

**San Qi Formula** (*San Qi Pian*) is a modern formulation designed to replicate the actions of the famous Chinese formula, *Yunnan Baiyao*. The ingredients of the original formula are a well-guarded secret, with only the chief ingredient, *san qi*, disclosed. The formulation under discussion here is designed to be fully transparent in order to aid the practitioner in prescription.

## GENERAL SIGNS/SYMPTOMS

**San Qi Formula** (*San Qi Pian*) can be used to treat bleeding of nearly any etiology<sup>1</sup> (external trauma or internal disharmony, such as reckless blood, heat, toxic heat, qi deficiency, or blood stasis). This formula also effectively treats pain and swelling from trauma or arthritis.

## APPLICATIONS

1. Stanches bleeding

2. Disperses blood stasis

3. Disperses swelling and relieves pain

4. Purges toxicity

## INGREDIENTS

PINYIN	LATIN	ENGLISH	PERCENT OF FORMULA
( <i>Sheng</i> ) <i>San Qi</i> , <i>Tian Qi</i> (chief)	Notoginseng (radix)	Tienqi ginseng, Pseudoginseng Root	45%
<i>Xian He Cao</i> (deputy)	Agrimoniae (herba)	Agrimony	20%
<i>Ji Guan Hua</i> (deputy)	Celosiae Cristatae (flos)	Cockscomb Flower	15%
<i>Bai Mao Gen</i> (deputy)	Imperatae (rhizoma)	Imperata Rhizome	10%
( <i>Sheng</i> ) <i>Ce Bai Ye</i> (deputy)	Platycladi (cacumen)	Oriental Arborvitae Leaf and Stem (raw)	10%

## GENERAL INDICATIONS / MODERN APPLICATIONS

- Arthritis
- *Bi* syndrome (wind-damp with blood stasis)
- Bleeding (internal or external) from trauma
- Bleeding from infection
- Blood in stool or urine
- Blood in the urine (hematuria)
- Bruising (contusion)
- Coughing blood (hemoptysis)
- Crohn's disease, acute with bleeding
- Epistaxis (nosebleed)
- Gums, bleeding
- Hematemesis (vomiting of blood)
- Hemoptysis (coughing blood)
- Hemorrhage
- Hemorrhoids
- Menstrual bleeding, excessive
- Phlebitis
- Postpartum bleeding
- PTSD
- Rectal bleeding
- Swelling (from toxin or trauma)
- Trauma, emotional
- Trauma, physical, pain, swelling or bleeding from
- Ulcers, bleeding
- Uterine bleeding (excessive)

## FORMULA DISCUSSION

Most of the time, when a practitioner finds a patient's indication listed with a particular formula, s/he must take care to determine that the disease pattern and the formula pattern are also a match. This is a basic doctrine of Chinese medicine. When treating bleeding disorders with **San Qi Formula** (*San Qi Pian*), pattern identification is not usually a crucial determinant. A perusal of Table 3 below will demonstrate the variety of patterns this formula addresses. Tables 1 and 4 show the variety of bleeding disorders treated and channels entered by each of the ingredients of **San Qi Formula** (*San Qi Pian*). The chief exceptions for using **San Qi Formula** (*San Qi Pian*) to treat bleeding disorders are (1) when the origin of the bleeding is purely hormonal; and (2) when the bleeding is due to severe deficiency. In the case of hormonal bleeding, **San Qi Formula** (*San Qi Pian*) can still be used, but it is usually wise to use in conjunction with the correct prescription hormone. When severe qi deficiency causes blood to leak out of the vessel, **San Qi Formula** (*San Qi Pian*) should be combined with **Ginseng and Astragalus Formula** (*Bu Zhang Yi Qi Tang*).

Aside from most types of bleeding disorders, a curious application of **San Qi Formula** (*San Qi Pian*)—and *Yunnan Baiyao*—is the treatment of emotional trauma and Post-Traumatic Stress Disorder (PTSD). The theory here is that all trauma, be it physical or emotional, involves blood stasis. The heart stores the *shen* in the blood by imprinting experience into blood. When we experience emotional trauma, it is as much a physiological event as it is emotional.

**FORMULA ACTIONS**

- Stanches bleeding
- Dispels stasis
- Disperses swelling and relieves pain
- Purges toxicity

**TONGUE**

Often purple; can be red from heat or pale and swollen if qi deficient.

**PULSE**

Hollow (*koumai*), hurried (*cumai*), wiry (*xianmai*) choppy (*semai*), hidden (*fumai*), rapid (*shuomai*), weak (*ruomai*), and others.

**CONTRAINDICATIONS / CAUTIONS**

Do not use during pregnancy.

**DOSAGE**

The standard dosage is 2-4 tablets, 2-4 times daily, depending on severity. For emotional trauma dosage, see “Formula Discussion.”

Anything we take in from the world and make a part of ourselves, be it food, observations, or experience, is imprinted into the blood by the heart, according to classical OM theory. The heart performs this action of ‘imprintation’ continuously as the moments of our lives accumulate.

