Use of Herbal Therapies to Relieve Pain: A Review of Efficacy and Adverse Effects

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Abstract:

To find holistic treatment with effective pain relief and few side effects, Americans spend billions of dollars annually on complementary and alternative medicine, including herbal therapies. Despite extensive use, the lack of regulatory scrutiny of these herbal supplements contributes to the paucity of reliable clinical data assessing their efficacy and safety. This review summarizes the existing studies investigating the efficacy of herbal therapies as a treatment for pain. Possible side effects, potential drug–herb interactions, and information about common herbal therapies are also summarized. MEDLINE, AMED, and the Cochrane Library databases were searched for the period from January 1966 to June 2005. Uses, dosages, routes of administration, and side effects were summarized. Strength of empirical evidence also was evaluated. This review found few well-controlled clinical studies. Furthermore, these studies documented limited efficacy of herbal therapies to treat pain. The information presented here may be used to further educate nurses and patients on the use of herbal therapies as well as direct future research efforts.

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BACKGROUND

Patients experiencing pain may try numerous therapies, including conventional and alternative approaches, for relief. Pain relief is the most frequently cited reason that people seek complementary and alternative medicine (CAM) (Astin, 1998). CAM encompasses therapeutic treatments such as relaxation, meditation, biofeedback, hypnosis, imagery, chiropractic, acupuncture, massage, aromatherapy, and herbal therapies. A 2002 study conducted by the National Center for Complementary and Alternative Medicine surveyed 31,044 adults and found that 36% of respondents used some form of CAM therapy during the last 12 months (Barnes, Powell-Griner, McFann, & Nahin, 2004). These therapies might be chosen because other conventional therapies were previously ineffective or produced side effects that were intolerable. Therefore, clinicians must be aware of CAM therapies used to treat pain to answer questions from patients effectively and to avoid possible interactions with medical (drug) therapies prescribed for patients.

REASONS FOR USING COMPLEMENTARY AND ALTERNATIVE MEDICINES

CAM users choose alternative therapies so their health care is more congruent with their personal values, beliefs, and overall philosophic orientation toward health and life (Astin, 1998). This philosophical orientation may result from personal values, past health care experiences (i.e., disillusionment with conventional therapies because of their lack of efficacy or side effects), or desire to have control over health care matters (Astin, 1998; Barnes et al., 2004).

Many herbal therapy users have a chronic disease. A study by Boon and colleagues (2000) reported that some patients with breast cancer chose CAM to boost their immune system, increase quality of life, prevent recurrence of cancer, provide a feeling of control over life, aid conventional medical treatment, or treat breast cancer. The most frequently cited health problems that lead to CAM use are anxiety, back problems, chronic pain, and urinary tract disorders (Astin, 1998). According to studies by Barnes et al. (2004) and Kimby, Launso, Henningsen, and Langgaard (2003), women and older adults are most likely to seek CAM therapy, and CAM users generally perceive the treatments have fewer side effects than do conventional medicines (Eisenberg, et al., 2001).

Unfortunately, those who use CAM face potential adverse side effects, including drug–herb interactions. Thus, clinicians in the pain field should be familiar with the uses and potential risks associated with CAM. More than half of patients first seek information related to CAM therapies from their primary physician (Eisenberg et al., 2001). Hyodo and colleagues (2003) found that 93% of Japanese clinical oncologists surveyed in 2002 had been asked about CAM options. In this study, 80.2% responded they were unable to advise their patients appropriately about the use of CAM products. Similarly, Eisenberg, Kessler, Foster, Norlock, Calkins, and Delbanco (1993) reported that physicians do not discuss the use of unconventional therapies because they lack adequate knowledge of these techniques. Other barriers to discussion regarding CAM exist, including patients perceiving that clinicians lack interest (Verhoef, Hilsden, & O'Beirne, 1999), are closed-minded, lack knowledge (Eliason, Huebner, & Marchand, 1999), and would not understand or would not approve of the alternative therapy (Eisenberg et al., 2001).

