

Clinical Uses of *Zingiber officinale* (Ginger)

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Abstract

This article discusses the clinical uses of *Zingiber officinale* (ginger) rhizome in Western botanical medicine. Ginger's ability to quell nausea and vomiting in a variety of conditions (pregnancy-induced, drug-induced [e.g., anesthetic, chemotherapy]), and motion-induced as well as digestive ailments) is considered to be the herb's most important effect today. However, ginger has many other clinical uses, some justified by traditional use and now some starting to see preliminary verification in clinical trials. These include ginger's use for treating colds, pulmonary afflictions, joint ailments, headaches, and orchitis. Throughout this article, various doses of ginger products are touched upon. The safety of ginger, focusing on its drug-herb interactions (or lack thereof), is also reviewed. The related plant *Zingiber zerumbet* (shell ginger) is mentioned. Ginger remains an important herb after thousands of years of recorded use for medicine.

Introduction

Today in Western botanical practice, *Zingiber officinale* (ginger) rhizome is primarily used to allay a variety of types of nausea. A debate continues in the research community about this herb's effectiveness for treating pregnancy-related nausea, motion sickness, drug-induced nausea (e.g., postoperative or chemotherapy-induced nausea), and "general" nausea resulting from foodborne infections or lifestyle problems (excessive in-

take of alcohol or rich food). Researchers have reported conflicting results from using ginger to treat these different types of nausea.

In practice, there is much less question about the usefulness of the plant for treating these conditions: It is a palatable herb that has been used as food and medicine since time out of mind. In fact, ginger is so widely cultivated that its origin, although suspected to be India, is unknown. The plant is now a sterile cultivar that relies on replanting by humans for its continued existence. There is no known wild progenitor to the plant still in existence.* Given its long connection with humans, botanical practitioners have an overwhelming sense that the plant is very safe and unhesitatingly turn to it as a first-choice treatment for nauseated patients.

While ginger is primarily used for nausea, this herb, of course, has other uses. It is a digestive stimulant, has been used for headaches, is warming (related to vasodilating and cardiac-stimulating effects), and is used to enhance or synergize botanical formulas. In China, it is used in formulas to lessen the toxicity of low-dose plants such as *Aconitum* spp. (aconite) root and *Pinellia ternata* (pinellia, *ban xia*) rhizome. Cooking aconite with ginger forms lipoalkaloids with reduced toxicity.¹ One study found that raw pinella stimulated rat gastrointestinal (GI) activity, causing some damage in the process, while pinellia mixed with ginger juice inhibited GI activity without damage.² This potential ability of ginger to affect how other compounds are handled in the human body also arises in an ongoing debate about ginger's potential ability to cause both positive and negative drug interactions.

Ginger rhizome is used fresh or dried. It is extracted into tinctures, teas, syrup, or honey; taken as a capsule; or grated and eaten. This plant can be distilled to obtain a volatile oil. In

*"Wild ginger" (*Asarum* spp.) is an unrelated plant with a gingerlike scent.

Fu Zi Li Shong Wan (Prepared Aconite Pill to Regulate the Center)

This classic Chinese herbal medicine formula was first written in the Imperial Grace Formulary of the Tai Ping Era in 1078–1085 AD.* The formula is an excellent example of pairing ginger with aconite to reduce its toxicity and offset its coldness with the warmth of ginger, as well as harmonizing the other ingredients in the formula (the additional licorice augments both of these effects further). The prescription includes:

- *Aconitum carmichaeli* (*fu zi*, aconite) prepared lateral root, 90 g
- *Zingiber officinale* (*gan jiang*, ginger) dried rhizome, 90 g
- *Panax ginseng* (*ren shen*, red Asian ginseng) dried, steamed root, 90 g
- *Attractylodes macrocephalus* (*bai zhu*) rhizome, 90 g
- *Glycyrrhiza uralensis* (*zhi gan cao*, licorice) honey-fried root, 90 g.

The ingredients are mixed and then 3 g of the resulting mixture is formed into each pill. One pill is taken mixed with warm water away from meals to strengthen the Spleen, warm the *Yang*, and dispel Cold.