According to traditional explanations, the qi from food does not become blood simply by being absorbed from the intestines. Rather, the *gu* qi from food rises into the chest where it first combines with qi gathered by the lungs; once the qi of earth (*gu* qi/ qi from food) combines with the qi of heaven (oxygen) it travels to the heart. But before it passes into the heart it is usually referred to not as “blood” but as “red substance”. This distinction is in place to remind us that blood is not blood until it contains our *shen*. The heart-kidney axis (*shaoyin*) allows for the easy combination of *jing* (essence) and *yuan* qi with the red substance inside the heart chamber. It is within the heart chamber that the emperor combines red substance and *yuan* qi, finally infusing that combination with *shen* to make blood.

But blood and *shen* are not synonymous. The *shen* does not come from combining food and air. The *shen* comes from the heart’s impressions, which in turn are influenced by the nature of our psychic constitutions, our *jing*, *yuan* qi, and all the previously-imprinted *shen* that circulates as memory in the blood. The record imprinted into our *shen*, is not like the record of entries in a ledger, but the feeling-impressions from memory, experience, judgments and attitudes. The term, “heart-stopping” is often used as a cliché to describe a shocking event. But within this cliché is a truth revealing a link between blood stasis and emotional trauma. Emotional trauma can be concurrent with physical trauma, or it can be experienced on its own; both scenarios involve stasis because the heart’s continuous imprintation function is interrupted, shaken; it stutters or hesitates at the moment of shock; this hesitation creates a stasis. The shock of emotional trauma invariably affects the *shen* (by definition of its being emotionally traumatic), and therefore must also affect some or multiple parts of the emperor-complex, i.e., the heart *zang* itself, its vessels, the blood that carries the *shen*, or any combination of these three. **San Qi Formula** (*San Qi Pian*) can be part of an especially effective strategy to rectify the disturbed *shen* with the emperor complex. The dosage is usually large (4-8 tablets, depending on constitution) and taken with a small glass of red wine (or ginger tea) before bed for 3-4 nights in a row. This strategy should be concurrent with proper psychotherapy. Wait 3-10 days between courses, if multiple courses are needed.

**SYNERGY OF INGREDIENTS**

The temperatures of the constituent substances vary enough to make the overall temperature of this formula very close to neutral. 45% of the formula is warm, 20% is neutral, 15% is cool, 10% is slight cold, and only 10% is cold. Yet the only cold substance, imperata rhizome (*bai mao gen*) is said to not damage the stomach qi and to actually have a nourishing effect. Notojineng (*san qi*) is the only substance in the formula that invigorates blood stasis, but it is 45% of the formula, so the action to invigorate blood and remove stasis is strong. Imperata rhizome (*bai mao gen*) stops bleeding by cooling blood and arresting the chaotic movement of blood. All the other constituents of **San Qi Formula** (*San Qi Pian*) astringe bleeding in various zones and tissues. (See Table 1.)

To appreciate how **San Qi Formula** (*San Qi Pian*) can treat so many types of bleeding disorders, it is helpful to compare the actions of the constituent ingredients in the following tables.

**Table 1: Common Bleeding Disorders and the Applications of Constituent Substances**

	Bleeding from trauma	Epistaxis (nosebleed)	Hemoptysis (coughing blood)	Hematemesis (vomiting blood)	Hematuria (blood in urine)	Hemorrhoids	Uterine Bleeding	Bleeding Gums
<b>San Qi</b>	X	X	X	X	X	X	X	
<b>Xian He Cao</b>	X	X	X	X	X	X	X	X
<b>Ji Guan Hua</b>					X	X	X	
<b>Bai Mao Gen</b>		X	X	X	X	X		
<b>Ce Bai Ye</b>		X	X	X	X	X		

**Table 2: Anti-Toxin Actions of Constituent Substances**

	Anti-bacterial	Anti-parasitic	Anti-viral	Anti-fungal	Reduces Toxicity / Anti-inflammatory
<b>San Qi</b>	X		X	X	X
<b>Xian He Cao</b>	X	X		X	X
<b>Ji Guan Hua</b>	X	X			
<b>Bai Mao Gen</b>	X				X
<b>Ce Bai Ye</b>	X		X		

**Table 3: OM Patterns of Bleeding Disorders Addressed by Constituent Substances**

<b>San Qi</b>	<b>Xian He Cao</b>	<b>Ji Guan Hua</b>	<b>Bai Mao Gen</b>	<b>Ce Bai Ye</b>
Bleeding from stasis		Bleeding from stasis		
Bleeding from excess heat	Bleeding from excess heat	Bleeding from excess heat	Bleeding from excess heat	Bleeding from excess heat
	Bleeding from deficiency heat	Bleeding from deficiency heat	Bleeding from deficiency heat	Bleeding from deficiency heat
Bleeding from cold stasis	Bleeding from cold stasis	Bleeding from cold stasis		
	Bleeding from deficiency cold			
Bleeding from infection	Bleeding from infection	Bleeding from infection	Bleeding from infection	
	Bleeding from qi deficiency			

