

# PINELLIA, ARISAEMA, ACORUS, and TYPHONIUM

by Subhuti Dharmananda, Ph.D., Director, Institute for Traditional Medicine, Portland, Oregon

## INTRODUCTION

Pinellia, arisaema, acorus, and typhonium are Chinese herbs that all come from the Araceae family; they are the only members of this family that are used extensively in the Chinese medical system. *Arisaema* is the representative genus; in Chinese, the Araceae are known as the "tiannanxing" family, or the arisaema family. The underground portions (a corm-like rhizome) of each of the herbs are the parts used in medicine.

All of these Chinese herbal medicines are characterized as being warming and phlegm-resolving. While each of the herbs have several uses, among the common applications is treatment of neurological disorders that are secondary to phlegm accumulation syndromes, such as epilepsy and post-stroke syndrome (see Table 1 for summary of actions and applications). The plants all produce toxic substances; some of these must be removed or counteracted by processing before using the medicinal part (in arisaema, pinellia, and typhonium). The leafy portions of all four plants, which are not used for internal medicine, are poisonous.

**TABLE 1: Summary of Actions and Sample Applications for the Araceae Herbs.** The following information is obtained from **Oriental Materia Medica** (9), with slight editing of terms where it would clarify the meaning.

Herbs	Actions	Applications
Pinellia <i>banxia</i>	harmonizes stomach, controls vomiting, dries dampness, removes phlegm, disperses accumulation and swelling	vomiting, cough and dyspnea, chest distention, stroke, phlegm-blockage causing fainting, wind-phlegm, dizziness, headache, insomnia
Arisaema "tiannanxing"	dispels wind to relieve convulsions, dries dampness to resolve phlegm, disperses swelling lumps and accumulations	stroke due to phlegm accumulation, hemiplegia, epilepsy
Acorus <i>sichangpu</i>	opens orifices, expels phlegm and turbidity, replenishes intelligence	epilepsy, wind diseases, coma due to accumulation of phlegm, amnesia, excessive dreaming, arthralgia due to wind-cold-damp, obstruction of qi, deafness, diarrhea
Typhonium <i>baifuzi</i>	removes wind-phlegm, dries cold-dampness, suppresses spasm	stroke syndrome, accumulation of phlegm, facial hemiplegia, headache, tetanus

## PINELLIA

Pinellia refers to the tuber of *Pinellia ternata* (see Figure 1), known to the Chinese as *banxia*. However, several species of *Arisaema* (including *A. yunnanense*, *A. bathycoleum*, *A. saxatile*, and *A. prazeri*) are used as substitutes, illustrating the close relationship between these two genera of the Araceae (1). Even one variety of typhonium, *Typhonium flagelliforme*, is used as *banxia* in China.

The raw material is somewhat toxic, being highly irritating to tissues that it contacts, and is mainly used externally; for example, to burn off warts and to treat carbuncles, or to apply over swellings such as lymphadenitis and thyroid nodules. In China, small amounts of raw pinellia may be administered internally for certain esophageal diseases, such as throat cancer, under close medical supervision.

For internal medicine, processed pinellia is almost always used in modern practice. The processing is carried out in various ways, the most common being: first, soak the roots in water for seven days continually, then soak the roots

in ginger juice or boil in ginger tea that contains a quantity of alum, and then steam in sulfur vapor. The initial herbal material is opaque white and the processed material has a translucent yellowish appearance. Although the processed material is technically known as *fabanxia*, this designation is not commonly used, and is most often reserved for the less common processing with licorice and lime (calcium carbonate).

Alum is one of the strongest detoxifying agents for pinellia, presumably because it interacts with the irritant component (as yet uncharacterized) and alters it or binds and removes it. In a recent evaluation of processing, it was suggested that the best method is to use 15 kg of ginger juice, 8 kg of alum, and 100 kg of pinellia which are decocted together for 2-3 hours until the juice is fully absorbed (2). Consuming fresh ginger is a remedy for poisoning due to accidental ingestion of raw pinellia (8). In the following discussion of pinellia, only the processed herb is considered.

