

## Dan Shen (Radix Salviae Miltiorrhizae)

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**Pinyin Name:** *Dan Shen*

**Literal Name:** “red ginseng”

**Alternate Chinese Names:** *Chi Shen, Zi Dan Shen*

**Original Source:** *Shen Nong Ben Cao Jing* (Divine Husbandman’s Classic of the Materia Medica) in the second century

**English Name:** salvia root

**Botanical Name:** *Salvia miltiorrhiza* Bge. (*Dan Shen*)

**Pharmaceutical Name:** Radix Salviae Miltiorrhizae

**Properties:** bitter, cool

**Channels Entered:** Heart, Pericardium, Liver

### CHINESE THERAPEUTIC ACTIONS

#### 1. Activates Blood Circulation, Dispels Blood Stasis

*Dan Shen* (Radix Salviae Miltiorrhizae) regulates blood circulation and addresses various disorders caused by blood stagnation, including gynecological or cardiovascular disorders, and the formation of nodules of blood stagnation.

**Gynecology:** *Dan Shen* is an excellent herb to treat various gynecological disorders caused by blood stagnation, such as irregular menstruation, amenorrhea and postpartum abdominal pain.

- Abdominal pain with irregular menstruation because of blood stasis or during the postpartum period: use this herb with *Hong Hua* (Flos Carthami), *Tao Ren* (Semen Persicae) and *Yi Mu Cao* (Herba Leonuri).
- Abdominal pain with blood stasis due to cold: combine it with *Wu Zhu Yu* (Fructus Evodiae) and *Rou Gui* (Cortex Cinnamomi).

**Chest, epigastric and abdominal pain:** *Dan Shen* treats pain and stifling sensations in the chest and epigastric areas caused by qi and blood stagnation.

- Chest pain: use *Dan Shen* with *Gua Lou Pi* (Pericarpium Trichosanthis) and *Ban Xia* (Rhizoma Pinelliae).
- Epigastric and abdominal pain due to qi and blood stagnation: use it with *Tan Xiang* (Lignum Santali Albi) and *Sha Ren* (Fructus Amomi).

**Palpable masses and accumulations due to blood stagnation:** *Dan Shen* has a strong dispersing action that can be used with other blood- and qi-invigorating herbs to treat masses in the abdomen.

- Palpable masses: use this herb with *San Leng* (Rhizoma Sparganii), *E Zhu* (Rhizoma Curcumae), *Ze Lan* (Herba Lycopi) and *Bie Jia* (Carapax Trionycis).
- Hepatomegaly or splenomegaly: combine this herb with *Bie Jia* (Carapax Trionycis), *Mu Li* (Concha Ostreae), *Zhi Ke* (Fructus Aurantii), *Dang Gui Wei* (Extremities Radicis Angelicae Sinensis), *Tao Ren* (Semen Persicae), *Hong Hua* (Flos Carthami), *Bai Zhu* (Rhizoma Atractylodis Macrocephalae), *Fu Ling* (Poria), *San Leng* (Rhizoma Sparganii), *E Zhu* (Rhizoma Curcumae), and *Xiang Fu* (Rhizoma Cyperi).

**Traumatic injuries and *bi zheng* (painful obstruction syndrome):** *Dan Shen* invigorates blood circulation in the channels and collaterals to treat arthritis or traumatic injury.

- External or traumatic injuries with pain and bruising: use this herb with *Dang Gui* (Radicis Angelicae Sinensis), *Hong Hua* (Flos Carthami), and *Chuan Xiong* (Rhizoma Ligustici Chuanxiong).
- Redness, swelling and pain due to heat-type *bi zheng* (painful obstruction syndrome): combine *Dan Shen* with *Ren Dong Teng* (Caulis Lonicerae), *Chi Shao* (Radix Paeoniae Rubrae), *Qin Jiao* (Radix Gentianae Macrophyllae), and *Sang Zhi* (Ramulus Mori).

#### 2. Cools the Blood, Reduces Swelling of Sores and Abscesses

**Heat in the *ying* (nutritive) and *xue* (blood) levels:** Manifestations include delirium, high fever, unconsciousness, irritability, insomnia, purpura or subcutaneous bleeding, with a dark, purplish-red tongue. *Dan Shen* cools the blood to treat febrile disorders or the presence of heat in the *ying* or *xue* levels.