Surprisingly, negative attitudes toward or experiences with conventional medicine do not predict CAM use (Astin, 1998), despite one stereotype that CAM users are disgruntled patients. CAM users are frequently no more dissatisfied or distrustful of conventional practitioners and hospitals than nonusers (Astin, 1998). Most complementary therapies are used in conjunction with conventional medicine (Eisenberg et al., 2001). In a national survey, 79% of respondents believed that the combination of conventional and alternative therapies is more effective than either approach alone (Eisenberg et al., 2001), and presumably this desire for a more holistic approach to health care is what accounts for $21.2 billion in U.S. consumer spending in 1997 on CAM professional services (Rees, 2001), including massage, acupuncture, chiropractic treatment, and herbal therapies.

HERBAL THERAPY USE FOR PAIN

Herbal therapies are more likely to be used by those with a better education, poorer health status, and a holistic orientation to health; those wanting relief from symptoms or seeking improvement in their general condition; and those who had a transformational experience that changed their world view (Astin, 1998; Kimby et al., 2003; Oldendick et al., 2000). The most commonly used natural products are echinacea, ginseng, ginkgo biloba, and garlic supplements (Barnes, et al., 2004). In the United States, approximately $4 billion per year is spent on herbal products, with an annual growth of more than 30% (Rees, 2001). During the 1990s, there was an estimated 380% increase in the sale of herbal substances. In 2002, a survey found 19% of adults had used natural products such as herbal medicine, functional foods (garlic), or animal-based supplements (Barnes, et al., 2004). Approximately $76 million was spent in 2002 for just three of these supplements alone: androstenedione, kava, and yohimbe (*Dangerous Supplements: Still at Large*, 2004).

The use of herbal therapies comes with potential risks that are worth noting to consumers of herbs for medicinal purposes. Active ingredients in herbal therapies or drugs may produce herb/herb or herb/drugs interactions that have undesirable side effects (Ernst, 1998; Fugh-Berman & Ernst, 2001). For example, when combined with levodopa, kava can cause an increase in the number and duration of "off" periods; St. John's wort taken with sertraline (Zoloft) may produce nausea, vomiting, or anxiety (Fugh-Berman & Ernst, 2001). Herbal therapies and drugs are often made of more than one active element. This further complicates what pharmacologic ingredient is causing the interaction or undesirable side effect (Izzo & Ernst, 2001; Fugh-Berman & Ernst, 2001).

A lack of standardization of herbal remedies also makes it challenging to understand what causes adverse interactions. Contamination, misidentification of

an herbal plant, or an incorrectly substituted plant all raise issues of quality (Drew & Myers, 1997; Ernst, 1998) and can result potentially in an unwanted side effect. Of 400 users of complementary medicine surveyed, Abbot, White, and Ernst (1996) found 8% of those who tried herbal remedies had an adverse reaction.

Incorrect preparations, incorrect dosages, lack of standardization, substitution, or improper processing of plants can result in unwanted combinations of ingredients in herbal therapies (Drew & Myers, 1997; Ernst, 1998). The pharmacologically active component may not necessarily be known, making it difficult to understand how the therapies work (Ernst, 2000). Unwanted ingredients may lead to contamination, for example, when bovine spongiform encephalopathy from bovine organs was found in dietary supplements (Department of Agriculture, 2000; Scott et al., 1999). Cassileth and Deng (2004) contend that herbs are diluted natural drugs that contain scores of different chemicals that may not have been documented. A CAM user may not anticipate the potential interactions with other medications or herbal preparations.

A lack of strict government regulation diminishes efforts at prevention of potentially harmful results of herbal remedies. In 1994, Congress passed the Dietary Supplement Health and Education Act (DSHEA) to set regulation standards of herbal therapies for medical benefit. DSHEA relieved pressure from the U.S. Food and Drug Administration (FDA) on herb manufacturers to prove health benefits of herbal therapies, thereby permitting them to make it to the marketplace without demonstrating any benefits (Larsen & Berry, 2003). This creates a difficulty, because 59% of respondents to an Internet survey believe herbal products must be approved by a government agency similar to the FDA (*Widespread Ignorance of Regulation and Labeling of Vitamins, Minerals and Food Supplements, According to a National Harris Interactive Survey*, 2002).

DSHEA also allows herbal manufacturers to make three types of claims without FDA approval: (1) nutrient content claims, (2) health claims, and (3) nutrient support or structure-function claims (Kurtzweil, 1998; *Overview of Dietary Supplements*, 2001). Limited federal authority has led to animal products being included in dietary supplements, increasing the possibility of contamination. Consumers need to be wary of false claims, insufficient labels, and the potential for animal products to be included in the herbal therapy.