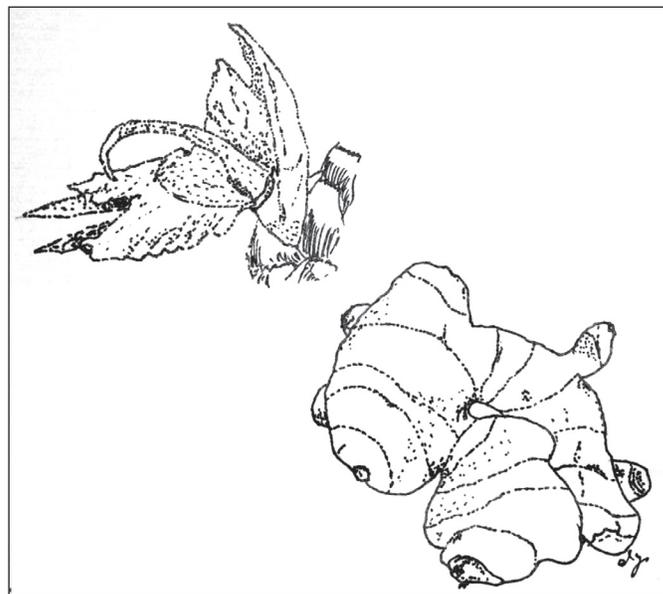
*Benksy D, Barolet R [transl]. Chinese Herbal Medicine: Formulas and Strategies. Seattle: Eastland Press, 1990.

some traditions, ginger is also applied topically. Western botanical medicine does not distinguish greatly, if at all, between fresh and dried ginger, whereas other traditions use these two forms differently. Doses vary but are often quite large.

Ginger and Pregnancy-Induced Nausea

There are a number of trials and reviews on the use of ginger in pregnancy-induced nausea. One small (67 women) placebo-controlled, 4-day study showed that 1000 mg of dried ginger decreased nausea and vomiting in pregnant women effectively.³ Another study (a double-blinded, randomized controlled trial) compared ginger (one 0.5-g dried ginger capsule twice daily) and dimenhydrinate (one 50-mg capsule twice daily) in 170 pregnant women in a 7-day study. Ginger was found to be as effective as the drug but with fewer side-effects.⁴ Another study compared ginger (650 mg, dried) and vitamin B₆ (25 mg) administered three times per day to 126 pregnant women requiring antiemetics for nausea and vomiting. The Rhodes score (which measures episodes of nausea, duration of nausea, and number of times a patient vomits) was used to assess the patients during 4 days of treatment. Both treatments were effective, but ginger was found to be more effective than the vitamin.⁵

In a double-blinded, placebo-controlled, randomized trial, ginger syrup was studied as an emetic in early pregnancy. One tsp of syrup was given to 26 pregnant women four times daily for 2 weeks. The syrup controlled vomiting in 67% of the woman by day 6 compared with 20% of the women taking the placebo. The syrup also reduced nausea significantly (77% of the women versus 20% had a 4-point reduction).⁶



Zingiber officinale (ginger). Drawing © 2009 by Eric Yarnell, N.D.

A prospective study of pregnant women taking ginger compared them with women taking a nonteratogenic, nonantiemetic drug found a benefit for mild nausea and found no statistical difference in the outcome of pregnancy and health of the infants except that the comparison group had more infants weighing less than 2500 g.⁷

A literature review of studies on the use of ginger for pregnancy-induced nausea found that, while data were insufficient to recommend ginger's use universally, it did appear to be a fairly low-risk and effective treatment. The review then

*Fresh ginger, as a tea,
a syrup or a tincture, is a good
first-choice treatment for
pregnancy-induced nausea.*

recommended that low doses of ginger be used in patients who were not responding to first-line therapies.⁸ Another systematic review looked at six double-blinded, randomized controlled trials. Four trials showed that ginger was superior to placebo; the other two trials indicated that ginger was as effective as vitamin B₆. The researchers concluded that the preliminary data were encouraging but that additional studies were needed.⁹

Dried ginger is used cautiously in pregnancy by Traditional Chinese Medicine (TCM) practitioners instead of the fresh form of the herb.¹⁰ While the British Herbal Compendium indicates ginger for pregnancy-induced nausea, neither the German Commission E nor the European Scientific Cooperative on Phytotherapy (ESCOP) recommend the herb for that purpose.¹¹

Although, generally, we do not see pregnant women in our practices, we conclude that, based on its long history of use, fresh ginger, as a tea, a syrup, or a tincture, is a good first-choice treatment for pregnancy-induced nausea. We defer to the wisdom of TCM and use dried ginger more cautiously. However, it does not need to be avoided completely, given the studies showing it has no negative effect on pregnancy or infants.