Pinellia is one of the primary herbs for treating a phlegm-damp syndrome, which is represented by copious amounts of thick sputum or accumulations in the body of thick fluid. This key herb is most commonly combined with hoelen (a bland herb to filter out dampness) and citrus and/or ginger (spicy herbs to disperse stagnated fluids) in order to alleviate these accumulations. Since fresh ginger has the reputation for counteracting the irritant action of pinellia, it is often included in ancient formulas for that purpose; however, the modern processed pinellia does not require that. Examples of basic formulas are Minor Pinellia and Hoelen Combination (*Xiao Banxia Jia Fuling Tang*: pinellia, ginger, and hoelen) from the *Jingui Yaolue*, and Citrus and Pinellia Combination (*Erchen Tang*: pinellia, citrus, ginger, hoelen, and licorice) from the *Hejiju Fang*.

Pinellia also has the reputation of lowering adversely rising stomach qi (counterflow of qi). This effect of the herb is utilized in the treatment of nausea and vomiting that is associated with phlegm retention in the stomach, stomach heat, or stomach qi disorder. For this purpose it is usually accompanied by ginger (which also has an antinauseant effect), and, since the condition is usually occurring in persons with weak spleen qi, it is administered with ginseng (or codonopsis as a substitute). Examples of such treatment strategies are Ginger, Ginseng, and Pinellia Formula (*Ganjiang Renshen Banxia Wan*, with just those three herbs) of the *Jingui Yaolue*, and Inula and Hematite Combination (*Xuanfu Huatai Zheshi Tang*: with pinellia, ginseng, ginger, licorice, jujube, inula, and hematite) from the Shanghan Lun. Traditionally, pinellia was used as a treatment for insomnia, partly based on the concept that the disorder was often related to stomach qi disharmony (see: *Exploring yin/yang #8; the wake/sleep cycle and treatment of insomnia*).

Although pinellia is described as having an acrid and warm quality, the processed herb is quite mild in taste, odor, and nature, and its medicinal effect is correspondingly mild. Its extract tastes somewhat mucilaginous and bland. The dosage in decoction is usually 6-15 grams/day.

The chemical composition of pinellia is not well established, with small amounts of alkaloids being identified, including traces of ephedrine. A glycoprotein fraction was reported to have notable antiemetic effects (3). Pharmacology experiments with the herbal extract (4) indicate an antitussive action, but when compared to codeine, its effect on a per unit weight basis was more than 600 times lower; it shows an antiemetic action in some experiments but fails in others. It has been suggested by experiments with rabbits that pinellia can reduce intra-ocular pressure (due to fluid accumulation in the eyes). Overall, the actions of the herb appear to be mild.

Clinical trials with pinellia are usually not undertaken, as the herb is always used in complex formulas. Reports from China indicate that when pinellia is used as the main herb in treatment, it can resolve suppurative otitis media, and can alleviate some symptoms of silicosis (5).

## ARISAEMA

Arisaema refers to the tubers of *Arisaema consanguineum* (see [Figure 2](#)) or other species, including *A. erubescens*, *A. heterophyllum*, and *A. amurense*; the Chinese name is "*tiannanxing*". At least one variety of pinellia, *Pinellia pedatisecta*, is also used as a source of arisaema (6), again revealing the close relationship of these genera of the Aracea. In fact, a study of old illustrations of the herbs has revealed that Li Shizhen, in his *Bencao Gangmu*, had merged or confused the different herbs *Pinellia pedatisecta* and *Arisaema heterophyllum* as one (7).

Like pinellia, arisaema is toxic in its raw state and is processed to make it suitable for internal use. The processing method is essentially the same as that for pinellia. There is an alternate processing method in which pig bile is added to the arisaema to produce bile-processed arisaema (*dannanxing*; *dan* = bile), which has a dark green color. The addition of bile alters the nature of the herb from warming to cooling, and it is used in cases where hot phlegm is said to be clouding the brain; bile purges phlegm downward.

This herb is typically used in conjunction with pinellia in herbal formulas. A good example of this combination is *Daotan Tang* (Phlegm-Expelling Decoction), which is made from Citrus and Pinellia Combination (*Erchen Tang*) by adding arisaema and chih-shih (chih-shih has the reputation for downward purging of phlegm accumulation). Another example is *Qingqi Huatan Wan* (Cleanse the Qi and Disperse Phlegm Pill), which is derived from *Daotan Tang* by removing licorice and fresh ginger and replacing with apricot seed, scute, and trichosanthes fruit. These latter three herbs are used for treating a "hot phlegm" accumulation (discolored, thick phlegm) causing repeated coughing; fresh ginger and licorice are commonly incorporated into treatments for "cold phlegm."

