Sarsaparilla (Smilax officinalis)) Database file in the Tropical Plant Database of herbal remedies

Family: Smilacaceae
Genus: *Smilax*
Species: *officinalis, aristolochiaefolia, glabra, febrifuga, ornata, regelii, japicanga*
Synonyms: *Smilax medica*
Common Names: Sarsaparilla, salsaparrilha, khao yen, saparna, smilace, smilax, zarzaparilla, jupicanga
Part Used: Root

SARSAPARILLA
Herbal Properties and Actions

MAIN ACTIONS	OTHER ACTIONS	STANDARD DOSAGE
• detoxifies organs	• relieves pain	Root
• cleanses blood	• kills fungi	**Decoction:** 1/2 to 1 cup 2-3
• aids absorption	• reduces inflammation	times daily
• kills bacteria	• kills germs	**Capsules:** 1-2 g twice daily
• stimulates digestion	• reduces fever	**Tincture:** 2-3 ml twice daily
• increases urination	• immunomodulator	
• protects liver	• fights free radicals	
• promotes perspiration	• relieves rheumatism	

Sarsaparilla is a brambled, woody vine that grows up to 50 m long, with paired tendrils for climbing (often high into the rainforest canopy). It produces small flowers and black, blue, or red berry-like fruits which are eaten greedily by birds. *Smilax*, a member of the lily family, is native to tropical and temperate parts of the world and comprises about 350 species worldwide. It is native to South America, Jamaica, the Caribbean, Mexico, Honduras, and the West Indies. The name *sarsaparilla* or *zarzaparilla* comes from the Spanish word *zarza* (bramble or bush), *parra* (vine), and *illa* (small)—a small, brambled vine.

The stems of many *Smilax* species are covered with prickles and, sometimes, these vines are cultivated to form impenetrable thickets

(which are called *catbriers* or *greenbriers*). The root, used for medicinal purposes, is long and tuberous—spreading 6-8 feet—and is odorless and fairly tasteless. Many species of *Smilax* around the world share the name *sarsaparilla;* these are very similar in appearance, uses, and even chemical structure. These include *S. officinalis*, *S. japicanga,* and *S. febrifuga* from South America (Brazil, Ecuador and Colombia); *S. regelii*, *S. aristolochiaefolia,* and *S. ornata* from Mexico and Latin America; and *S. glabra* from China. Sarsaparilla vine should not be confused with the large sasparilla and sassafras trees (the root and bark of which were once used to flavor root beer). Sarsaparilla has been used as an ingredient in root beer and other beverages for its foaming properties—not for its flavoring properties.

TRIBAL AND HERBAL MEDICINE USES

Sarsaparilla root has been used for centuries by the indigenous peoples of Central and South America for sexual impotence, rheumatism, skin ailments, and as a general tonic for physical weakness. It has long been used by tribes in Peru and Honduras for headaches and joint pain, and against the common cold. Many shamans and medicine men in the Amazon use sarsaparilla root internally and externally for leprosy and other skin problems (such as psoriasis and dermatitis.) Leprosy can be common in areas where the disease is carried by armadillos (and in the Amazon, armadillos are "on the menu" in indigenous diets). Sarsaparilla root also was used as a general tonic by indigenous tribes in South America, where New World traders found it and introduced it into European medicine in the 1400s.

European physicians considered sarsaparilla root a tonic, blood purifier, diuretic, and sweat promoter. A *Smilax* root from Mexico was introduced into European medicine in 1536, where it developed a strong following as a cure for syphilis and rheumatism. Since this time, *Smilax* roots have had a long history of use for syphilis and other sexually-transmitted diseases throughout the world. With its reputation as a blood purifier, it was registered as an official herb in the *U.S. Pharmacopoeia* as a syphilis treatment from 1820 to 1910. From the 1500s to the present, sarsaparilla has been used as a blood purifier and general tonic and also has been used worldwide for gout, syphilis, gonorrhea, rheumatism, wounds, arthritis, fever, cough, scrofula, hypertension, digestive disorders, psoriasis, skin diseases, and cancer.

