TRICHOSANTHES
The phlegm resolving herb

SOURCES
Trichosanthes (gualou) refers to the plant Trichosanthes kirilowii. The part of the plant that was originally considered important as a medicine was the fruit (gualou; named the same as the entire plant), which is either used whole (quan-gualou; quan = whole) or subdivided into two components: the pericarp (gualoupi; pi = peel) and the seed (gualouren; ren = seed). Additionally, trichosanthes root has also been adopted into medicinal use, it is called gualougen (gen = root) or tianhuafen (heavenly flower powder; the root has a powdery quality). Today, the root is used more often than the fruit for many of the original applications.

This plant belongs to the gourd family, Cucurbitaceae: the fruit of Trichosanthes kirilowii forms a relatively spherical gourd (gua=gourd). The common names for trichosanthes in English are Chinese cucumber and snakegourd (derived from the long snake-like gourds produced by some other species of Trichosanthes).

Trichosanthes fruit is described in the Shennong Bencao Jing (1):
Gualou is bitter and cold. It mainly treats wasting, thirst, generalized fever, vexatious fullness, and great heat. It supplements vacuity, quiets the center, and mends expiry and damage. Its other name is dilou. It grows in rivers and valleys as well as shady places in the mountains.

MEDICINAL USE
According to Oriental Materia Medica (2), the pericarp of the fruit is especially used for relieving stagnancy of qi circulation in the chest, the seed is especially useful as a moistening agent for treating dry constipation, the whole fruit possesses both properties and may be used as a substitute for either of the two. The root was first officially described more than 800 years after the fruit in the Tujing Bencao (1062 A.D.), though it was briefly mentioned earlier (ca. 470 A.D.) in Leigong Paozhi Lun (Discussion of Herb Preparation by Leigong).

Trichosanthes root is described as sweet, slightly bitter, and slightly cold, is said to be particularly useful for treating diabetes and skin swellings (it is reputed to decrease pus formation and thus treat furuncles, carbuncles, boils, and abscesses). The stalk and leaves of the plant are also used as a folk remedy for feverish diseases. As relayed by Shen Ruoxiang (14):
Trichosanthes fruit is sweet, its nature cold, it enters the lungs, stomach, and large intestine channels. This product is able to ease the chest and free the diaphragm. It clears heat and transforms phlegm, so it chiefly treats complaints such as lung heat cough with thick, sticky, rattling phlegm, oppressive chest pains, pustulating lung ulcers, and intestinal dryness constipation. Trichosanthes root is sweet, its nature cold, and it enters the lung and stomach channels. It is used to clear heat and stop thirst, boost the stomach and generate fluids. It mainly treats patterns involving yin deficiency and fluid injury, diseases consequent to yin deficiency heat, fire poison pustular sores, and middle wasting diabetes.

IN FORMULAS
Trichosanthes is a prominent herb in the Shanghan Lun and its companion volume Jingui Yaolue (220 A.D.). Among the formulas mentioned in those texts (3, 4) are the 7 formulas that are still referenced in Chinese and Japanese medical books today, listed in Table 1. In some cases, trichosanthes root was substituted for the fruit by later herb scholars, and this substitution is indicated as such in the ingredients list presented in
The Table. In general, these formulas are used for chest disorders marked by pain, difficult breathing, and phlegm accumulation, and for disorders in which thirst is a significant symptom. The prescriptions are small ones, with just 2-7 ingredients, usually including one or more ingredients, aside from trichosanthes, for treating phlegm-damp accumulations, such as pinellia, oyster shell, ginger, or hoelen.