As with pinellia, little is known about the active constituents of arisaema, though saponins have been found; saponins usually have a phlegm resolving property. Pharmacology experiments with arisaema extract reveal an anticonvulsant effect (which may explain its use in treating epilepsy), a sedative action, and an expectorant action (4). Since arisaema is always used in complex formulas, clinical trials of the single herb have not been carried out.

## ACORUS

Acorus usually refers to *Acorus gramineus* ([see Figure 3](#)), for which the bulbous rhizome is used. The general Chinese term for the herb is *changpu*, but this particular species is described as *shichangpu* (*shi* = rock, named for the rocky ground conditions in which it is found growing). This term distinguishes it from another variety, *Acorus calamus*, known as *shuichangpu* (*shui* = water, also named for the growing conditions); it is known internationally by herbalists, going by the names of calamus root or sweet flag. *Acorus calamus* is used far less often than *A. gramineus* in China; in fact, its primary use is ceremonial, in which it is hung, along with *Artemesia*, on doorways to expel evil spirits during the dragon boat festival. There is also a botanically unrelated variety of *changpu* obtained from *Anemone altaica* known as *jiujiechangpu*, for which the common name altaica has been adopted by ITM and other organizations.

Acorus was one of the highly respected herbs depicted in the *Shennong Bencao Jing*. Its uses are described there as follows (22):

Acorus mainly treats wind, cold, damp impediment, cough, and counterflow of qi. It opens the heart orifices, supplements the five viscera, frees the nine orifices, brightens the eyes and sharpens the hearing, and helps the articulation of the voice. Prolonged taking may make the body light, improve memory, prevent confusion, and prolong life.

The uses of acorus, as defined in this ancient text, are almost identical to those indicated in the same text for polygala, with which acorus is frequently combined in formulas for treating neurological disorders.

In formulas for resolving phlegm that causes mental disorders, acorus often accompanies both pinellia and arisaema. An example of this combination is *Ditan Tang* (Phlegm-Cleansing Decoction) made from *Erchen Tang* by removing fresh ginger and adding arisaema, acorus, chih-shih, ginseng, and bamboo; ginseng is used as a sedative that tonifies the spleen to regulate fluids and bamboo is added as a sedative that resolves phlegm accumulation. Acorus is also included in the formulas for nodules due to phlegm accumulation. For example, *Tongqi Xiaojian Wan* (Pill for Opening the Circulation of Qi and Reducing Hardness) is used for phlegm masses such as goiter, scrofula, and breast lumps. The formula is derived from *Ditan Tang* by removing bamboo and adding a number of phlegm-resolving herbs-arisaema, acorus, platycodon, fritillaria, and sargassum-as well as a few additional ingredients with various therapeutic actions, such as tang-kuei, cnidium, trichosanthes root, cyperus, and scute.

The effects of acorus are thought to be due mainly to the essential oil fraction, which contains asarone (a significant ingredient of asarum); terpenes, such as caryophyllene (a major ingredient of clove); and methyleugenol and methylisoeugenol (found also in asarum and clove). *Acorus calamus* was reported, in a single study, to cause cancer in laboratory animals, causing the FDA to restrict its use in herbal medicines. This is probably due to its high content of methyleugenol, which may be carcinogenic in animals without being carcinogenic in humans (see: [Safety issues affecting herbs: the case of asarum](#)).

## TYPHONIUM

Typhonium refers to the rotund roots of *Typhonium giganteum* ([see Figure 4](#)). The Chinese name is *baifuzi*, which refers to the light color of the root material (*bai* = white) and its similarity in appearance to aconite (*fuzi*). In fact, a substitute herb for *baifuzi* is *Aconitum koreanum*, which is processed the same way as *fuzi* to yield a non-toxic herb

material. Typhonium is not a commonly used herb, but it is well known by Chinese herbalists. The herb is used for a condition of wind-phlegm, which produces stiffness or convulsions. Commonly, it is administered for post-stroke syndromes, characterized by tongue and facial paralysis, or difficulty with speech.