PLANT CHEMICALS

Sarsaparilla contains the plant steroids sarsasapogenin, smilagenin, sitosterol, stigmasterol, and pollinastanol; and the saponins sarsasaponin, smilasaponin, sarsaparilloside, and sitosterol glucoside, among others. The majority of sarsaparilla's pharmacological properties and actions have been attributed to these steroids and saponins. The saponins have been reported to facilitate the body's absorption of other drugs and phytochemicals, which accounts for its history of use in herbal formulas as an agent for bioavailability and to enhancement the power and effect of other herbs.

Saponins and plant steroids found in many species of plants (including sarsaparilla) can be synthesized into human steroids such as

estrogen and testosterone. This synthesis has never been documented to occur in the human body - only in the laboratory. Yet plant steroids and their actions in the human body have been a subject of much interest, sketchy research and, unfortunately, disinformation - mainly for marketing purposes. Sarsaparilla has been marketed (fraudulently) to contain testosterone and/or other anabolic steroids. While it is a rich source of natural plant steroids and saponins, it never has been proven to have any anabolic effects, nor has testosterone been found in sarsaparilla or any other plant source thus far.

Flavonoids in sarsaparilla have been documented to have immune modulation and liver protective activities. A U.S. patent was awarded in 2003 describing these flavonoids to be effective in treating autoimmune diseases and inflammatory reactions through their immunomodulating effects. Sarsasapogenin and smilagenin were subjects of a 2001 U.S. patent which reported that these Smilax steroids had the ability to treat senile dementia, cognitive dysfunction, and Alzheimer's disease. In the patent's animal studies references, smilagenin reversed the decline of brain receptors in aged mice and restored the receptor levels to those observed in young animals, reversed the decline in cognitive function, and enhanced memory and learning. These studies, however, have not been published in any peer-reviewed journals - only in the context of the patent, thus far.

Sarsaparilla's main plant chemicals include: acetyl-parigenin, astilbin, beta-sitosterol, caffeoyl-shikimic acids, dihydroquercetin, diosgenin, engeletin, essential oils, epsilon-sitosterol, eucryphin, eurryphin, ferulic acid, glucopyranosides, isoastilbin, isoengetitin, kaempferol, parigenin, parillin, pollinastanol, resveratrol, rhamnose, saponin, sarasaponin, sarsaparilloside, sarsaponin, sarsasapogenin, shikimic acid, sitosterol-d-glucoside, smilagenin, smilasaponin, smilax saponins A-C, smiglaside A-E, smitilbin, stigmasterol, taxifolin, and titogenin.

BIOLOGICAL ACTIVITIES AND CLINICAL RESEARCH

Clinical research has validated the traditional use of sarsaparilla for skin conditions such as psoriasis, eczema, acne, and leprosy. In 1942, it was reported in the New England Journal of Medicine to improve the condition of psoriasis dramatically. There the results of a clinical study with 92 patients was detailed which reported that it improved psoriasis lesions in 62% of cases and completely cleared lesions in 18% of cases. One of the possible mechanisms of action in psoriasis is sarsaparilla's blood cleansing properties. Individuals with psoriasis have been found to have high levels of endotoxins circulating in the bloodstream (endotoxins are cell wall fragments of normal gut bacteria). Sarsaponin, one of sarsaparilla's main steriods, was found to bind to these endotoxins and remove them, thus improving psoriasis.

This endotoxin-binding action is probably why the root has been used for centuries as a "blood purifier." Other health conditions associated with high endotoxin levels include eczema, arthritis, and ulcerative colitis. Sarsaparilla's effective use in the treatment of leprosy has been documented in a 1959 human trial. The effectiveness of sarsaparilla in the treatment of adolescent acne caused by excessive androgens has received some experimental support as well.

