doses for diarrhea:

Powdered root:

$\frac{1}{4}$ - $\frac{1}{2}$ tsp. (1 gram) boiled in 1 cup of water for 10 minutes⁷⁰. Take 1 Tbsp. (15 cc) at a time, up to 1 cup daily.

Tincture: $\frac{1}{4}$ tsp. daily

Typical adult doses for constipation:

Powdered root:

1 tsp (5 -6 grams) boiled in 1 cup of water for 10 minutes. Take 1 Tbsp. (15 cc) at a time, up to 1 cup daily.

Tincture: $\frac{1}{2}$ -1 tsp daily

NOTE: 30 – 100 mg of dried hydroxyanthracene derivatives are equivalent to approximately 1.2 – 4.8 grams of the dried root.¹⁵ The total daily dose is 1 – 2 grams of dried root.

For toothache: Tincture is applied by cotton swab directly to the painful tooth⁷.

Availability of standardized preparations: None. There is marked variation in the anthraquinone content of commercial preparations, as well as the potential for contamination with related species and heavy metals in imported products.

Multi-ingredient products containing rhubarb root: Abdominolon, Certobil, Cholaflex, Colax, Compound Fix Elixir, Dragees laxatives, Enteroton, Fam-Lax, Herbal Laxative, Herbalax, Neo-Cleanse, New-Lax, Plantago complex, Tisana Arnaldi, Vegebyl

Dosages used in herbal combinations: Variable

Pediatric dosages: Not recommended for children less than twelve years old.

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