An example of its application is in *Qianzheng San* (Powder for Restoring the Normal Position), comprised of typhonium, silkworm, and scorpion, and given for paralysis due to stroke. An extended version of that formula is *Yifeng Dan* (Wind-Stopping Pill), made from *Qianzheng San* by adding uncaria, siler, and tabasheer (a type of bamboo extract, *tianzhuhuang*). Typhonium is sometimes combined with arisaema to treat pain, stiffness, and spasms, especially in the upper body (being affected by both internal and external wind), as in *Shenbai San* (Miraculous White Powder) made with typhonium, arisaema, gastrodia, angelica, cnidium, chrysanthemum, and gypsum. Similarly, *Yuzhen San* (Powder for Tetanus) is made with typhonium, arisaema, gastrodia, angelica, siler, and chiang-huo.

In some formulas, pinellia is included with both typhonium and arisaema, as in *Zhengrong Tang* (Appearance-normalizing Decoction) which has, in addition to these three herbs, siler, chiang-huo, silkworm, chaenomeles, licorice, and fu-shen. It is used for treatment of facial paralysis due to stroke. Typhonium is combined with both acorus and arisaema in *Shenxian Jieyu Dan* (Immortals Speech-Recovering Pellet), which also contains scorpion, gastrodia, chiang-huo, saussurea, and polygala, and is used for speech difficulties resulting from stroke.

Little is known about the active constituents of typhonium or its pharmacology. In addition to its applications for neurological disorders, typhonium has been utilized for pain and swellings, though the substitute aconite species may be the ones used for that purpose. According to the book **Sichuan Chinese Pharmacological History**, typhonium is "very warm in nature and has an acrid-sweet taste, it contains toxins, and cures gastric pain and joint pain that is due to a blood disorder." In **Origin of Materia Medica**, it is stated that typhonium "penetrates stomach yin to reach the yang, leads the effect of medicine upwards to activate the heart and the lung, clears away heat accumulated as the result of cold stagnation due to yang deficiency; it is used with herbs that expel pathogenic wind but does not itself function to overcome pathogenic wind." Other Chinese texts point to the use of typhonium for lymphatic swellings (8).

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## APPENDIX 1: Treatment of Epilepsy with Chinese Herbs

Epilepsy, often called seizure disorder, is characterized by intermittent seizures that usually begin during childhood in cases due to genetically based brain defect or early-childhood traumatic brain injury. Seizure disorders, which may be for limited duration or persisting, occur in children as the result of infections that produce a high fever, especially those infections affecting the brain (e.g., meningitis, viral encephalitis). Seizures may begin later in life secondary to various brain disorders (for example, seizures occur with brain tumors, some strokes, or head injuries). Because the most common situation is for epilepsy to begin during childhood (before age 18, sometimes during infancy, most often between ages 2 and 14), it is usually considered a pediatric concern in Chinese texts. However, people with epilepsy can live quite a long time, especially with use of seizure-controlling drug therapies, so that the childhood epilepsy becomes an adult disorder.

The seizures are described as belonging to two types: grand mal (full convulsions, with most of the brain affected by abnormal electrical discharges) and petit mal (no convulsions, but there may be fluttering of the eye lids, twitching of facial muscles, and lack of normal responsiveness). In petit mal, a limited portion of the brain is affected, yielding the limited muscular twitching, hallucinations (sight or smell), or repetitive movements. In either case, the condition usually lasts for only a few seconds, rarely a minute.

Epilepsy occurs in China with some frequency and a number of remedies have been applied. Some of the remedies are aimed at treating fevers that may initiate the seizures; in most modern cases, seizures occur without the feverish disease, and this is the subject of the following reports.

## TRADITIONAL CHINESE VIEWS ON EPILEPSY

From the traditional Chinese viewpoint, epilepsy occurs in children because of frightful experiences (which are said to "scatter the qi") and/or because of dietary patterns that involve excess food consumption and accumulation of phlegm. Infants with epilepsy may be said to have the disease because the mother was frightened while carrying the fetus. The pathogenesis of epilepsy was described in the book **Mental Dysfunction** (10), as follows:

Epilepsy is due to apprehension and fright or unrestricted indulgence of food or suffering of fright during gestation that leads to inquietude of the qi of the visceral organs lasting a long period. With sudden accumulation of phlegm, the obstructed qi stirring the internal draft causes a sudden severe collapse which can be stopped by nothing. This abnormal condition lasts until the qi returns to normal.