A 2001 U.S. patent was filed on sarsaparilla (Smilax china) for psoriasis and respiratory diseases. This patent cited clinical observations and studies with children and human adults with *Psoriasis vulgaris*, pustular psoriasis, erythroderma psoriaticum lesions, and associated itching-reporting marked clinical improvements with dosages of 3-6 g daily. It also reported that, upon

discontinuation of sarsaparilla after only two months of treatment, there was further gradual remission of lesions and no side effects. In addition, this patent indicated sarsaparilla was shown to be a preventative and therapeutic agent for respiratory and allergic diseases such as acute bronchitis, bronchial asthma, asthmatic bronchitis, and chronic bronchitis. Again, these studies and observations reported in the patent have yet to be published in any peer-reviewed journals.

Sarsaparilla has long been used in the treatment of syphilis. Clinical observations in China demonstrated that sarsaparilla was effective (according to blood tests) in about 90% of acute and 50% of chronic cases. In the 1950s the antibiotic properties of sarsaparilla were documented; other studies documented its antifungal and antimycobacterial activities. Its anti-inflammatory activity has been demonstrated in several in vitro and in vivo studies, using different laboratory-induced models of arthritis and inflammation. One of these studies attributes the beneficial effect for arthritis to sarsaparilla's immune modulatory action. Sarsaparilla also has demonstrated liver protective effects in rats, with researchers concluding that it is able to prevent immune-mediated liver injury. Improvement of appetite and digestion has been noted with sarsaparilla, as well as its diuretic actions in humans. The root has been reported to have stimulatory activity on the kidneys in humans and, in chronic nephritis, it was shown to increase the urinary excretion of uric acid.

CURRENT PRACTICAL USES

Sarsaparilla is becoming more widely available in health food stores, with a variety of tablets, capsules, and tincture products sold today. Most of the sarsaparilla root in herbal commerce today comes from cultivation projects in Mexico and Latin America as well as China. In naturopathic and herbal medicine, it is used mostly in combination with other herbs for its tonic, detoxifying, blood purifying, and lymph-cleansing properties. In retail stores and products, it can be found as an ingredient in various herbal remedies made for skin disorders, libido enhancement, hormone balancing, and sports nutrition formulas. It's also commonly used in herbal preparations as a synergist or bioavailability aid - as it is thought that the saponins in sarsaparilla root increase the absorption of other chemicals in the gut. No known toxicity or side-effects have been documented for sarsaparilla; however, ingestion of large dosages of saponins may cause gastrointestinal irritation.

Sarsaparilla Plant Summary

Main Preparation Method: capsules or decoction

Main Actions (in order):
blood cleanser, immunomodulator (selectively reduces overactive immune cells), antimutagenic (cellular protector), detoxifier, tonic (tones, balances, strengthens overall body functions)

Main Uses:

1. 1. for psoriasis, dermatitis, leprosy, and other skin disorders
2. 2. as a blood purifier and general detoxification aid

3. 3. as a general tonic (tones, balances, strengthens), stimulant, and hormonal regulator
4. 4. for arthritis, rheumatism and autoimmune disorders which cause inflammation
5. 5. for syphilis and other sexually transmitted diseases

Properties/Actions Documented by Research:
anti-inflammatory, antibacterial, antifungal, antimutagenic (cellular protector), blood cleanser, detoxifier, diuretic, hepatoprotective (liver protector), immunomodulator (selectively reduces overactive immune cells), neuroprotective (protects brain cells)

Other Properties/Actions Documented by Traditional Use:
absorption aid, analgesic (pain-reliever), anticancerous, antioxidant, antirheumatic, antiseptic, aphrodisiac, diaphoretic (promotes sweating), digestive stimulant, febrifuge (reduces fever), stimulant, tonic (tones, balances, strengthens), wound healer

Cautions: Excessive dosages can cause gastrointestinal irritation.

Traditional Preparation: One-half to 1 cup of a standard root decoction 2-3 times daily. Alternatively, 1-2 grams of root powder in tablets or capsules twice daily or 2-3 ml of a standard tincture or fluid extract may be taken twice daily.