Ginger and Drug-Induced Nausea

In 120 patients undergoing major gynecologic surgery, two ginger capsules (each 500 mg) taken 1 hour before the procedure reduced the incidence and frequency of postsurgical vomiting, compared with placebo. Nausea was also reduced in the active arm of the study (48.3% versus 66.7%). No adverse effects were noted.¹² In another study of 60 patients undergoing gynecologic laparoscopy for noncancerous conditions, three

Ginger has a long history of use as a home remedy against nausea, including nausea caused by drugs.

capsules of ginger (each 500 mg) taken 1 hour before the procedure prevented postprocedure nausea and had a borderline statistical significance in quelling postprocedure vomiting.¹³

A meta-analysis of five randomized trials of 363 patients concluded that a fixed dose of at least 1 g of ginger was more effective than placebo for preventing postprocedure nausea and vomiting. Only one side-effect, abdominal discomfort, was reported. No mention was made of any problems with excess bleeding.¹⁴ A German systematic review of ginger in nausea concluded that there is no clear evidence of the efficacy of ginger in postoperative nausea but also noted that, in daily doses up to 6 g, the herb has few side-effects.¹⁵

Ginger is slowly earning a reputation for its ability to quell nausea induced by some drugs—particularly chemotherapy agents. In 2007, recruitment was ongoing for a phase II/III trial of ginger for treating delayed postchemotherapy nausea (nausea that occurs 24 hours or more after treatment).¹⁶ At present, despite the use of drugs such as ondansetron and granisetron, up to 70% of patients with cancer experience delayed nausea and vomiting.¹⁷

However, existing studies are neither large nor well-designed in terms of evaluating ginger's potency in this area. In one open study, participants either ate their regular diet, their diet plus a protein drink and ginger (4 capsules containing 1 g of ginger), or their diet plus a high-protein drink and 1 g of ginger daily. Protein was incorporated in this regimen because it is believed to reduce the nausea of motion sickness and pregnancy, perhaps by reducing gastric dysrhythmias.¹⁸ Other studies also indicate that ginger delays gastric emptying and gastric rhythms.¹⁹ The



Ginger roots.

high-protein/ginger combination reduced the delayed nausea, and participants in that group used less antiemetic medication. The results in patients who were taking the lower-protein/ginger combination were not significantly different from the results in the control group.¹⁸ Thus, seems that the amount of protein in the diet had a greater significance, and it is unclear what role, if any, ginger played in reducing nausea in these patients.

Another randomized, double-blinded crossover study in 48 patients taking cisplatin-based chemotherapy along with a standard antiemetic regimen divided the patients into two groups. Group A was given ginger capsules (1 g per day) for 5 days. Group B was given a placebo capsule on day 1 and oral metoclopramide for the following 4 days. The groups were crossed over to the other regimen for the next cycle of chemotherapy. There were no significant differences in the efficacy of the two regimens, but restlessness as a side-effect occurred much more frequently in the metoclopramide arm. The researchers concluded that adding ginger “had no advantage” in the acute phase but was statistically equal to metoclopramide in the delayed phase.²⁰

Finally, an abstract reported on a randomized study comparing ginger with placebo in chemotherapy-induced nausea and noted that significant improvements were observed in the ginger group. As this study is not available, we cannot confirm its validity, the dose of ginger used, nor the chemotherapy agents tested.²¹

Patients undergoing photopheresis typically take 8-MOP® (methoxsalen) as part of their treatment, and the drug tends to cause nausea. In an observational study, 11 patients took 1590 mg of ginger per day 1 half hour before ingesting 8-MOP. Patients completed a survey describing the degree of nausea at baseline and 1 hour after ingesting the ginger capsules. A significant reduction in self-reported nausea was noted after the ingestion of ginger compared with baseline.²²