**Table 4: Channels Entered by Constituent Substances**

	<b>San Qi</b>	<b>Xian He Cao</b>	<b>Ji Guan Hua</b>	<b>Bai Mao Gen</b>	<b>Ce Bai Ye</b>
<b>Liver</b>	X	X	X		X
<b>Lung</b>		X		X	X
<b>Large Intestine</b>	X		X		X
<b>Stomach</b>	X			X	
<b>Spleen</b>		X			
<b>Small Intestine</b>				X	
<b>Urinary Bladder</b>				X	

Table 5: Unique Actions of Constituent Substances (other than hemostatic)

San Qi	Xian He Cao	Ji Guan Hua	Bai Mao Gen	Ce Bai Ye
Cardioprotective	Used for bleeding due to heat, cold, excess, or deficiency	Consolidates <i>jing</i>	Clears excess or latent heat	Promotes hair growth
Anti-atherosclerotic		Preserves body fluids	Decreases vascular permeability	Stops vaginal discharge
Antiarrhythmic	Alleviates diarrhea and dysentery	Stops vaginal discharge	Promotes urination, reduces edema	Disperses dampness from <i>bi</i> syndrome and trauma
Hepatoprotective	Analgesic		Protects the yin	Regenerates flesh
Renoprotective	Reduces swelling and edema		Effectively vents rashes	Topically used to heal burnt flesh
Analgesic	Prevents leakage of qi and blood		Treats jaundice	Expectorant
Reduces swelling and edema				Boosts and protects yin
Antioxidant				Stops bleeding from qi and blood deficiency
Increases sperm motility				
CNS protective				
PNS protective				

### MODERN APPLICATIONS

The “modern applications” for **San Qi Formula** (*San Qi Pian*) do not vary from classical indications. Bleeding issues are bleeding issues. There are some modern disease designations, such as PTSD, Crohn’s Disease, or amoebic dysentery, that are known to be helped with the ingredients of this formula, but the common denominator in each will be bleeding or trauma. However, it may be informative and useful here to mention some studies done on the individual ingredients of this formula.

*San Qi*—See **PUBLISHED STUDIES ON SAN QI/NOTOGINSENG**, on page 6.

*Xian He Cao*—Agrimony has long been used to stanch bleeding. It promotes platelet production and accelerates coagulation time.<sup>i</sup> *Xian he cao* also has the function to invigorate blood. The anti-hemostatic effect is dose dependent and is most effective at lower doses. Its antiplatelet action is effective in treating acute pulmonary thromboembolism. A study was done on mice showing that *xian he cao* was effective at preventing ADP-induced acute pulmonary thromboembolic death (aspirin and indomethacin had no effect) and collagen and sodium arachidonate-induced thromboembolic death.<sup>ii</sup>

Modern research has shown this herb to be very effective at relieving pain and reducing edema. A recent study done on mice concluded that *xian he cao* has a powerful analgesic effect, increasing the pain threshold, and significant anti-inflammatory action, effectively reducing swelling and edema.<sup>iii</sup>

*Ji Guan Hua*—Celosiae or cockscomb flower clears heat, cools blood, and stops bleeding. One study shows bleeding time was greatly reduced in mice five days after they were given a decoction of *ji guan hua* versus the control group.

In the same study rabbits were given the same decoction. Seven days after taking *ji guan hua* coagulation time, prothrombin time, and plasma recovery was shortened, as well as significantly shortened euglobulin lysis time (which measures overall fibrinolysis) compared to the control group.<sup>iv</sup>

*Bai Mao Gen*—Imperata rhizome is most often used for treating epistaxis, hematuria, and nephropathy. A study to investigate the effectiveness of *bai mao gen* for nephropathy in rats was done. The results showed that *bai mao gen* can significantly reduce hematuria, proteinuria, and IgA nephropathy in rats, as well as showing improved renal function.<sup>v</sup>

*Ce Bai Ye*—Oriental Arborvitae is known for stopping bleeding due to heat in the blood. It can be used for any type of bleeding including deficiency. One study done on mice showed bleeding time was reduced by 62% compared to the control group.<sup>vi</sup> Another study showed that *ce bai ye* (charred) can significantly shorten bleeding time and plasma recalcification time (partial thromboplastin time) in mice and rats.<sup>vii</sup>

### FORMULA COMPARISONS

**San Qi Tablets** (*San Qi Wan*) and **San Qi Formula** (*San Qi Pian*) have similar actions to stanch bleeding and dispel blood stasis to treat trauma and bleeding. **San Qi Tablets** (*San Qi Wan*) has only one ingredient: *san qi*/panax notoginseng root. **San Qi Formula** (*San Qi Pian*) is 45% *san qi*, plus four other herbs that assist and broaden the stanch bleeding function. *Xian he cao* both astringes and invigorates blood to stanch bleeding. *Ji guan hua*, *bai mao gen*, and *ce bai ye* all cool the blood and stanch bleeding by virtue of their astringency. **San Qi Tablets** (*San Qi Wan*) is used more often for cardiovascular problems and, as a single-herb tablet, is ideal for combining with

other formulas. **San Qi Formula** (*San Qi Pian*) is a general formula for any type of bleeding, but with its heat-clearing function is a better choice if the bleeding is caused by heat.