Contraindications: Large doses may cause gastrointestinal upset.

Drug Interactions: Sarsaparilla may increase the absorption of some drugs and compounds. Some report that it can increase the absorption of Digitalis glycosides while accelerating the elimination of hypnotic drugs.

Worldwide Ethnomedical Uses

Argentina	for rheumatism, and to increase perspiration and libido
Brazil	for acne, anorexia, arthritis, blood purification, digestive disorders, eczema, fever, gallstones, gout, hives, kidney problems, kidney stones, impotence, leprosy, muscle weakness, psoriasis, rheumatism, skin disorders, sterility, syphilis, ulcers, urinary insufficiency, venereal diseases, and as an aphrodisiac, laxative, and to increase perspiration
China	for abscesses, arthritis, boils, cystitis, diarrhea, digestive disorders, dysentery, enteritis, fever, malaria, mercury poisoning, rheumatism, rheumatoid arthritis, skin problems, sores, syphilis, urinary insufficiency, and as an aphrodisiac and tonic
England	for abscesses, anorexia, antiseptic, blood cleansing, cancer, dysentery, eczema, fatigue, gout, immune enhancement, impotence, infections, inflammation, itching, leprosy, mercury poisoning, muscle weakness, PMS, psoriasis, rheumatism, rheumatoid arthritis, skin problems, syphilis, tonic, venereal diseases and as an aphrodisiac, antiseptic, diuretic, and to increase perspiration
Europe	or arthritis, inflammation, kidney problems, psoriasis, rheumatism, skin problems, sweat promotion, urinary disorders, urinary insufficiency, venereal diseases
Latin America	for aches, acne, arthritis, colds, digestive disorders, fever, gout, impotence, pain, psoriasis, rheumatism, skin problems, sweat promotion, syphilis, venereal disease, weakness, and as an aphrodisiac and tonic

Mexico	for arthritis, blood purification, burns, cancer, digestive disorders, dyspepsia, eczema, fever, gonorrhea, inflammation, leprosy, nephritis, rash, rheumatism, scrofula, skin problems, syphilis, venereal disease, and to increase perspiration and urination
United States	for acne, arthritis, bladder problems, blood purification, burns, cancer, convalescence, coughs, diabetes, digestive disorders, eczema, eye infections, fatigue, fever, gonorrhea, gout, herpes, hives, hypertension, impotence, infertility, inflammation, itching, kidney problems, laxative, liver protection, pleurisy, PMS, psoriasis, rheumatism, scrofula, shingles, skin problems, stomach disorders, stress, sweat promotion, syphilis, tuberculosis, ulcers, ulcerative colitis, urinary disorders, urinary insufficiency, vaginal discharge, venereal disease, warts, wounds, and as an expectorant
Elsewhere	for abscesses, arthritis, asthma, boils, burns, cancer, colds, conjunctivitis, cystitis, dyspepsia, dysentery, eczema, edema, epilepsy, gonorrhea, gout, herpes, impotence, inflammation, intestinal gas, kidney problems, leprosy, lymph inflammation, malaria, menstrual disorders, psoriasis, rashes, stimulant, tonic, toothache, tumor, urogenital diseases, venereal disease, wounds, and as an aphrodisiac, stimulant, and tonic

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Referenced Quotes on Sarsaparilla

1. "Since ancient times Sarsaparilla has been considered an excellent blood purifier. More recently it has been used alone or with other herbs to combat psoriasis, eczema, warts and other skin infections. ln homeopathy it is frequently used for skin eruptions that are accompanied by intense itching."

2. "Sarsaparilla is used all over the world for a wide range of symptoms. These include lung and stomach congestion, skin diseases, herpes, syphilis, psoriasis, arthritis, rheumatism, gout, nervous disorders, epilepsy, chronic liver disorders, colds fevers, and stomach and intestinal gas. It helps promote good circulation, clear toxins, balance the glandular system, and stimulate metabolism and male sexual potency. The natural steroidal glycosides found in smilax make it a favorite for body builders and anyone who would like to be stronger and energized. It promotes rejuvenation and can be used as an anti-inflammatory."