Ginger has a long history of use as a home remedy against nausea, including nausea caused by drugs. Clinical studies validating the herb's potential in this setting are still lacking. While this article focuses on clinical studies and uses, it should

A potential significant use for fresh ginger may be in cases of swine flu.

be noted that animal studies do show that ginger has potential usefulness for quieting drug-induced nausea. Given the safety and palatability of ginger, it should be routinely administered to patients who are prescribed drugs that tend to induce nausea. We would recommend ginger even for opioids and similar drugs, although some animal studies suggest that it may have less value.

Ginger and Motion Sickness

The German Commission E has approved ginger for preventing motion sickness, recommending a daily dose of 2–4 g of rhizome. A number of small studies have shown that ginger is likely to offset motion sickness, although this has not been unequivocally established.

Individuals (13) with a history of motion sickness were pre-treated with placebo or ginger (1000 mg or 3150 mg) before undergoing circular movement in a crossover, double-blinded, randomized study. Ginger increased the time before onset of nausea significantly.²³ It was reported in an article that, in another study, 28 young children traveling by train, boat or car took either 50 mg of dimenhydrinate or 500 mg of ginger as a preventative. Ginger was significantly more effective than dimenhydrinate overall. We have been unable to locate this study.¹⁶

In another study, in which 8 blindfolded volunteers were rotated around an axis, ginger (500 or 1000 mg) was compared with scopolamine (0.6 mg) or lactose. Another 8 volunteers were given 1000 mg of fresh ginger or placebo, and a third group of 4 volunteers was given 940 mg of ground ginger or placebo and subjected to a combination of emetic stimuli. The scopolamine increased the number of head movements the volunteers could make before developing motion sickness while ginger did not.²⁴ Two other studies found ginger to be equivalent to placebo, while a third study found 940 mg of ginger to be superior to dimenhydrinate and placebo.^{25–27}

Ginger fared well in two studies on seasickness. In a trial of 60 passengers on a ship in rough sea, 500 mg of ginger every 4 hours was equivalent to 100 mg of dimenhydrinate every 4 hours for reducing the severity of nausea. In another study of 1489 individuals on a whale safari, ginger root did as well as standard treatments (cinnarizine, cinnarizine with domperidone, cyclizine, dimenhydrinate with caffeine, and meclizine with caffeine) and did better than scopolamine.²⁸ Finally, in a

study of 80 cadets who were randomized to take either one g of ginger or 1 g of placebo, 61% experienced seasickness, but the people who were given the placebo experienced more-severe symptoms—a result that became statistically significant after 4 hours of treatment.²⁹

As with other types of nausea, ginger should be the treatment of first choice in motion-induced nausea, based on this herb's historical use, cost, palatability, and safety.

Ginger and Digestion

Nausea and vomiting are symptoms of a variety of infections, and ginger has an even longer history of use for treating these ailments than for treating the kinds of nausea described above. Fresh ginger, in particular, is used in TCM for nausea resulting from essentially external (e.g., microbial) causes as opposed to internal (e.g., digestive) causes.[†]

One TCM materia medica reported that fresh ginger is used to alleviate vomiting, to disperse Cold and stop coughing.¹⁰ Fresh ginger especially helps patients who sweat but whose conditions are not improved by diaphoretic action. This source reported on a study (which we were unable to review) showing that ginger combined with brown sugar produced normal stool cultures in 4 days, quieted pain and tenesmus in 5 days, and cured 70% of patients with acute dysentery in 7 days. Another materia medica reported that fresh ginger induces diaphoresis, warms the stomach, controls vomiting, and removes toxins. Thus, fresh ginger is used to treat nausea and vomiting that are combined with common colds, pain in the chest and abdomen, retention of phlegm, and shortness of breath.³⁰

Dried ginger is viewed somewhat differently, although it is also used to treat vomiting, diarrhea, and abdominal pain. The herb is said to improve digestion and absorption in the GI tract and thereby counteract nausea, vomiting, and diarrhea.³⁰ This use is somewhat reminiscent of the view of the German physician Rudolf Weiss, M.D., who used ginger as a hot bitter (or heating digestive stimulant) suitable for patients with gastric subacidity.³¹

The Eclectic physicians used ginger to disguise the nauseating taste of other medicines. These practitioners also used ginger as a stimulating digestive tonic because it increased saliva flow and stomach-acid secretion, quieted cramping, and dispelled flatus. Ginger was combined in a cordial (pleasant-tasting medicine) with *Rheum palmatum* (rhubarb) to treat cholera when patients with the disease had cold extremities, nausea, and vomiting. The Eclectics found this herb of occasional value for treating fevers that were accompanied by intestinal pain and flatulence.