There are two main classifications for non-traumatic internal bleeding: excess and deficient. Excess type bleeding is most often due to heat in the blood. While there is often internal organ involvement, by the time bleeding occurs it is due to heat pushing out the blood from the vessels. **San Qi Formula** (*San Qi Pian*) works on various manifestations of excess bleeding such as coughing or vomiting blood, nose bleeds, blood in the urine, excessive uterine bleeding, intestinal bleeding, and ecchymosis. The bleeding is often accompanied with fever, thirst, and a general feeling of heat. The blood will be dark red or bright red and the amount can be profuse. **Rehmannia Cool Blood Formula** (*Tu Fu Ling Sheng Di Huang Wan*) also treats these conditions when blood-heat is the underlying cause. By clearing heat and cooling blood it will in turn stop the bleeding. **San Qi Formula** (*San Qi Pian*) focuses on effectively stopping the bleeding. It also treats the underlying cause, heat in the blood with several of the deputy herbs, *ji guan hua*, *bai mao gen*, and *ce bai ye* to cool blood and stanch bleeding, though its focus is to stanch bleeding. Use **San Qi Formula** (*San Qi Pian*) to

stop the bleeding, after the initial bleeding has subsided switch to **Rehmannia Cool Blood Formula** (*Tu Fu Ling Sheng Di Huang Wan*) or another appropriate formula to focus more on the underlying cause of the bleeding.

#### ENDNOTES

- <sup>i</sup>Wei Xianhui, "The Clinical Application of Agrimony", *Fujian Traditional Chinese Medicine*, Vol 6, 1986.
- <sup>ii</sup>Hsu M F, et al., "Effect of Hsien-ho-t'sao (*Agrimonia Pilosa*) on Experimental Thrombosis in Mice", *The American Journal of Chinese Medicine*, Vol 15, 1987.
- <sup>iii</sup>Gong, Chungui, et al., "Experimental Studies of Anti-inflammatory and Analgesic Effects of Extract from *Herba Agrimoniae*", *Journal of Pharmaceutical Practice*, Vol 6, 2006.
- <sup>iv</sup>Guo Liwei, et al., "Hemostatic Effect of *Flos Celosiae Cristatae* and its Mechanism", *Journal of Nanjing University of Traditional Chinese Medicine*, 1996.
- <sup>v</sup>Yin Yousheng, et al., "Effects of *Rhizoma Imperatae* and its Compound Decoction on the Model of IgA Nephropathy in Rats", *Li Shi Zhen Medicine and Materia Medica Research*, Vol 11, 2011.
- <sup>vi</sup>Xu Zhenwen, et al., "Oriental *Arborvitae* Hemostatic Ingredients", *Chinese Medicine Bulletin*, Vol 2, 1983.
- <sup>vii</sup>Chen Chao, et al., "Pharmacodynamic Study of Oriental *Arborvitae* Hemostatic Effect" Traditional Chinese Medicine Branch of the Chinese Medical Association Symposium, 2008.

#### USEFUL COMBINATIONS

For bleeding due to heat in the blood	Use with <b>Rehmannia Cool Blood Formula</b>
For bleeding due to spleen deficiency	Use with <b>Ginseng and Astragalus Formula</b>
For bleeding due to yin deficiency with deficiency fire	Use with <b>Rehmannia and Scrophularia Formula</b>
For blood in the urine	Use with <b>Polyporus and Dianthus Formula</b>
For blood in the stool	Use with <b>Ginseng and Astragalus Formula</b> for spleen deficiency, or <b>Wu Hua Formula</b> for damp-heat
For bleeding from fibroids	Use with <b>Polyporus and Dianthus Formula</b>
For excessive menstrual bleeding	Use with <b>Ginseng and Astragalus Formula</b> for qi deficiency, or <b>Chong Release Formula</b> for blood stagnation, or <b>Rehmannia Cool Blood Formula</b> for blood heat
For cough with blood	Use with <b>Lily Preserve Metal Formula</b> for yin deficiency, or <b>Mulberry and Lycium Formula</b> for lung heat