The sudden accumulation of phlegm, as alluded to here, can cause unconsciousness, fainting, or convulsion. In

order for the seizure to occur, there must be a sufficient amount of phlegm. In most cases, this phlegm has its ultimate source in the digestive system, where the combination of poor diet, excess food consumption, and inadequate function of the stomach can lead to accumulation. In fact, it has been noted the seizures occur more commonly after a large meal (11). However, merely having phlegm accumulation is not sufficient to cause a seizure; in order for that to occur, the phlegm must be suddenly propelled into the orifices that control the brain, and this is the result of stirring of internal wind. Therefore, the main objectives in preventing seizures are to remove phlegm and calm wind. Since internal wind can be stirred up by invasion of external wind (see: *Drawing a concept: feng*), wind-dispelling herbs may also be utilized in the treatment. Once the problem of wind and phlegm is resolved, as preventive measures, one must improve the functions of the stomach and spleen and assure proper nourishment of the liver yin and blood so as to prevent the recurrence of phlegm accumulation and internal wind disturbance.

In the book **Clinic of Traditional Chinese Medicine** (12), childhood epilepsy is given three possible causes: fright (to be treated by herbs such as acorus, polygala, arisaema, curcuma, hoelen, dragon tooth, zizyphus, and biota); accumulation of phlegm (to be treated by herbs such as pinellia, arisaema, acorus, citrus, hoelen, bamboo, chih-ko, and scorpion); and blood stasis (birth injury; to be treated with herbs such as salvia, persica, carthamus, cnidium, red peony, ginger, and musk).

In the **Advanced Textbook of Traditional Chinese Medicine and Pharmacology** (6), three causes are indicated: congenital (because the mother has been frightened), emotional (fear and fright affect the child), and traumatic (head trauma during birth). In addition, diseases that cause phlegm accumulation, or improper diet that also causes phlegm accumulation, can contribute to epilepsy, especially if the strain and stress of an irregular lifestyle causes the phlegm to rise to the head. Prolonged experience of epilepsy leads to deficiency of the *zangfu* organs, which, in turn, can lead to relapse and continued disease. According to this textbook, epilepsy cases can be divided into four categories for treatment:

1. Blockage by wind and phlegm: use the Pill for Relieving Epilepsy, with pinellia, arisaema (bile processed), acorus, bamboo, gastrodia, scorpion, silkworm, succinum, fu-shen, and polygala. Or, use the Pill of Alum and Curcuma (made of just those two ingredients).
2. Phlegm-fire excess: use Gentiana Combination (*Longdan Xiegan Tang*), with the Decoction for Cleansing Phlegm (which contains pinellia, arisaema, citrus, chih-shih, hoelen, acorus, bamboo, ginseng, licorice, and ginger). Or, use the Pill of Bamboo Juice for Eliminating Phlegm, which contains lapis, aquilaria, rhubarb, scute, bamboo juice, pinellia, fu-shou, licorice, ginger juice, hoelen, and ginseng.
3. Deficiency of liver and kidney yin, leading to internal wind. Use modified *Zuogui Wan*, with rehmannia, dioscorea, cornus, lycium, tortoise shell, oyster shell, turtle shell, platycodin, magnetite, fritillaria, bamboo sap, and bamboo.
4. Deficiency of spleen and stomach, leading to production of phlegm-dampness. Use modified *Si Junzi Tang*, with codonopsis, hoelen, atractylodes, licorice, pinellia, citrus, acorus, polygala, arisaema, and silkworm.

## MEDICAL JOURNAL REPORTS ON TREATMENT OF EPILEPSY

As an example of treatment methods used in China, there is a report of 100 cases of grand mal epilepsy in patients ranging from 2-66 years old who were treated with encapsulated herbs for at least six months at the Xian Epilepsy Hospital (13). Patients who were using Western drugs were gradually withdrawn from the drugs during the first two months. The herb formula used included the following ingredients, divided by category to illustrate the treatment principles:

Herbs to tonify spleen: astragalus and codonopsis

Herbs to resolve phlegm: arisaema (bile-processed) and hyoscyamus (*tianxianzi*)

Herbs to calm wind: hematite, silkworm, scorpion

Herbs to vitalize blood: salvia, persica, carthamus, and curcuma

The addition of herbs to vitalize blood is characteristic of some of the new treatment methods, used for many diseases, but is not otherwise common for treatment of epilepsy. The authors claimed that therapeutic effects became noticeable within one week to one month, and a significant reduction in the frequency of attacks occurred in all but 5 patients.