3. "ACTIONS: Stimulates metabolism, Enhances glandular balance, Boosts hormone, production, Cleanses blood, Aids muscle building. TRADITIONAL USE: Smilax is used for glandular balance, and is believed to aid building of muscle mass. Recognized for its properties believed to increase metabolic rate. Naturally stimulates production of hormones. Known to encourage muscle mass when used adjunct to specific exercise. High in vitamins and minerals. Has been used in the treatment of gout, rheumatism, kidney and bladder dysfunctions and skin conditions. MERIDIAN INDICATIONS: Warms male organs, Strengthens muscles, Nourishes blood, kidney, Stomach, Liver EVA POINTS: Triple Warmer, Bladder 65, Stomach, Kidney, Liver."

4. "Medical Action and Uses: Alterative, tonic. Used in chronic skin diseases, rheumatism, passive dropsy."

5. "A sweet herb used for impotency, liver problems, stress, rheumatism, gout, venereal disease (i.e., syphilis), leukorrhea, herpes, other disorders caused by blood impurities, epilepsy, and nervous system disorders. Reduces fever, clears skin disorders such as eczema and psoriasis, and controls diabetes. Also good for stomach and kidney disorders. Regulates hormones, increases energy, and protects against harmful radiation."

11. "Sarsaparilla to increase circulation, clear toxins and stimulate metabolism."

13."Sarsaparilla's medicinal use has been as a tonic and a blood purifier. A blood purifier or depurative refers to an agent that cleanses and purifies the system. Sarsaparilla's reputation in this regard probably stems from its importation from the Caribbean and South America to Europe in the sixteenth century for the treatment of syphilis.
During military operations in Portugal in 1812, a British Inspector General of Hospitals noted that the Portuguese soldiers suffering from syphilis who used sarsaparilla recovered much faster and more completely than their British counterparts, who were treated with mercury.
Sarsaparilla was also used by the Chinese in the treatment of syphilis. Clinical observations in China demonstrated that sarsaparilla is effective, according to blood tests, in about 90 percent of acute cases and 50 percent of chronic cases.
An interesting note is that sarsaparilla species have been used all over the world in many different cultures for the same conditions, namely gout, arthritis, fevers, digestive disorders, skin disease, and cancer.
The mechanism of action of sarsaparilla is largely unknown, although the plant does contain several saponins and has been shown to be clinically effective in the treatment of psoriasis. This evidence points to a possible effect on binding of cholesterol and bacterial toxins in the intestines.
Evidence seems to support sarsaparilla as an endotoxin binder. Endotoxins are cell wall constituents of bacteria that are absorbed from the gut. Normally, the liver filters out these and other gut-derived compounds before they reach the general circulation. If the amount of endotoxin absorbed is excessive or if the liver is not functioning adequately, the liver can become overwhelmed, and endotoxins will spill into the blood. In a controlled study of ninety-two patients, an endotoxin-binding saponin (sarsaponin) from sarsaparilla greatly improved the psoriasis in 62 percent of the patients and resulted in complete clearance in 18 percent."

14."Smilax is another herb with a reputation as a remarkable tonic and male rejuvenator. This herb has been receiving considerable attention lately, but not of a research nature. Rather it has become a favorite of the body-building crowd. Is there any justification for this interest?
As a tonic, smilax has been used primarily to increase vitality and virility, and is used throughout Central and South America and some parts of southern North America to treat the symptoms of sexually transmitted diseases. This practice has even spread to Europe. Chinese physicians verified the antisyphilis property of sarsaparilla. In clinical observations, its effectiveness on primary syphilis was rated at 90 percent. Allowing for some halo effect, the results are still staggering. This may help explain how the herb came to used that way in Europe. It was simply effective.
Worldwide opinion also concurs on other uses for smilax, including an anti-inflammatory effect in arthritis and gout, and a detoxification effect in cancer and skin disorders.
The effectiveness of smilax in the treatment of skin disorders, such as the acne of adolescence caused by raging androgens, has received some experimental support.