## PUBLISHED STUDIES ON SAN QI/NOTOGINSENG

- Chan, P., Thomas, G. N., Tomlinson, B. (2002) "Protective effects of trilinolein extracted from panax notoginseng against cardiovascular disease." *Acta Pharmacol. Sin.* 23: 1157–1162.
- Chan, R. Y., Chen, W. F., Dong, A., Guo, D., Wong, M. S. (2002) "Estrogen-like activity of ginsenoside Rg1 derived from Panax notoginseng." *J. Clin. Endocrinol. Metab.* 87: 3691–3695.
- Chen, J. C., Xu, M. X., Chen, L. D., Chen, Y. N., Chiu, T. H. (1999) "Effect of Panax notoginseng extracts on inferior sperm motility in vitro." *Am. J. Chin. Med.* 27: 123–128.
- Chen, J. C., Chen, L. D., Tsauer, W., Tsai, C. C., Chen, B. C., Chen, Y. J. (2001b) "Effects of Ginsenoside Rb2 and Rc on inferior human sperm motility in vitro." *Am. J. Chin. Med.* 29: 155–160.
- Chen, J. Q., Zhang, Y. G., Xiong, C., Zhang, S. Z., Zeng, Q., Rong, M. Z. (1992) "Effects of Panax notoginseng saponins on monophasic action potentials of heart and automaticity and contractility of isolated atria." *Zhongguo Yao Li Xue Bao* 13: 538–540.
- Chen, J. Q., Zhang, Y. G., Li, S. L., Zeng, Q., Rong, M. Z. (1994) "Effects of Panax notoginseng saponins on myocardial adenosine triphosphatase." *Zhongguo Yao Li Xue Bao* 15: 347–350.
- Chen, S. W., Li, X. H., Ye, K. H., Jiang, Z. F., Ren, X. D. (2004) "Total saponins of Panax notoginseng protected rabbit iliac artery against balloon endothelial denudation injury." *Acta Pharmacol. Sin.* 25: 1151–1156.
- Chung, V. Q., Tattersall, M., Cheung, H. T. (2004) "Interactions of a herbal combination that inhibits growth of prostate cancer cells." *Cancer Chemother. Pharmacol.* 53: 384–390.
- Cicero, A. F., Bandieri, E., Arletti, R. (2000) "Orally administered Panax notoginseng influence on rat spontaneous behaviour." *J. Ethnopharmacology* 73: 387–391
- Cicero, A. F., Vitale, G., Savino, G., Arletti, R. (2003) "Panax notoginseng (Burk.) effects on fibrinogen and lipid plasma level in rats fed on a high-fat diet." *Phytother. Res.* 17: 174–178.
- Dan, H. X., Zhang, B. H., Xie, S. R., Yao, J. A., Jia, J. N. (1993) "Effects of panaxadiol saponins isolated from Panax notoginseng on intracellular and extracellular calcium." *Zhongguo Yao Li Xue Bao* 14: S22–S25.
- Feng, P., Jiang, H. (1998) "Effect of total saponins of Panax notoginseng (TSPNS) on myocardial intracellular Ca<sup>2+</sup> and activity of calcium pump of membrane of sarcoplasmic reticulum in SHR." *Zhongguo Zhong Yao Za Zhi* 23: 173–175.
- Feng, P. F., Qin, N. P., Qiao, Q. (1997) "Clinical and experimental study of improving left ventricular diastolic function by total saponins of Panax notoginseng." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 17: 714–717.
- Gao, B. Y., Li, X. J., Liu, L., Zhang, B. H. (1992) "Effect of panaxatriol saponins isolated from Panax notoginseng (PTS) on myocardial ischemic arrhythmia in mice and rats." *Yao Xue Xue Bao* 27: 641–644.
- Gao, H., Wang, F., Lien, E. J., Trousdale, M. D. (1996) "Immunostimulating polysaccharides from Panax notoginseng." *Pharmacol. Res.* 13: 1196–1200.
- Gong, Y. H., Jiang, J. X., Li, Z., Zhu, L. H., Zhang, Z. Z. (1991) "Hypoglycemic effect of sanchinoside C1 in alloxan-diabetic mice." *Yao Xue Xue Bao* 26: 81–85.
- Guan, Y. Y., Kwan, C. Y., He, H., Sun, J. J., Daniel, E. E. (1994) "Effects of Panax notoginseng saponins on receptor-operated Ca<sup>2+</sup> channels in vascular smooth muscle." *Zhongguo Yao Li Xue Bao* 15: 392–398.
- Han, J., Hu, W., Sun, Z. (1999) "Effect of Panax notoginseng saponin on Ca<sup>2+</sup>, CaM in craniocerebral injury." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 19: 227–229.
- Han, J. A., Hu, W. Y. (1996) "Progress in the study on protective effect of saponins Panax notoginseng on ischemic brain damage." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 16: 506–507.
- Hao, C. Q., Yang, F. (1986) "Anti-inflammatory effects of total saponins of Panax notoginseng." *Zhongguo Yao Li Xue Bao* 7: 252–255.
- He, W., Zhu, Z., Liu, J., Ye, H., Zeng, J., Huang, X., Lai, F. (2004) "Study on therapeutic window of opportunity for Panax notoginseng saponins following focal cerebral ischemia/reperfusion injury in rats." *Zhong Yao Cai* 27: 25–27.
- Hsieh, M. T., Peng, W. H., Wu, C. R., Wang, W. H. (2000) "The ameliorating effects of the cognitive-enhancing Chinese herbs on scopolamine-induced amnesia in rats." *Phytother. Res.* 14: 375–377.
- Hu, G. C., Yang, Q. (1988) "Effect of saponins from the leaves of Panax notoginseng on migraine." *Zhong Xi Yi Jie He Za Zhi* 8: 726–727, 709.
- Hu, Y., Li, Y., Jin, R., Qi, L., Dai, Y. (1992) "Effects of artificially cultured Panax notoginseng cell on cardiovascular system." *Zhongguo Zhong Yao Za Zhi* 17: 361–363, 384.
- Huang, Y. S., Yang, Z. C., Yan, B. G., Hu, X. C., Li, A. N., Crowther, R. S. (1999) "Improvement of early postburn cardiac function by use of Panax notoginseng and immediate total eschar excision in one operation." *Burns* 25: 35–41.
- Konoshima, T., Takasaki, M., Tokuda, H. (1999) "Anti-carcinogenic activity of the roots of Panax notoginseng." II. *Biol. Pharmaceut. Bull.* 22: 1150–1152.
- Kubo, M., Matsuda, R., Matsuda, H., Arichi, S. (1984) "Effect of Panax notoginseng on experimental disseminated intravascular coagulation (DIC)." *Yakugaku Zasshi* 104: 757–762.
- Kwan, C. Y. (1995) "Vascular effects of selected antihypertensive drugs derived from traditional medicinal herbs." *Clin. Exp. Pharmacol. Physiol. Suppl.* 22: S297–S299.