Those individuals considering herbal therapy use for pain control also may struggle to find credible sources of information. A recent U.S. investigation suggests that information provided by health food stores can be dangerously misleading, because potentially uneducated health food store employees may freely give advice about treatment for life-threatening illnesses (Phillips, Nichols, & King, 1995). Likewise, prominent herbal therapy product web sites often convey incorrect information (Morris & Avorn, 2003). A review of Internet web sites found 273 (81%) of 338 sites made one or more health claims that may or may not be proven.

Labels on herbal products also are not a reliable source of information, often missing important details such as product's safety, effectiveness, or possible side effects (Zuk, 2000). This lack of information runs contrary to what the general population believes is included on herbal product labels. In a study of knowledge of regulations and labeling of food supplements, 68% of survey respondents believed the government requires label warnings on potential side effects or dangers (*Widespread Ignorance of Regulation and Labeling of Vitamins, Minerals and Food Supplements, According to a National Harris Interactive Survey*, 2004). Ultimately, relaxed regulation places the onus on clinicians to educate and protect patients. As people with pain frequently turn to CAM for relief, pain management nurses must be aware of the risks and benefits of CAM for pain control.

METHODS

Literature Search

To identify articles on the use of herbal therapies to reduce pain, a literature search of MEDLINE (January 1966 to June 2005), AMED (Allied and Complementary Medicine, January 1985 to June 2005), and the Cochrane Library (November 2003 to June 2005) databases was conducted. Reference lists of articles identified from the initial search were also reviewed for additional articles. Research conducted with humans or animals was reviewed. Only English language publications were considered. Search criteria comprised the term *pain*with the common name, Latin name, and common synonyms for the herb in question (e.g., for *Black cohosh,* search criteria *pain* and *baneberry, cimicifuga,* and *bugbane* each were used). Most articles were identified using the herb's common or Latin name.

Inclusion Criteria

All English-language titles and abstracts, from January 1966 to the present, were evaluated for inclusion in this review. The first articles on herbal therapies to reduce pain were published in 1990. All pain syndromes were considered for this review. Publications written in English in which an herb was studied to determine its effect on reducing pain or investigated in

Table 1.
Strength of Evidence (Jacox et al., 1994)

Types of Evidence
I. Meta-analysis of multiple, well-designed controlled studies
a. Studies of patients with cancer
b. Studies of other clinical populations
II. At least one well-designed experimental study
a. Studies of patients with cancer
b. Studies of other clinical populations
III. Well-designed, quasiexperimental studies such as nonrandomized controlled, single group pre-post, cohort, time series, or matched case-controlled studies
a. Studies of patients with cancer
b. Studies of other clinical populations
IV. Case reports and clinical examples
a. Studies of patients with cancer
b. Studies of other clinical populations
Strength and consistency of evidence
A. There is evidence of type I or consistent findings from multiples studies of types II, III, or IV.
B. There is evidence of types II, III, or IV, and findings are generally consistent.
C. There is evidence of types II, III, or IV, but findings are inconsistent.
D. There is little or no evidence, or there is type V evidence only.

a human or rodent trial were included. The review resulted in a range of articles addressing several types of pain syndromes treated with the use of herbal therapy.

Strength of Evidence

Methodologic quality of the studies reviewed was evaluated using a scientific evidence scale published by the U.S. Department of Health and Human Services (Jacox et al., 1994). The type of evidence and the strength and consistency of the evidence were recorded for all of the studies included in this review. Types of evidence were (1) meta-analysis, (2) at least one well-designed experimental study, (3) well-designed quasi-experimental studies, (4) well-designed nonexperimental studies, and (5) case reports and clinical examples (Table 1). Strength and consistency of evidence were (1) consistent findings from multiples studies, (2) findings that are generally consistent, (3) findings are generally inconsistent, (4) little or no evidence (Table 1).

Possible Uses and Safety Information

This review of commonly used herbal therapies used to treat pain includes information about possible known uses, dosages, and routes of administration. It also includes safety and adverse effect information. This information was collected primarily from the *Natural Medicine Comprehensive Database* (2003) and several other published sources (*Nutrition in Cancer Care*, 2004; Skidmore-Roth, 2004; *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines,*1998; Koenig, 2003). Several web sites were identified, and content from them was incorporated into the review. These are listed in Table 2.