Another example is from the Huairan Hospital of Traditional Chinese Medicine (14) where 40 patients with epilepsy were treated for three months with a decoction containing the following ingredients:

Herbs to resolve phlegm: pinellia, arisaema, acorus, gleditsia

Herbs to calm wind: antelope horn, gastrodia, strychnos, silkworm, scorpion

It was reported that all but 2 patients had some degree of improvement, with 35% becoming free of seizures (follow-up after the trial was not reported, however).

In a review of treatments for epilepsy (15), the following two formulas were mentioned for trials having at least 40 patients:

**Formula 1. Based on Tablet for Sedating Epilepsy**

Herbs to resolve phlegm-damp: pinellia, arisaema, citrus, hoelen, alum

Herbs to calm wind: hematite, centipede, earthworm, scorpion, silkworm, uncaria

**Formula 2. Based on Pill for Treating Epilepsy**

Herbs to resolve phlegm and open orifices: acorus, ox gallstone, musk, bamboo sap

Herbs to calm wind: gastrodia, uncaria, earthworm, mother of pearl, haliotis, ho-shou-wu

A treatment reported by a health clinic in Jiangsu (16) relied on *Xiankeding Pian*, made from the following crude materials reduce to powder:

Herbs to resolve phlegm: lapis, alum,

Herbs to calm wind: centipede, gecko (*pi-hu*), degelatinized deer antler powder, mother of pearl, placenta

The use of hematite (which serves primarily as a source of iron) as a treatment has been pursued as a single remedy and claimed effective (15); hematite was also used with red halloysite (another iron compound) and seeds of almond and croton (17) in a large study involving over 300 cases. Lapis, mentioned in the above formula, is also a source of iron (the "gold" lapis used in these formulas is mica schist, which is mostly iron).

In most Chinese herbal formulas for epilepsy, there are other mineral agents, such as alum (a source of aluminum and magnesium), and a variety of materials rich in calcium: mother of pearl, haliotis, degelatinized deer antler, etc. In one case, dragon tooth was the major ingredient in a treatment for epilepsy involving only two other herbs as main ingredients: the standard antispasmodic pair of peony and licorice (18). It is possible that a disturbance in mineral metabolism is involved in seizure induction and these various mineral materials might help to correct the imbalance. Cinnabar was mentioned as an ingredient in several formulas for epilepsy and not included in the above recounting of the formulas, since it is not deemed essential and cannot be used in the West. Alum is also not recommended for internal use outside of China, due to concerns about its safety.

Most of the epilepsy formulas contain animal ingredients, which are thought to have a potent effect on internal wind: silkworm and scorpion are most frequently mentioned. The small gecko (*pi-hu*) is included in some of the formulas for epilepsy, as with one formula containing only zaocys, gecko, earthworm, and arisaema (15). In modern practice outside of China, scorpion and centipede are not available for use, due to concerns about their potential toxicity.

Recent efforts by the Chinese to control epilepsy include: the use of vanillin (19), which is the taste component of vanilla beans, but is also found in other herbs (mainly the *Styrax* trees, yielding styrax, benzoin, and liquidambar); the herb valerian combined with calcium and other agents (20); and the close relative of valerian, nardostachys (21) also used with other herbs.