In subsequent Chinese medical works (5), trichosanthes has mainly been used in large formulas (9 or more ingredients) for treatment of lung disorders that are characterized by thick phlegm and thirst. Examples of these larger traditional Chinese formulas with trichosanthes still in use are: Ophiopogon and Trichosanthes Combination (Maimendong Yinzi); Bupleurum and Scute Combination (Chai Xian Tang); and Trichosanthes and Chihshih Combination (Gualou Zhishi Tang). One of the formulas of few ingredients, Fritillaria and Trichosanthes Formula (Beimu Gualou San), is comprised of trichosanthes fruit, trichosanthes root, fritillaria, hoelen, red citrus, and platycodon; like the other formulas, it is indicated for phlegm that is difficult to expectorate (thick phlegm) and dry throat (thirst). Modern patent remedies (11, 12) for cough and phlegm accumulation sometimes include trichosanthes as an ingredient. Examples are Qingfei Yihuo Pian (with trichosanthes root), Qingchi Huatan Wan (with trichosanthes seed), and Superior Brand Loquat Flavored Syrup (with trichosanthes seed).

The combination of trichosanthes fruit (especially the peel) and bakeri (xiebai) is considered to provide a harmonizing balance for the circulation in the chest. The cold tri-
chosanthes moistens and loosens, while the warm bakeri dissipates fluids and frees the flow of qi; together, they “free the flow of yang and move the qi, loosen the chest, and clear the lungs (15).” The indication of trichosanthes fruit for chest pain in ancient times inspired development of this herb into a treatment for angina pectoris in modern times. The fruit extract (in tablet form and injection) has been reported effective in treating this coronary disorder (6). Bakeri is a relative of onion and garlic; the latter has been developed as a health product for improving cardiovascular conditions.

TRICHOSANTHES FOR DIABETES
The use of trichosanthes for treating diabetes (see: Treatment of diabetes with Chinese herbs) may be traced back to the discussions on disease causation by Liu Wansu (ca. 1120-1200 A.D.). He propounded the theory that diseases are usually caused by heat in the body, which should be countered by herbs that had a cold nature. His theory, in relation to diabetes, has largely been retained to the present: the initial stage of the disease is treated primarily by herbs that clear heat and nourish yin. One of his formulas that is still used for treatment of diabetes is Ophiopogon and Trichosanthes Combination (Maimendong Yinzi). Most of the herbs in this formula (which is also used for treating of cough with sticky phlegm) have been shown by modern research to lower blood sugar. Modern Chinese treatments for diabetes frequently include trichosanthes root as an ingredient. For example, Jiangtang Pian (Reducing Sugar Tablet) is comprised of astragalus, polygonatum, trichosanthes root, pseudostellaria, and rehmannia, and is recommended for those with low levels of insulin, but who are still capable of producing insulin. In a clinical trial of this formula, the herbs were administered as extracts in tablet form at a total dose of over 40 grams per day (raw materials equivalent). The herb therapy was reported to improve sugar tolerance and elevate the level of serum insulin. In the treatment of 405 cases of diabetes with this preparation, 76.5% of the patients were reported to have improved sugar tolerance.

Yuquan Wan (Jade Spring Pill), is a patent formula recommended for diabetes. The extract pills are swallowed in large quantities, amounting to 36-48 grams per day, and are taken for at least one month. In laboratory animal studies, this formula was shown to increase glycogen in liver cells (that is, uptake of sugar by the cells was improved). A second generation of Jade Spring Pills, comprised of pueraria, trichosanthes root, rehmannia, licorice, and schizandra (plus other herbs not mentioned on the label) were then produced. These pills are indicated in the package labeling for the “ill function of the islets of Lan-gerhans.” The instructions are to take a 6 gram dose of the pills four times daily (24 grams of pills per day). Compared to the first generation product, it is said on the package insert, the new version has been clinically proved to have an improved rate of cure, while the dose has been reduced. In a recent clinical evaluation of a Chinese herb formula for diabetes, Jade Spring Pills, used for the control group, was reported to be effective in reducing blood sugar for 79% of cases treated.

INJECTION ADMINISTRATION OF PROTEIN FRACTION
A protein fraction from trichosanthes root, called trichosanthin (Figure 5), has been developed into an injection drug in China (7). This compound is destroyed during boiling of the herb to make a tea and is degraded by stomach acid and proteases when taken orally, so there is little to be absorbed when used as a tea or extract given by the oral route.