Ginger tea and ginger ale are common home remedies for a variety of conditions that present with nausea and vomiting. Ginger has obvious clinical value for treating various digestive

†As Western botanical practitioners, we confess to a, for the most part, poor understanding at best of the distinctions made between symptoms calling for dried versus fresh ginger.

conditions, many of which involve nausea. A potential significant use for fresh ginger may be in cases of swine flu (H1N1v), which sometimes presents atypically with nausea and diarrhea but without significant fever.³²

Other Clinical Uses of Ginger

The Eclectic physicians found ginger beneficial for addressing issues unrelated to digestion and nausea. These physicians used the herb to “break up” colds and lessen menstrual cramping. Topically, with *Salix* spp. (willow) bark, ginger was considered to be excellent for treating indolent ulcers. As a plaster, powdered ginger was used to treat “violent” headaches.³³

TCM practitioners also use ginger more broadly than most practitioners do today. Dried ginger is recommended as a hemostat for treating chronic bleeding in which the patient is cold, pale, and has a weak pulse. The herb is also used to treat pulmonary afflictions in which the patient’s expectoration is white, watery, or thin.

Ginger is also used for rheumatic pain,³⁰ and studies are beginning to confirm that ginger has a role to play in joint pain. One trial tested ginger in osteoarthritis (OA). One group of 40 patients was given two 500-mg capsules of ginger per day, another group of 40 patients received placebo, and a third group of 40 patients were given three 400-mg ibuprofen tablets per day for 1 month. Acetaminophen was used as a rescue remedy. Ginger and ibuprofen were significantly more beneficial than placebo and equivalent in their effects.³⁴

Another study combined ginger with a ginger relative, *Alpinia galanga* (galangal) giving a combination extract to 261 patients with OA of the knee. The combination had a moderate effect on reducing knee pain that occurred when patients were standing, compared with placebo. Side-effects were minor and consisted of mild GI upset.³⁵ Another source reported that ginger, “to varying degrees,” relieved pain and swelling in patients with OA and rheumatoid arthritis (RA) as well as those with muscular pain in 56 patients without causing any adverse effects during a period ranging from 3 months to 2.5 years.^{36†}

Finally, a proprietary ginger extract (Zintona EC Grünwalder Gesundheitsprodukte GmbH, Bad Tölz, Germany) containing 250 mg of ginger per capsule) was evaluated in 29 patients with symptomatic gonarthrosis in a 6-month-long, double-blinded, placebo-controlled crossover study. During the first 3 months, ginger was equivalent to placebo for providing relief, but, at 6 months, the herb showed a significant advantage over the placebo.³⁷

Ginger had a significant lipid-lowering effect, compared with placebo, in a double-blinded controlled trial of 85 patients with hyperlipidemia (the dose was 3 g of ginger per day).³⁸ Finally, there is a report of a study, (not available for review), of 24 patients with acute orchitis. Six to ten slices of ginger (0.2-mm thick) were placed over the affected testis and changed

†We did not review the original version of this study.

Shell Ginger

Zingiber zerumbet (shell ginger) is a relative of ginger that comes from Java. The Eclectics noted that this herb has a pleasant odor and, aside from being bitter, tastes somewhat like ginger. They did not discuss how shell ginger was used or if it was used differently from ginger.* In Hawaiian folk tradition *Z. zerumbet* root is reportedly not used as a food but rather as a scent, a shampoo, and a medicine. Medicinally, it is applied topically to treat sores, headaches, toothaches, skin diseases, achy joints, and stomach aches.†

This rhizome is gaining attention because one of its constituents, zerumbone, a sesquiterpene, is showing interesting pharmacologic properties. It has an enzymolytic effect on acetyl cholinesterase that might prove to be of value for treating Alzheimer’s disease.‡ The herb has shown strong cytotoxic properties on a variety of cancer-cell lines[¶] and appears to activate cellular detoxification.[§]

*Ref. 33.