The tonic effect of smilax may be the result of its ability to stimulate the removal of accumulated waste products from the cells, blood and lymph.
One final note: Smilax contains a wide variety of saponins, mainly sarsasapogenin, smilagenin, sitosterol and stigmasterol. These substances commonly occur in plants with immune enhancing action, in the adaptogens, in tonics, and in herbs used for their nutritive value. Smilax saponins have not been investigated thoroughly, but they may hold the key to the popularity of the plant for body-building purposes. Sarsaparilla saponins have, for example, been used in the synthesis of sex hormones."

Hobbs, Christopher, "Sarsaparilla, A literature review" HerbalGram No. 17 - Summer 1988, Pg 10. :
"Gerard, in his Great Herbal, mentions that the Honduran and Peruvian sarsaparilla "are a remedy against long continual pain of the joints and head, and against the cold." Spanish "sarza parilia", S. aspera, he takes to be similar, but weaker in action(11).
According to Monardes, the Spanish botanist, Mexican sarsaparilla was introduced into European medicine about 1536 at Seville (12). Other species soon followed from Guatamala and Honduras. They were highly regarded as a remedy for syphilis, which was also imported from the new world in the late 1400's, and for rheumatism. From Spain, the herb found its way into the pharmacists shops all over Europe and England.
Few plants have had the rise and fall in popularity that sarsaparilla has had. When it was introduced it was considered remarkably effective for diverse chronic diseases, and many doctors of the time wrote about its benefits. Generally considered an alterative tonic, blood purifier, diuretic and diaphoretic, it was given alone or in combination with other herbs, as well as with mercury for long-standing venereal disease.
Pereira, a leading physician in London in the mid-nineteenth century, felt that sarsaparilla works when "the malady is of long continuance, and the constitution is enfeebled and emaciated, either by the repeated attacks of the disease, or by the use of mercury," and that it is "the great restorer of a appetite, flesh, colour, strength and vigour."
11. Gerad, John (1633). The Herbal or General History of Plants, reprinted by Dover, NY (1975)
12. Lloyd, J. U. (1929) Origin and History of all the Pharmacopeial Vegetable Drugs, Caxton Press, Cincinnati"

Published Research on Sarsaparilla

All available third-party research on sarsaparilla can be found at **PubMed.** A partial listing of the published third party research on sarsaparilla updated through Feb 2019 is shown below:

Anti-inflammatory & Anti-Arthritic Actions:
Dong, L., et al. "Corrigendum to "Astilbin from *Smilax glabra* Roxb. attenuates inflammatory responses in complete Freund's adjuvant-induced arthritis rats." *Evid. Based Complement. Alternat. Med.* 2018 Dec; 2018: 6279328.
Tettey, C., et al. "*Smilax china* leaf extracts suppress pro-inflammatory adhesion response in human umbilical vein endothelial cells and proliferation of HeLa cells." *Arch. Physiol. Biochem.* 2018 Oct:1-5.
Xie, Y., et al. "Anti-inflammatory furostanol saponins from the rhizomes of *Smilax china* L." *Steroids.* 2018 Dec; 140: 70-76.
Bao, Y., et al. "Therapeutic effects of *Smilax glabra* and *Bolbostemma paniculatum* on rheumatoid arthritis using a rat paw edema