The protein (MW 24,000) was developed for clinical use in inducing abortion as part of China’s intensive birth control policy (“one family: one child”). Dr. Jin Yucai, who worked with this drug in clin-
ical practice in China, wrote an extensive review of the compound’s use for abortion in an introduction to the book Compound Q: Trichosanthin and Its Clinical Applications (9). There was a comment in Qianjin Yifang (682 A.D.) by the famous scholar Sun Simiao that trichosanthes root promotes menstrual flow; this comment was echoed by Li Shizhen in the Bencao Gangmu (1578 A.D.) that trichosanthes root can re-establish menstruation and facilitate the expulsion of a retained placenta. Since then, trichosanthes was included in most of the herbal prescriptions for inducing abortions. In the 1960s, Chinese researchers examined prescriptions used for that purpose and found that they usually contained both trichosanthes root and gleditsia fruit (zaojia). However, it was found that trichosanthes contained the primary abortifacient activity and gleditsia fruit tended to produce some toxic symptoms without making a significant contribution to the intended effect. In 1970, a research group in Shanghai (the main center in China where development of gynecological treatments with traditional herbal medicine is carried out) isolated trichosanthin and produced the injection form. Purity of preparation is important for safe use. Trichosanthis is reputed to have been used in treating breast abscess and breast cancer since the Ming Dynasty. Today, trichosanthis is used as a treatment for some cancers (8), for example, by using 10 mg per day by IV infusion, once or twice per week for malignant hydatidiform mole (a type of placental tumor). It was also developed as an antiviral therapy for HIV infection (9). In 1990, trichosanthis was viewed by some as the most promising therapy for AIDS, functioning as a ribosome inhibitor that could block viral reproduction. However, its use was limited by the immunological consequences of any prolonged administration, as appeared necessary for HIV treatment. New drugs (introduced in 1995) have proven highly effective for this disease while being administered orally and without the risk of antigenic reactions.

**ACTIVE CONSTITUENTS**

In relation to oral consumption, the active constituents of interest in the fruit and root are triterpene saponin alcohols (sterols), present in the amount of about 1%. The dominant sterols are camposterol, sitosterol, and stigmasterol (Figure 6) which are also ingredients in ginseng (the saponin glycosides of ginseng are related to these compounds as well). The sterols may have phlegm-thinning (mucolytic) activity and some antiinflammatory actions. Other members of the Curcubitaceae, such as gynostemma (jiaogulan), also contain ginseng-type saponin components. There are some alkaloids (not clearly identified) in the peel, while the seeds are rich in oils (with sterols present in the oil fraction). Another member of this family of gourds, benincasa (dongguaizi; winter melon seed) is similarly used in China to treat cough due to heat-phlegm, thirst, and dry constipation (its main ingredients are fatty oils, and it has sterols as well). The starch in the trichosanthis root, comprising about 25% of the dry weight, may contribute to the action of treating dry throat, since it provides a mucilaginous substance. The bitter melon, Momordica charantia, mainly used in Ayurvedic medicine, is considered one of the more valuable treatments for diabetes and contains a compound, called “plant insulin,” which may be found in other Curcubitaceae gourds. Bitter melon also...
contains a protein (momordicharin, similar to trichosanthin) that has been tried as a treatment for HIV infection.

**DOSAGE**

Trichosanthes root, fruit, seed, and pericarp are normally administered in doses of 9-15 grams in decoction (or equivalent of dried decoction); trichosanthes seed is sometimes used in higher doses, up to 20 grams, in the treatment of constipation (its oil lubricates the intestines). When powdered and made into pills (as traditionally done with Gualou Qumai Wan), trichosanthes is consumed at a dose of 2-3 grams daily. Trichosanthis is given by injection or IV once or twice to induce abortion, and repeatedly for treatment of cancer or HIV infection; for IV infusion, 10 mg is suspended in 500 ml of normal saline for a one day dose.