RESULTS

In our search of herbal therapies, 34 publications describing the use of 24 herbal therapies to treat pain were identified (Table 3). Ten of the 24 (42%) herbal therapies had research evidence available investigating the ability of the herbal therapy to manage pain. For the remaining 16 herbal therapies (58%), no known research on their use in pain management was identified at the time of this review. The herbal therapies that were proven effective were useful when specifically treating arthritis (Brzeski, Madhok & Capell, 1991; Deal et al., 1991), polyneuropathy (Low, Opfer-Gehrking, Dyck, Litchy, & O'Brien, 1995), postmastectomy pain syndrome (Dini, Bertelli, Gozza, & Forno, 1993; Watson & Evans, 1992), neuropathy (Scheffler, Sheitel, & Lipton, 1991), or low-back pain (Chrubasik, Eisenberg, Balan, Weinberger, Luzzati, & Conradt, 2000; Frerick, Keitel, Kuhn, Schmidt, Bredehorst, & Kuhlmann, 2003). The quality of the identified studies ranged from a meta-analysis of multiple studies producing consistent findings (Type I, A) to case reports that had generally consistent findings (Type V, B; Table 1). Overall, most of the research had at least one well-designed experimental study that produced evidence that was generally consistent. This review found only four double-blind, randomized, controlled trial studies

TABLE 2.
CAM-Related Informational Web Sites

Organization	Web Site
American Botanical Council	http://www.herbs.org
Centers for Disease Control and Prevention, Public Health Services, U.S. Department of Health and Human Services	http://www.cdc.gov
Memorial Sloan-Kettering Cancer Center	www.mskcc.org/aboutherbs
National Center for Complementary and Alternative Medicine	http://nccam.nih.gov/
Office of Complementary and Alternative Medicine	http://www3.cancer.gov/occam/
Office of Dietary Supplements, National Institutes of Health	http://dietary-supplements.info.nih.gov
Society of Integrative Oncology	http://www.integrativeonc.org/
U.S. Food and Drug Administration, Public Health Service, Department of Health and Human Services	http://www.fda.gov/
U.S. National Library of Medicine, National Institutes of Health	http://www.nlm.nih.gov

CAM, Complementary and alternative medicine.
Data from Larsen & Berry, 2003

(Deal et al., 1991; Low et al., 1995; Jeffrey & Belcher, 2002; Sindrup, Madsen, Bach, Gram, & Jensen, 2001).

Studies for only 10 of 24 herbs used to manage pain successfully were reviewed for efficacy. Of these 10 herbals, several studies used a placebo-controlled study methodology to investigate the herbal therapy's effectiveness (Altman & Marcussen, 2001; Brzeski, Madhok, & Capell, 1991; Chrubasik et al., 2000; Deal et al., 1991; Dini et al., 1993; Ellison et al., 1997; Frerick et al., 2003; Low et al., 1995; Scheffler, Sheitel, & Lipton, 1991; Watson & Evans, 1992). In addition, several studies found that herbal therapies were no more effective at managing pain compared with a placebo or general pain medication (Bliddal et al., 2000; Ernst & Pittler, 1998; Kaziro, 1984; Paice, Ferrans, Lashley, Shott, Vizgirda, & Pitrak, 2000; Sindrup et al., 2001).

Adverse Effect and Interactions

Many of the herbal therapies had significant adverse side effects that should be considered when using these treatments. For example, Arnica is considered poisonous if injected and may also cause liver damage (Skidmore-Roth, 2004). In 2004, Ephedra was banned because of its increased risk for heart palpitations, tremors, and insomnia. This was the first time U.S. officials blocked the sale of an over-the-counter herbal supplement (*Government Announces Ban on Ephedra*, 2004). Overall, common side effects caused by the investigated herbal therapies included nausea, vomiting, burning sensations, gastrointestinal irritation, intestinal blockage, and insomnia. Adverse interactions with numerous drugs and the possibility of worsening medical conditions were common to many of the herbal therapies we investigated. For example, herbal therapies may worsen diabetes for some patients or estrogen-sensitive hormone disorders in some women (*Natural Medicine Comprehensive Database*, 2003; *Nutrition in Cancer Care*, 2004; Skidmore-Roth, 2004; *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*, 1998).