model." *Biomed. Pharmacother.* 2018 Dec; 108: 309-315.
Shu, J., et al. "Three new flavonoid glycosides from *Smilax glabra* and their anti-inflammatory activity." *Nat. Prod. Res.* 2018 Aug; 32(15): 1760-1768.
Dong, L., et al. "Astilbin from *Smilax glabra* Roxb. attenuates inflammatory responses in complete freund's adjuvant-induced arthritis rats." *Evid. Based Complement. Alternat. Med.* 2017; 2017: 8246420.
Tian, L., et al. "Steroidal Saponins from the genus *Smilax* and their biological activities." *Nat. Prod. Bioprospect.* 2017 Aug; 7(4): 283-298.
Zhong, C., et al. "Phenolic compounds from the rhizomes of *Smilax china* L. and their anti-inflammatory activity." *Molecules.* 2017 Apr; 22(4).
Lu, C., et al. "Polysaccharides from *Smilax glabra* inhibit the pro-inflammatory mediators via ERK1/2 and JNK pathways in LPS-induced RAW264.7 cells." *Carbohydr. Polym.* 2015 May; 122: 428-36.
Lu, C., et al. "Optimization of astilbin extraction from the rhizome of Smilax glabra, and evaluation of its anti-inflammatory effect and probable underlying mechanism in lipopolysaccharide-induced RAW264.7 macrophages." *Molecules.* 2015 Jan; 20(1): 625-44.
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Ma, Y., et al. "[Pharmaceutical screening of the effective fraction from *Smilax* for treatment of chronic pelvic inflammatory disease]." *Nan Fang Yi Ke Da Xue Xue Bao.* 2013 Jan; 33(1): 145-9.
He, X., et al. "[Comparison of anti-inflammatory effect and analysis of astilbin red and white transverse section *Smilax glabra* in 28 collection sites]." *Zhongguo Zhong Yao Za Zhi.* 2012 Dec; 37(23): 3595-8.
Liagre, B., et al. "Inhibition of human rheumatoid arthritis synovial cell survival by hecogenin and tigogenin is associated with increased apoptosis, p38 mitogen-activated protein kinase activity and upregulation of cyclooxygenase-2." *Int. J. Mol. Med.* 2007 Oct; 20(4): 451-60.
Shao, B., et al. "Steroidal saponins from *Smilax china* and their anti-inflammatory activities." *Phytochemistry.* 2007 Mar; 68(5): 623-30.
Shu, X., et al. "The anti-inflammation effects of *Smilax china* ethylacetate extract in rats and mice." *Zhongguo. Zhong. Yao. Za. Zhi.* 2006 Feb; 31(3): 239-43.
Shu, X., et al. "Anti-inflammatory and anti-nociceptive activities of *Smilax china* L. aqueous extract." *J. Ethnopharmacol.* 2006 Feb; 103(3): 327-32.
Ji, W., et al. "Effects of Rebixiao granules on blood uric acid in patients with repeatedly attacking acute gouty arthritis." *Chin. J. Integr. Med.* 2005 Mar; 11(1): 15-21.
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Kidney Protecting Actions:

Huang, L., et al. " The anti-hyperuricemic effect of four astilbin stereoisomers in *Smilax glabra* on hyperuricemic mice." *J. Ethnopharmacol.* 2019 Mar 6. pii: S0378-8741

Wang, S., et al. " The flavonoid-rich fraction from rhizomes of *Smilax glabra* Roxb. ameliorates renal oxidative stress and inflammation in uric acid nephropathy rats through promoting uric acid excretion." *Biomed. Pharmacother.* 2019 Mar; 111: 162-168.
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Chen, L., et al. "Astilbin attenuates hyperuricemia and ameliorates nephropathy in fructose-induced hyperuricemic rats." *Planta Med.* 2011 Nov; 77(16): 1769-73.
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Liver Protecting Actions:

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Immune Stimulant & Immune Modulating Actions:

Wang, Y., et al. "Smiglaside A ameliorates LPS-induced acute lung injury by modulating macrophage polarization via AMPK-PPARγ pathway." *Biochem. Pharmacol.* 2018 Oct; 156: 385-395.
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Zheng, Z., et al. "Macrophage biospecific extraction and HPLC-ESI-MSn analysis for screening immunological active components in Smilacis Glabrae Rhizoma." *J. Pharm. Biomed. Anal.* 2013 Apr; 77: 44-8.
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