**TOXICITY AND ADVERSE EFFECTS**

There are no cautions in most of the traditional Chinese literature about using trichosanthes. In The Illustrated Chinese Materia Medica (10), it is said that trichosanthes root is contraindicated in “spleen-stomach vacuity cold with diarrhea and in cold phlegm or damp phlegm” (the fruit is indicated for treatment of hot phlegm that is dry) (10). Trichosanthes fruit extract is used in China in both tablet and injection form for angina pectoris. Side effects are noted with only the injection form, though infrequently: 1.7% of cases treated with intravenous administration, but no cases with intramuscular injection (13). An LD50 for trichosanthes peel was reported to be over 300 g/kg by intraperitoneal injection or intravenous administration in mice. A related fruit from Trichosanthes cucumerina is used as food (in soups) in Asia.

As indicated above, the injection of trichosanthis is potentially dangerous and should not be used in the modern setting where alternatives are available. IV trichosanthis can produce fever, headache, arthralgia, skin rashes, or anaphylactic shock; repeated use can produce neurological disorders. Literature reports about trichosanthes toxicity in humans are based on the widespread use of the injection form in China rather than oral use of the herb or even injection of the whole extract. Therefore, one should be cautious when interpreting the toxicity reports. Although the various Chinese Materia Medica guides indicate no contraindications for use of trichosanthes during pregnancy, it would appear that trichosanthes root should be used cautiously, as high doses may have an abortifacient effect; the fruit, pericarp, and seed have never been suggested to produce a pregnancy-related effect. The small amounts of trichosanthes root typically used in pills and other prepared forms, especially for treatment of dry mouth, sticky phlegm, and chest tightness, are not of immediate concern, but high doses that are used in some treatments of diabetes, for example, should be avoided during pregnancy. While trichosanthis is largely destroyed after oral consumption, the other components may have some abortifacient potential (7).
BASED FORMULAS
Trichosanthes fruit, root and seed are commonly used in recent developed formulas. Trichosanthes Fruit Tablets in the Sevens Forest product range is a typical example. This modern formula is based on Beimu Gualou San (Fritillaria & Trichosanthes Combination) which is used for the treatment of yellow phlegm, viscous sputum, or dry cough. This symptom pattern usually arises with infections, but may persist for a few days even after an infection has been effectively treated. The traditional formula utilizes fritillaria (chuan beimu), trichosanthes fruit, citrus, and platycodon, four herbs for resolving phlegm accumulation, along with hoelen and trichosanthes root (which have not been included here). These latter two herbs are substituted by scute, polygala, and licorice: scute is included to alleviate lung heat, polygala to help resolve phlegm, and licorice to act as a soothing anti-inflammatory. These herbs also provide a mild sedative quality to calm the agitation caused by chronic coughing. This formula differs from Belamcanda 15 and Stemona Tablets, which contain a larger proportion of herbs to treat the infection (clean toxin), but with a relatively low proportion of herbs to resolve phlegm. As such, these other formulas may be more suitable for the initial treatment of the disease, to eliminate the infectious agent, while Trichosanthes Fruit Tablets may be used along with them or later, to resolve phlegm and treat persisting mucus disorder. This formula is also suitable for treating rhinitis and sinusitis which is of the phlegm-heat type.

REFERENCES
Yang Shou-zhong (translator), The Divine Farmer’s Materia Medica, 1998

Ou Ming, et al., An Illustrated Guide to Antineoplastic Chinese Herbal Medicine, 1990 Commercial Press, Hong Kong.

Hsu HY and Peacher WG (translators) Shang Han Lun, 1981 Oriental Healing Arts Institute, Long Beach, CA.

Hsu HY and Wang SY (translators), Chin Kuei Yao Lueh, 1983 Oriental Healing Arts Institute, Long Beach, CA.

Hong-Yen Hsu and Chau-Shin Hsu, Commonly Used Chinese Herb Formulas with Illustrations, 1980 rev. ed., Oriental Healing Arts Institute, Long Beach, CA.


Ou Ming, et al., An Illustrated Guide to Antineoplastic Chinese Herbal Medicine, 1990 Commercial Press, Hong Kong.

Shen Ruoxing, Distinguishing the uses of related medicinals, RCHM News; Spring 2001, 13-15.