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- Heat in the *ying* or *xue* levels: use *Dan Shen* with *Sheng Di Huang* (Radix Rehmanniae), *Xuan Shen* (Radix Scrophulariae), and *Zhu Ye* (Herba Phyllostachys).

**Sores and abscesses:** *Dan Shen* has potent action to reduce swelling in toxic sores and breast abscesses.

- Initial stage of breast abscess: use this herb with *Jin Yin Hua* (Flos Lonicerae) and *Lian Qiao* (Fructus Forsythiae).
- Erysipelas: use it with *Mu Dan Pi* (Cortex Moutan), *Chi Shao* (Radix Paeoniae Rubrae), *Tian Hua Fen* (Radix Trichosanthis), *Jin Yin Hua* (Flos Lonicerae), *Lian Qiao* (Fructus Forsythiae), and *Pu Gong Ying* (Herba Taraxaci).

### 3. Nourishes Blood, Calms the Shen (Spirit)

**Palpitations and insomnia related to heat in the blood or Heart blood deficiency:** Cool in nature, *Dan Shen* dispels heat from the Heart and nourishes blood, to treat insomnia and palpitations.

- Palpitations and insomnia due to heat: use it with *Xuan Shen* (Radix Scrophulariae), *Lian Qiao* (Fructus Forsythiae) and *Jin Yin Hua* (Flos Lonicerae). **Exemplar Formula:** *Qing Ying Tang* (Clear the Nutrition Level Decoction).
- Palpitations and insomnia from Heart blood deficiency: combine this herb with *Sheng Di Huang* (Radix Rehmanniae), *Bai Zi Ren* (Semen Platycladi), and *Suan Zao Ren* (Semen Zizyphi Spinosa). **Exemplar Formula:** *Tian Wang Bu Xin Dan* (Emperor of Heaven's Special Pill to Tonify the Heart).

### DOSAGE

5 to 10 grams in decoction, up to a maximum of 30 grams. Liquor-fried *Dan Shen* (with grain-based liquor) has a stronger function to activate blood circulation, remove blood stasis, and relieve pain.

### CAUTIONS / CONTRAINDICATIONS

- *Dan Shen* is incompatible with *Li Lu* (Radix et Rhizoma Veratri).
- Patients with hypermenorrhea, hemoptysis or hematuria should use *Dan Shen* with caution.

### CHEMICAL COMPOSITION

Tanshinone I, II<sub>A</sub>, II<sub>B</sub>; hydroxytanshinone, methyltanshinonate, methylenetanshinquinone, przewatanshinquinone A, miltirone, dihydrotanshinone I, tanshinol A, tanshinol B, tanshinol C, nortanshinone, 1,2,15,16-tetrahydrotanshinquinone, isotanshinone I, II; isocryptotanshinone, tanshiquinone A, B, C.<sup>1</sup>

### PHARMACOLOGICAL EFFECTS

- **Cardiovascular:** Administration of *Dan Shen* in various laboratory animals is associated with negative

chronotropic and inotropic effects, and reduction of blood pressure.<sup>2</sup> *Dan Shen* dilates and increases blood perfusion to the coronary arteries to reduce the damage of cardiac ischemia and prevent or diminish death of cardiac muscle.<sup>3</sup>

- **Antiplatelet:** Injection of *Dan Shen* is associated with antiplatelet effects in healthy rabbits, rats and mice. The antiplatelet effect reaches its peak 30 minutes after intravenous injection, and lasted for approximately 2 hours.
- **Anticoagulant and thrombolytic:** Administration of *Dan Shen* is also associated with anticoagulant and thrombolytic effects.<sup>4,5</sup>
- **Antibiotic:** It has an inhibitory influence on *Staphylococcus aureus*.<sup>6</sup>
- **Hepatoprotective:** Administration of *Dan Shen* is associated with a marked hepatoprotective effect by lowering liver enzyme levels in mice exposed to carbon tetrachloride. It is also beneficial in treating mice with liver cirrhosis. The hepatoprotective function of *Dan Shen* is due in part to its effect at improving blood circulation and promoting regeneration of liver cells.<sup>7,8,9</sup>
- **Antineoplastic:** In mice with lung cancer, intraperitoneal injection of a *Dan Shen* preparation at the dosage of 9.0 g/kg showed marked inhibitory action on the growth of cancer cells with  $p < 0.05$  to 0.02. In mice with ascites carcinoma, intraperitoneal injection of a *Dan Shen* preparation was effective in inhibiting the growth and spread of tumor cells.<sup>10,11</sup>
- **CNS suppressant:** Administration of *Dan Shen* has a marked sedative effect, as it prolongs the hypnotic influence of phenobarbital and negates the stimulating effects of caffeine.<sup>12</sup>