†Bustamam A, Ibrahim S, Al-Zubairi AS, et al. Zerumbone: A natural compound with anti-cholinesterase activity. *Am J Pharmacol Toxicol* 2008;3:209–211.

‡Abdel Wahab SI, Abdul AB, Alzubairi AS, et al. In vitro ultramorphological assessment of apoptosis induced by zerumbone on (HeLa). *J Biomed Biotechnol* 2009;March 25:e-pub ahead of print [article number 769568].

¶Nakamura Y, Yoshida C, Murakami A, et al. Zerumbone, a tropical ginger sesquiterpene, activates phase II drug metabolizing enzymes. *FEBS Lett* 2004; 572:245–250.

§awapuhi, awapuhi kuahiwi, opun. Hawaiian Ethnobotany Online Database. Online document at: www2.bishopmuseum.org/ethnobotanydb/resultsdetailed.asp?search=awapuhi Accessed July 21, 2009.

daily or every other day. All patients found the treatment hot-to-numbing, although a few reported local erythema and edema. The average time-to-cure in this group was 3 days. In a control group of 4 patients, the average time-to-cure was 8.5 days.³⁰

Drug Interactions

The following discussion on ginger and its drug interactions is drawn from a text we highly recommend; it was written by a naturopathic physician, herbalist, and medical doctor working in concert (see reference).³⁹ This treatise does not cover nearly enough herbs (largely because of a lack of information about most herbs) but when an herb is included in this text, as in the case of ginger, the beneficial and negative herb–drug interactions are discussed authoritatively and thoroughly. As a result, we highly recommend our readers to go to the source rather than relying on our brief summary.

In TCM, ginger is added to formulas to moderate the potentially toxic effect of strong plants such as aconite and pinellia. In Western and Ayurvedic medicine, ginger is often added to formulas to enhance, synergize, and promote absorption of the formulas’ herbal ingredients (see *Fu Zi Li Shong Wan* (Prepared Aconite Pill to Regulate the Center) for an example). Pharmacologic and animal studies do show that ginger, on occasion, enhances absorption (sulfaguanidine) and, on occasion, increases the accumulation of a drug (daunorubicin).

As discussed above, ginger may prevent anesthetic-induced nausea—this is a *beneficial* herb–drug interaction. Similarly, there is preliminary evidence that ginger may prevent or mitigate chemotherapy-induced nausea, which is also a beneficial herb–drug interaction.

There is a theoretical concern that ginger may interact adversely with antiplatelet agents extrapolated from ginger's nonsteroidal anti-inflammatory drug (NSAID)–like activity. Currently, it appears that ginger can be used safely at therapeutic doses along with antiplatelet and anticoagulant medications, but there is a possibility that, in some individuals, there may be an adverse reaction, so monitoring is advised. There is also a theoretical concern that ginger could increase the international normalized ratio (INR) and risk of bleeding in patients who are taking coumarin anticoagulants. The single case report on which this is based was deemed insufficient to confirm such an interaction, given the lack of a plausible pharmacologic mechanism. At least one controlled clinical trial in healthy adults found that ginger had no effect on the pharmacokinetics of warfarin.⁴⁰ Current thinking indicates that ginger, at normal dose ranges, presents no significant risk of bleeding in patients who are taking oral vitamin K–antagonist anticoagulation agents.

Conclusion

Ginger is an herb with a pleasing taste. It is an invaluable, inexpensive, and safe remedy for all types of nausea. It is also obvious, from historical uses, that ginger should be more widely used as an anti-inflammatory in its own right and as a synergist with other anti-inflammatory herbs and drugs. Finally, given the use of ginger and its close relatives (see Shell Ginger) as a topical treatment in traditions as varied as TCM, Ayurveda, Eclectic medicine, and Hawaiian medicine, we should definitely add some of those uses to our botanical repertoire. ■

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