A review conducted by Fugh-Berman and Ernst (2001) of suspected interactions of herbal therapies and other treatments found warfarin was the drug most likely to be involved in adverse interaction with an herbal therapy, and St. John's wort was the herbal therapy most likely to cause an adverse interaction. Although many herbs have potential side effects, several herbal therapies reviewed have a status of "Generally Recognized as Safe" for food use in the United States (chamomile, cinnamon, cloves, ginger, mustard) (*Natural Medicine Comprehensive Database*, 2003).

DISCUSSION

The use of herbal therapies is an increasingly popular method to treat pain, either alone or as a complement to traditional medical approaches. Unfortunately, research demonstrating the efficacy of herbal therapies to treat pain is limited. The strongest evidence identified in this analysis was Type I, A, found in only one study. For the majority of the herbal therapies reviewed, there was no empirical evidence for the analgesic efficacy of these compounds. Questions still remain about their underlying mechanisms to provide analgesia (Ernst, 2000). As the use of herbal therapies grows, empirical research demonstrating their benefits in pain control lags. The establishment of the National Center for Complementary and Alternative Medicine supports research of herbal therapies and other CAM.

In regard to the safety of herbal therapies, several possible drug and herbal interactions were identified.

Table 3.
Herbal Therapies for the Relief of Pain

Agent	Possible Uses	Dose/Routes	Studies	Safety/Adverse Reactions
• Arnica* (*Arnica montana*) • *Also known as:* Arnica flos, Leopard's bane, Mountain tobacco, Wundkraut	• Used for general counterirritant, anti-inflammatory, and pain reliever (Data from Koenig, 2003) • Topically, to decrease inflammation in bruises, sprains, wounds, acne, boils, and rashes (Data from Skidmore-Roth, 2004)	• Topically: Used as a cream, 15% arnica oil (Natural Medicine Comprehensive Database, 2003) • Typical strength is 2 g of flowerheads in 100 mL water	• Arnica gave rise to greater pain than a placebo and caused more swelling when used to treat impacted wisdom teeth (Data from Kaziro, 1984). Type III, B** • Topical application of *Arnica montana* gel was a safe, well-tolerated, and effective treatment of mild to moderate osteoarthritis of the knee (Data from Knuesel, Weber, & Suter, 2002). Type II, B • Significant reduction of pain experienced by patients who underwent hand surgery (Data from Sindrup et al., 2001). Type II, B • Analysis of eight trials found, on balance, homeopathic arnica is no more effective than placebo (Data from Ernst & Pittler, 1998). Type I, B	• Considered poisonous if injected (Data from Skidmore-Roth, 2004) • Serious liver and kidney damage can occur (Data from Skidmore-Roth, 2004) • Interacts with antihypertensive drugs (Data from Skidmore-Roth, 2004)
• Black Cohosh *(Cimicifuga racemose)* • *Also known as:* Baneberry, Cimicifuga, Bugbane	• It is a smooth-muscle relaxant, an antispasmodic, an antitussive, a diuretic, an antidiarrheal, and an antiarthritic (Data from Skidmore-Roth, 2004)	• Oral: 300-2000 mg of the dried rhizome or root three times daily (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Likely safe when used orally and appropriately, safe in studies lasting up to 6 months (Natural Medicine Comprehensive Database, 2003) • Adversely interacts with hormone sensitive cancers/conditions, but has no known drug interactions (Natural Medicine Comprehensive Database, 2003)
• Camphor (*Cinnamomum camphora*) • *Also known as:* Camphora, Cemphire, Camphor tree	• Applied topically as an analgesic and an antipruritic (Natural Medicine Comprehensive Database, 2003) • Muscle rheumatism, respiratory tract diseases, circulatory regulation disorders (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998)	• Topically: 0.1%–0.3%, 3 to 4 times daily (Natural Medicine Comprehensive Database, 2003) • Inhalation: tablespoon of solution per quart of water, medicated vapors are breathed (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Likely safe when used topically in low concentrations short-term. Unsafe when used orally (Natural Medicine Comprehensive Database, 2003) • Orally, camphor can cause significant toxicity, symptoms can occur rapidly starting with nausea and vomiting, oral and intestinal burning, feeling of warmth, and headache (Natural Medicine Comprehensive Database, 2003) • Oral preparations are no longer available in the United States (Natural Medicine Comprehensive Database, 2003)