### CLINICAL STUDIES AND RESEARCH

- **Acute viral hepatitis:** One report covered 104 patients who were treated with intravenous injection of a *Dan Shen* preparation with an effective rate of 97%. The effectiveness is attributed to the ability of *Dan Shen* to promote regeneration of liver cells.<sup>13</sup>
- **Chronic nephritis:** According to another report, 48 patients were treated with an intravenous infusion of 16 to 20 ml of a *Dan Shen* preparation in 500 ml of D5W (2 ml of injectable contain 3 grams of dried herb) for 14 days per treatment course. Depending on the severity of illness, the effective rate ranged from 62.5 to 80%. Patients with hematuria were treated with extreme caution, as *Dan Shen* has both antiplatelet and anticoagulant effects.<sup>14</sup>
- **Oral leukoplakia:** Presence in the oral cavity of abnormal growths with white discoloration and distinct borders was diagnosed as oral leukoplakia and treated with *Dan Shen* injectable. After application of anesthetic to the affected area, 2 to 4 ml of the preparation were inject-

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ed at the base of the abnormal growth every other day for a total of 7 injections per treatment course. The study reported good patient response with shrinkage and disappearance of the abnormal white growth.<sup>15</sup>

- **Chronic hepatitis:** According to one report, 22 patients with chronic active hepatitis (characterized as blood stasis) were divided into two groups. Patients in group one received 4 ml of *Dan Shen* via intramuscular injection. Patients in group two received 100 ml of individually-customized herbal decoctions twice daily plus 250mg of glucuronolactone three times daily. The study reported normal liver function in 11 out of 11 patients in the *Dan Shen* injectable group after just 2 months, and in only 6 out of 11 patients in the herbal decoction group after 3 months.<sup>16</sup>
- **Cervical erosion:** In one study, 11 patients with cervical erosion were treated topically with a *Dan Shen* preparation, with up to a 57.66% success rate. Additional benefits included good patient compliance and lack of toxicity, adverse effects and/or allergic reactions.<sup>17</sup>
- **Epidemic hemorrhagic fever:** Oral or intravenous administration of *Dan Shen* showed marked effectiveness in treatment of epidemic hemorrhagic fever by reducing the length of illness, decreasing the duration of oliguria, and minimizing the amount of blood lost.<sup>18</sup>
- **Whooping cough:** In one study, 28 patients with whooping cough were treated with 2 ml of an intravenous infusion of *Dan Shen* (2 ml of injectable contained 2 grams of dried herb) one or two times daily. Marked improvement was reported in 21 out of 28 patients.<sup>19</sup>
- **Schistosomal hepatomegaly:** Administration of a 30 to 50% *Dan Shen* decoction (equivalent to 18 to 45 grams of dried herb daily) for 30 to 42 days showed a reduction in size of the liver in 44.4% of the patients, softening of the liver in 55.5%, a reduction in size of the spleen in 48.8%, and softening of the spleen in 53.6%.<sup>20</sup>
- **Coronary artery disease:** In one study, 323 patients with coronary artery disease were treated with oral administration of a *Dan Shen* preparation given three times daily (equivalent to daily dose of 60 grams of dried herbs). The study reported improvement based on symptomatic evaluation in 80.9% of the patients, and improvement based on ECG reading in 57.3% of the patients. That study noted that patients without previous incidence of myocardial infarction were most responsive to the treatment. Furthermore, a reduction of total cholesterol levels was reported in many patients.<sup>21</sup> In another study, 108 patients with angina were treated with an injectable of a *Dan Shen* preparation with improvement in 86% of the patients based on symptomatic evaluation, and in 54.7% of the patients based on an ECG evaluation.<sup>22</sup>
- **Shock:** Two patients with cardiogenic shock and sudden arrest of heartbeat were successfully rescued by intra-

venous injection of a *Dan Shen* preparation. The therapeutic effect was described as being similar to that of phentolamine or dobutamine.<sup>23</sup>