- Kwan, C. Y., Kwan, T. K. (2000) "Effects of Panax notoginseng saponins on vascular endothelial cells in vitro." *Acta Pharmacol. Sin.* 21: 1101–1105.
- Lam, S. K., Ng, T. B. (2002a) "Pananotin, a potent antifungal protein from roots of the traditional Chinese medicinal herb Panax notoginseng." *Planta Med.* 68: 1024–1028.
- Lam, S. K., Ng, T. B. (2002b) "A xylanase from roots of sanchi ginseng (Panax notoginseng) with inhibitory effects on human immunodeficiency virus-1 reverse transcriptase." *Life Sci.* 70: 3049–3058.
- Lang, J., Cao, H., Wei, A. (1998) "Comparative study on effect of Panax notoginseng and ticlid in treating early diabetic nephropathy." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 18: 727–729.
- Lei, W. Y. (1984) "Analgesic and central nervous system inhibiting effects of total saponins extracted from the leaves of Panax notoginseng." *Zhong Yao Tong Bao* 9: 134–137.
- Lei, X. L., Chiou, G. C. (1986) "Cardiovascular pharmacology of Panax notoginseng (Burk) F.H. Chen and Salvia miltiorrhiza." *Am. J. Chin. Med.* 14: 145–152.
- Leung, A. W., Mo, Z. X., Zheng, Y. S. (1991) "Reduction of cellular damage induced by cerebral ischemia in rats." *Neurochem. Res.* 16: 687–692.
- Li, S. H., Chu, Y. (1999) "Anti-inflammatory effects of total saponins of Panax notoginseng." *Zhongguo Yao Li Xue Bao* 20: 551–554.
- Li, X., Chen, J. X., Sun, J. J. (1990) "Protective effects of Panax notoginseng saponins on experimental myocardial injury induced by ischemia and reperfusion in rat." *Zhongguo Yao Li Xue Bao* 11: 26–29.
- Li, X. H., Dong, Z. R., Hao, H. L. (2004e) "Effect of Panax notoginseng saponin on procoagulant activity and differentiation induction in NB4 cells." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 24: 63–66.
- Li, X. J., Zhang, B. H. (1988) "Studies on anti-arrhythmia effects of panaxatriol saponins isolated from Panax notoginseng." *Yao Xue Xue Bao* 23: 168–173.
- Li, X. J., Fan, J. S., Liu, Y. W., Zhang, B. H. (1993) "Effects of panaxatriol saponins (PTS) isolated from Panax notoginseng on the action potential and delayed rectifier current (I<sub>x</sub>) in sheep cardiac Purkinje fibers." *Yao Xue Xue Bao* 28: 81–84.
- Lin, C. F., Wong, K. L., Wu, R. S., Huang, T. C., Liu, C. F. (2003) "Protection by hot water extract of Panax notoginseng on chronic ethanol-induced hepatotoxicity." *Phytother. Res.* 17: 1119–1122.
- Lin, S. G., Zheng, X. L., Chen, Q. Y., Sun, J. J. (1993) "Effect of Panax notoginseng saponins on increased proliferation of cultured aortic smooth muscle cells stimulated by hypercholesterolemic serum." *Zhongguo Yao Li Xue Bao* 14: 314–316.
- Liu, J., Liu, Y., Klaassen, C. D. (1994) "The effect of Chinese hepatoprotective medicines on experimental liver injury in mice." *J. Ethnopharmacol.* 42: 183–191.