• Capsaicin *(Capsicum frutescens)* • *Also known as:* African Chillies, African Pepper, Capsaicin Fruit, Garden Pepper, Sweet Pepper, Mexican Chilies, Grains of Paradise	• Stimulate digestion when used orally, as an antiflatulent, for colic, diarrhea, cramps, to improve peripheral circulation, reducing blood clotting tendencies, and preventing heart disease (Natural Medicine Comprehensive Database, 2003) • Topically to reduce pain	• Oral: Capsicum fruit is usually in doses of 30–120 mg, 3 times daily (Natural Medicine Comprehensive Database, 2003) • Topical: For pain syndromes, creams can be applied 3–4 times daily (Natural Medicine Comprehensive Database, 2003) • Available in 0.075% and 0.025% creams	• Systemic capsaicin is effective for short-term treatment of Burning Mouth Syndrome but with major gastrointestinal side effects (Data from Petruzzi et al., 2004) Type II, B • Topically applied capsaicin cream may decrease subjective neck pain (Data from Mathias et al., 1995) Type IV, B • Capsaicin is ineffective in relieving pain associated with HIV-associated peripheral neuropathy (Data from Paice et al., 2000). Type II, B • Topical 0.075% capsaicin cream appeared to be more effective than the vehicle cream in relief of postmastectomy pain syndrome in a double-blind study (Data from Watson, 1994). Type II, B • Open-label trial where 68.4% of patients received good pain relief from 0.025% capsaicin administered to treat postmastectomy pain syndrome (Data from Dini et al., 1993). Type III, B • Double-blind, 8-week trial found topical capsaicin 0.075% cream is safe and effective in managing painful diabetic neuropathy (Data from Scheffler, Sheitel & Lipton, 1991). Type II, B • Analysis of several trials found topical capsaicin is generally not satisfactory as a sole therapy for chronic painful conditions; it may serve as an adjuvant (Data from Watson, 1994). Type I, B • Long-term, open, nonrandomized study might indicate that the analgesic effect of capsaicin in post-herpetic neuralgia is mediated by both interference with neuropeptide metabolism and morphologic changes of nociceptive afferents (Data from Peikert, Hentrich, & Ochs, 1991). Type II, B	• Likely safe when used orally in amounts typically found in food (Natural Medicine Comprehensive Database, 2003) • May cause gastrointestinal irritation, sweating, and flushing of the head and neck when taken orally (Natural Medicine Comprehensive Database, 2003) • Interferes with the activity of acid-inhibiting drugs, antihypertensive drugs (Natural Medicine Comprehensive Database, 2003) • May increase the effects of antiplatelet drugs, barbiturates, cocaine, and drugs with sedative properties (Natural Medicine Comprehensive Database, 2003) • Topically, may increase pain, may cause burning of the eye or mucous membrane if accidentally applied

Table 3.
Herbal Therapies for the Relief of Pain (Cont'd)

Agent	Possible Uses	Dose/Routes	Studies	Safety/Adverse Reactions
			• After 2 weeks, 80% of capsaicin-treated patients with osteoarthritis or rheumatoid arthritis in a double-blind randomized study experienced a reduction in pain (Data from Deal et al., 1991). Type II, B • A two-arm, double-blind, placebo-controlled, crossover study found topical capsaicin cream decreases postsurgical neuropathic pain to a 3 to 1 margin over placebo. There were some toxicities (Data from Ellison et al., 1997). Type II, B • A vehicle-controlled, double-blind, multicenter study found 0.075% capsaicin cream is safe and effective in treating painful diabetic neuropathy (Scheffler, Sheitel, & Lipton, 1991). Type II, B • In a 12-week, double-blind, placebo-controlled randomized study of capsaicin cream on distal painful polyneuropathy found no difference between capsaicin cream and the placebo (Data from Low et al., 1995). Type II, B • In a double-blind, randomized, placebo-controlled multicenter parallel group study, treatment of low back pain with capsicum plaster was statistically and clinically beneficial compared with a placebo (Data from Frerick et al., 2003). Type II, B • Meta-analysis found capsaicin cream to be effective in easing pain associated with diabetic neuropathy and osteoarthritis. Capsaicin's effectiveness may be attributed to placebo effects (Data from Zhang & Li Wan Po, 1994). Type I, A	