- **Scleroderma:** Sixteen patients with scleroderma were treated by intravenous infusion of a *Dan Shen* preparation for an average of 43.3 days. The study reported marked improvement in 37.6%, slight improvement in 31.2%, and no improvement in 31.2%.<sup>24</sup>
- **Ischemic stroke:** Intravenous administration of *Dan Shen* was 83.42% effective in treating 43 patients with stroke due to cerebral ischemia. The group that received Chinese herbs responded better than the group that received drugs.<sup>25</sup>
- **Cerebral thrombosis:** Intravenous administration of *Dan Shen* was 93.5% effective in treating 46 patients with cerebral thrombosis.<sup>26</sup>
- **Insomnia:** Injection of *Dan Shen* into *Zusanli* (ST 36) bilaterally was 61% effective in treating 100 patients diagnosed with insomnia.<sup>27</sup>
- **Allergic rhinitis:** Bilaterally injection of *Dan Shen* into inferior nasal concha of the nose was 86% effective in treating 50 patients diagnosed with allergic rhinitis.<sup>28</sup>
- **Glaucoma:** Intramuscular injection of *Dan Shen* in 94 patients for treatment of mid- to late-stage glaucoma showed good overall results. Out of 116 affected eyes, the study reported vision improvement in 58 eyes, no change in 49 eyes, and deterioration in 9 eyes.<sup>29</sup>

### HERB-DRUG INTERACTION

- **Anticoagulant or antiplatelet drugs:** *Dan Shen* has a significant impact on the pharmacodynamics and pharmacokinetics of warfarin, according to studies conducted in rats. After a single dose of warfarin, use of *Dan Shen* orally for three days increased the absorption rate constant, plasma concentration, prothrombin time, steady-state plasma level, area under plasma-concentration-time curves, maximum concentrations and elimination half-lives of warfarin. However, there was a decrease of clearances and apparent volume of distribution of warfarin. The researchers concluded that this herb-drug interaction explains the exaggerated warfarin effect when herbs such as *Dan Shen* and *Dang Gui* (Radix Angelicae Sinensis) were administered concurrently.<sup>30</sup> [Note: Examples of anticoagulants include heparin, warfarin (Coumadin) and enoxaparin (Lovenox); and examples of antiplatelets include aspirin, dipyridamole (Persantine), and clopidogrel (Plavix).]
- **Digoxin:** In an *in vitro* study, it was demonstrated that *Dan Shen* has digoxin-like immunoreactivity. Concurrent use of both digoxin and *Dan Shen* may result in falsely elevated serum digoxin concentrations (positive interference) as measured by the fluorescence polarization

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immunoassay, and a falsely lowered level (negative interference) when measured by the microparticle enzyme immunoassay. A more reliable assay can be obtained by monitoring the free digoxin concentration.<sup>31</sup>

## TOXICOLOGY

No fatalities were reported following bolus intraperitoneal injection of *Dan Shen* decoction at 43 g/kg in mice. No abnormalities were observed following daily intraperitoneal injection of a *Dan Shen* preparation at 2.4 g/kg for 14 days.<sup>32,33</sup>

## AUTHORS' COMMENTS

Of all blood-invigorating and stasis-removing herbs, *Dan Shen* is one of the most commonly used. It markedly lowers the viscosity of blood and improves perfusion of blood to various vital organs of the body, including, but not limited to, the brain, the heart, and the kidneys. Because it dilates coronary arteries and improves blood perfusion to the heart, *Dan Shen* is one of the most important herbs in the treatment of cardiac ischemia and angina.

Some traditional texts consider using the single herb *Dan Shen* to be equivalent to the function of the formula *Si Wu Tang* (Four-Substance Decoction). But this herb is cool and is mainly used to dispel blood stagnation. Although it can calm the *shen* (spirit) to treat palpitations and insomnia, this is not its primary function. Some believe that with only a minor function to tonify blood, the effect of using *Dan Shen* will be significantly lower than that of using blood-tonic herbs. Therefore the theory of *Dan Shen* being equivalent to *Si Wu Tang* does not meet with unanimous agreement among scholars and clinicians.

*Dan Shen*, *Dang Gui* (Radix Angelicae Sinensis) and *Dang Gui Wei* (Extremities Radix Angelicae Sinensis) all invigorate and tonify the blood. The differences are as follows:

- *Dan Shen* is cool and has a stronger function to dispel blood stagnation.
- *Dang Gui* is warm and functions more effectively to tonify blood.
- *Dang Gui Wei* is warm, and is used primarily to invigorate blood circulation.

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