- Liu, J. C., Chan, P., Chen, J. J., Lee, H. M., Lee, W. S., Shih, N. L., Chen, Y. L., Hong, H. J., Cheng, T. H. (2004a) "The inhibitory effect of trilinolein on norepinephrine-induced beta-myosin heavy chain promoter activity, reactive oxygen species generation, and extracellular signal-regulated kinase phosphorylation in neonatal rat cardiomyocytes." *J. Biomed. Sci.* 11: 11–18.
- Liu, J. C., Cheng, T. H., Lee, H. M., Lee, W. S., Shih, N. L., Chen, Y. L., Chen, J. J., Chan, P. (2004b) "Inhibitory effect of trilinolein on angiotensin II-induced cardiomyocyte hypertrophy." *Eur. J. Pharmacol.* 484: 1–8
- Liu, K. Z., Li, J. B., Lu, H. L., Wen, J. K., Han, M. (2004c) "Effects of Astragalus and saponins of Panax notoginseng on MMP-9 in patients with type 2 diabetic macroangiopathy." *Zhongguo Zhong Yao Za Zhi* 29: 264–266.
- Liu, S., Chen, J. X. (1984) "Anti-arrhythmic effect of total saponins of Panax notoginseng." *Zhongguo Yao Li Xue Bao* 5: 100–103.
- Liu, S. J., Zhou, S. W. (2000) "Panax notoginseng saponins attenuated cisplatin-induced nephrotoxicity." *Acta Pharmacol. Sin.* 21: 257–260.
- Long, Y. C., Ye, Y. H., Xing, Q. Y. (1996) "Studies on the neuroexcitotoxin beta-N-oxalo-L-alpha, beta-diaminopropionic acid and its isomer alpha-N-oxalo-L-alpha, beta-diaminopropionic acid from the root of Panax species." *Int. J. Peptide Protein Res.* 47: 42–46.
- Ma, L., Xiao, P., Guo, B., Wu, J., Liang, F., Dong, S. (1999) "Cerebral protective effects of some compounds isolated from traditional Chinese herbs." *Zhongguo Zhong Yao Za Zhi* 24: 238–239, 256.
- Ma, L. Y., Xiao, P. G., Liang, F. Q., Chi, M. G., Dong, S. J. (1997) "Effect of saponins of Panax notoginseng on synaptosomal 45Ca uptake." *Zhongguo Yao Li Xue Bao* 18: 213–215.
- Ng, T. B., Liu, F., Wang, H. X. (2004) "The antioxidant effects of aqueous and organic extracts of Panax quinquefolium, Panax notoginseng, Codonopsis pilosula, Pseudostellaria heterophylla and Glehnia littoralis." *J. Ethnopharmacol.* 93: 285–288.
- Park, W. H., Lee, S. K., Kim, C. H. (2005) "A Korean herbal medicine, Panax notoginseng, prevents liver fibrosis and hepatic microvascular dysfunction in rats." *Life Sci.* 76: 1675–1690.
- Rao, M. R., Shen, X. H., Zou, X. (1987) Calcium antagonistic action of saponins from Panax notoginseng." *J. Trad. Chin. Med.* 7: 127–130
- Seo, J. Y., Lee, J. H., Kim, N. W. (2005) "Inhibitory effects of a fermented ginseng extract, BST204, on the expression of inducible nitric oxide synthase and nitric oxide production in lipopolysaccharide-activated murine macrophages." *J. Pharm. Pharmacol.* 57: 911–918.
- Shi, L., Fan, P. S., Wu, L., Fang, J. X., Han, Z. X. (1990) "Effects of total saponins of Panax notoginseng on increasing PGI<sub>2</sub> in carotid artery and decreasing TXA<sub>2</sub> in blood platelets." *Zhongguo Yao Li Xue Bao* 11: 29–32.
- Shi, Q., Hao, Q., Bouissac, J., Lu, Y., Tian, S., Luu, B. (2005) "Ginsenoside-Rd from Panax notoginseng enhances astrocyte differentiation from neural stem cells." *Life Sci.* 76: 983–995.