An unusual twist in the development of modern treatments for epilepsy is the suggestion that administering high levels of fat may be helpful. This would appear to be in complete contradiction to the Chinese view, in which fat corresponds closely to phlegm, a major contributor to epilepsy. Although the evidence is preliminary, work done at the Johns Hopkins Medical Institutions appears to show that some children respond positively to a high fat diet, as a



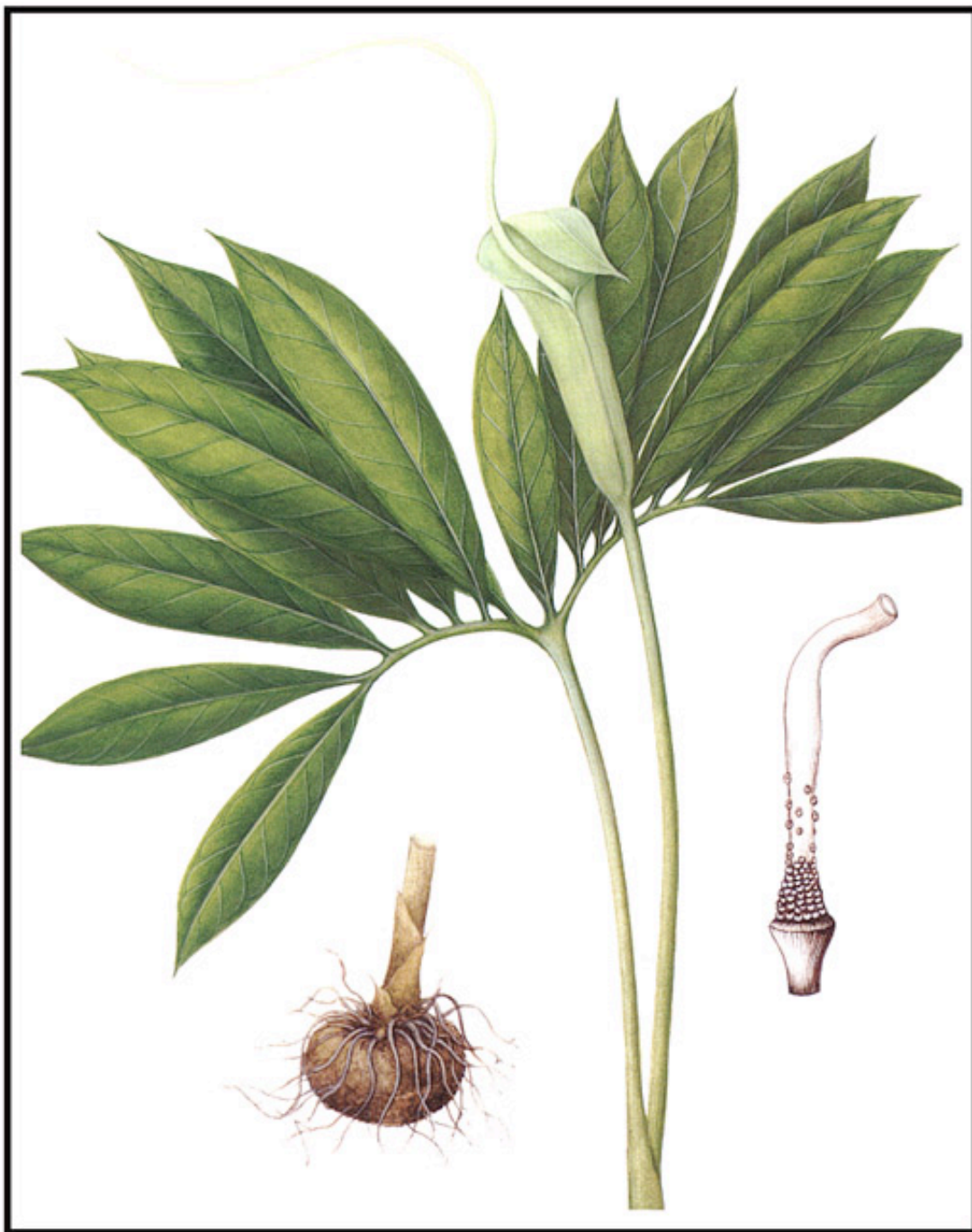
substitute for seizure medications (the medication withdrawal and dietary adjustment is started in the hospital). Possibly, some imbalance in fat metabolism might help explain why this divergent approach seems to yield positive results. Other modern approaches include administration of amino acids (including dimethyl glycine, glutamic acid, and taurine) which affect brain chemistry, and improving nutritional status with vitamins (B-complex and E) and minerals (especially calcium and magnesium).

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**Figure 1:** *Pinellia ternata*.





**Figure 2:** *Arisaema consanguineum*.



**Figure 3:** *Acorus gramineus*.



**Figure 4:** *Typhonium giganteum*.