- Shi, X., Zhao, F., Dai, X., Dong, X., Fang, J., Yang, H. (2003) "Effects of san qi on gastric secretion and protective factors of gastric mucosa in the rat with precancerous lesion of stomach." *J. Tradit. Chin. Med.* 23: 220–224.
- Sun, H. X., Pan, H. J., Pan, Y. J. (2003) "Haemolytic activities and immunologic adjuvant effect of Panax notoginseng saponins." *Acta Pharmacol. Sin.* 24: 1150–1154.
- Tohda, C., Matsumoto, N., Zou, K., Meselhy, M. R., Komatsu, K. (2002) "Axonal and dendritic extension by protopanaxadioltype saponins from ginseng drugs in SK-N-SH cells." *Japanese. J. Pharmacol.* 90: 254–262.
- Wang, J., Xu, J., Zhong, J. B. (2004a) "Effect of Radix notoginseng saponins on platelet activating molecule expression and aggregation in patients with blood hyperviscosity syndrome." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 24: 312–316.
- Wang, J. D., Chen, J. X. (1984) "Cardiac and hemodynamic effect of total saponins of Panax notoginseng." *Zhongguo Yao Li Xue Bao* 5: 181–185.
- Wang, Z. W., Gao, S. Z., Cheng, B. C. (1997) "Observation of therapeutic effect by combined administration of Salvia miltiorrhiza, ligustrazine and Panax notoginseng on late hemorrhagic shock of rabbits." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 17: 292–294.
- Wei, F., Zou, S., Young, A., Dubner, R., Ren, K. (1999) "Effects of four herbal extracts on adjuvant-induced inflammation and hyperalgesia in rats." *J. Alternat. Complement. Med.* 5: 429–436.
- Wei, Y., Fan, J. M., Pan, L. P. (2002) "Effect of Panax notoginseng saponins on human kidney fibroblast." *Zhongguo Zhong Xi Yi Jie He Za Zhi* 22: 47–49.
- White, C. M., Fan, C., Chow, M. (2000) "An evaluation of the hemostatic effect of externally applied notoginseng and notoginseng total saponins." *J. Clin. Pharmacol.* 40: 1150–1153.
- White, C. M., Fan, C., Song, J., Tsikouris, J. P., Chow, M. (2001) "An evaluation of the hemostatic effects of hydrophilic, alcohol, and lipophilic extracts of notoginseng." *Pharmacotherapy* 21: 773–777.
- Wu, F., Zhang, S. S., Kang, G. F. (2003) "Effects of Panax notoginseng saponins on the expression of tumor necrosis factor alpha and secretion of phospholipase A2 in rats with liver fibrosis." *Zhonghua Gan Zang Bing Za Zhi* 11: 51–52.
- Wu, J. X., Chen, J. X. (1988a) "Depressant actions of Panax notoginseng saponins on vascular smooth muscles." *Zhongguo Yao Li Xue Bao* 9: 147–152.
- Wu, J. X., Sun, J. J. (1992) "Comparative effects of Panax notoginseng saponins, verapamil, and norepinephrine on cerebral circulation in anesthetized rats and rabbits." *Zhongguo Yao Li Xue Bao* 13: 520–523.
- Wu, W., Zhang, X. M., Liu, P. M., Li, J. M., Wang, J. F. (1995) "Effects of Panax notoginseng saponin Rg1 on cardiac electrophysiological properties and ventricular fibrillation threshold in dogs." *Zhongguo Yao Li Xue Bao* 16: 459–463.
- Xi, X. H., Jiang, D. Y., Tang, C. Z., Tan, J. Q., Nie, A. G. (2000) "Effect of Panax notoginseng saponins combined isovolumic haemodilution on the retinal microcirculation of patients with retinal vein occlusion." *Hunan Yi Ke Da Xue Xue Bao* 25: 376–378.
- Xiong, Z. G., Sun, J. J. (1989) "Effects of Panax notoginseng saponin Rb1 and Rg1 on myocardial action potential and slow inward current." *Zhongguo Yao Li Xue Bao* 10: 520–522.
- Xiong, Z. G., Chen, J. X., Sun, J. J. (1989) "Effects of Panax notoginseng saponins on cardiac action potentials and slow inward current." *Zhongguo Yao Li Xue Bao* 10: 122–125.
- Xu, Q., Zhao, Y., Cheng, G. R. (1993) "Blood-lipid decreasing action of total saponins of Panax notoginseng (Burk.) F.H. Chen." *Zhongguo Zhong Yao Za Zhi* 18: 367–368, 383.
- Yao, X. H., Li, X. J. (2002) "Protective effects and its mechanism of panaxatriol saponins isolated from Panax notoginseng on cerebral ischemia." *Zhongguo Zhong Yao Za Zhi* 27: 371–373.
- Yokozawa, T., Satoh, A., Cho, E. J. (2004) "Ginsenoside-Rd attenuates oxidative damage related to aging in senescenceaccelerated mice." *J. Pharm. Pharmacol.* 56: 107–113.
- Yuan, J., Guo, W., Yang, B., Liu, P., Wang, Q., Yuan, H. (1997) "116 cases of coronary angina pectoris treated with powder composed of radix ginseng, radix notoginseng and succinum." *J. Tradit. Chin. Med.* 17: 14–17
- Yue, C. J., Zhong, J. J. (2005) "Impact of external calcium and calcium sensors on ginsenoside Rb1 biosynthesis by Panax notoginseng cells." *Biotechnol. Bioengineer.* 89: 444–452.
- Zhang, B., Jin, S., Kuang, X., Yao, W., Xia, G., Jiang, M. (1999) "Effects of Rg1 on calcium channel of guinea pig ventricular myocytes." *Zhongguo Zhong Yao Za Zhi* 24: 624–626, 640.
- Zhang, H. G., Li, X. H., Yang, Z. C. (2003) "Effects of Panax notoginseng saponins on myocardial G $\alpha$  mRNA expression and ATPase activity after severe scald in rats." *Burns* 29: 541–546.
- Zhang, J., Fang, X. Y. (2003) "The historical condition in the spread of Sanqi (Panax notoginseng) in the Ming Dynasty." *Zhonghua Yi Shi Za Zhi* 33: 16–20.
- Zhang, W., Wojta, J., Binder, B. R. (1994) "Effect of notoginsenoside R1 on the synthesis of tissue-type plasminogen activator and plasminogen activator inhibitor-1 in cultured human umbilical vein endothelial cells." *Arterioscler. Thromb.* 14: 1040–1046.
- Zhang, W. J., Wojta, J., Binder, B. R. (1997) "Effect of notoginsenoside R1 on the synthesis of components of the fibrinolytic system in cultured smooth muscle cells of human pulmonary artery." *Cell. Mol. Biol.* 43: 581–587.