• Chamomile *(matricaria recutita)* • *Also known as:* Cammilla, Kamillen, Pin Heads, Camomilla, Allemande, Manzanilla	• Skin and mucous membrane inflammations, irritations of the respiratory tract (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Reduces gastrointestinal spasms and inflammatory diseases of the gastrointestinal tract (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Antispasmodic for menstrual cramps (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998)	• Oral: 2–8 g of the dried flower head (Natural Medicine Comprehensive Database, 2003) • Topical: Used as a rinse. No known typical dosage • Tea: Steep 3 g in 150 mL boiling water for 5–10 minutes (Natural Medicine Comprehensive Database, 2003)	• Chamomile extract spray does not significantly ameliorate pain associated with postoperative sore throat (Data from Kyokong et al., 2002) Type II, B	• Has a Generally Recognized as Safe status for food use in the US (Natural Medicine Comprehensive Database, 2003) • Generally safe when consumed in amounts commonly found in foods (Natural Medicine Comprehensive Database, 2003) • Theoretically, large doses may increase the risk of bleeding when used with anticoagulants (Nutrition in Cancer Care, 2004) • Theoretically, may increase additive and side effects of benzodiazepines (Nutrition in Cancer Care, 2004)
• Cinnamon (*Cinnamomum*) • *Also known as:* Cinnamon bark, Batavia cassia, Ceylon Cinnamon, Panang Cinnamon, Saigon Cinnamon	• Improve appetite (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Treat dyspepsia, abdominal pain, nausea, and other digestive complaints (Data from Koenig, 2003) • Thought to be, antispasmodic, antiflatulent, antidiarrheal, antimicrobial, and anthelmintic (Natural Medicine Comprehensive Database, 2003)	• Oral: 2–4 g of cinnamon bark (Natural Medicine Comprehensive Database, 2003) • Topical: No known typical dosage • Tea: 0.5–1 g of the bark in 150 mL of boiling water, for 5–10 min, then strain (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Has a Generally Recognized as Safe status for food use in the US (Natural Medicine Comprehensive Database, 2003) • Likely safe when consumed in amounts commonly found in foods and possibly safe when used orally and appropriately in amounts slightly greater than those found in food (Natural Medicine Comprehensive Database, 2003) • Might interfere with antacids (Natural Medicine Comprehensive Database, 2003)

Table 3.
Herbal Therapies for the Relief of Pain (Cont'd)

Agent	Possible Uses	Dose/Routes	Studies	Safety/Adverse Reactions
• Cloves (*Syzgium aromaticum*) • *Also known as:* Clove, Caryophylli, Caryophyllus, Clous de Girolfe, Flores Caryophyllum	• Used for gastrointestinal upset, including flatulence, nausea, and vomiting (Natural Medicine Comprehensive Database, 2003) • Reduces inflammatory changes of the oral and pharyngeal mucosa (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Counterirritant for pain (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Used for toothache or mouth and throat inflammation (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998)	• Oral: 120–300 mg, limit ingestion to 3.6 mg/kg clove oil per day (Natural Medicine Comprehensive Database, 2003) • Topical: Commonly used in mouthwash, 15% clove tincture can treat athletes' foot (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Has a Generally Recognized as Safe status for food use in the US (Natural Medicine Comprehensive Database, 2003) • Likely safe when consumed in amounts commonly found in food and possibly safe when taken orally in higher doses for medicinal purposes (Natural Medicine Comprehensive Database, 2003) • May be irritating to respiratory tract when smoked (clove cigarettes) (Natural Medicine Comprehensive Database, 2003) • Concomitant use of anticoagulants and antiplatelets could theoretically increase the risk of bleeding and the effects of these drugs (Natural Medicine Comprehensive Database, 2003)
• Cod-liver Oil	• Used for hyperlipidemia, hypertriglyceridemia, hypertension, coronary heart disease, osteoarthritis, and systemic lupus erythematosus (Natural Medicine Comprehensive Database, 2003)	• Oral: For lowering triglycerides, 20 mL per day. For lowering blood pressure, 20 mL per day (Natural Medicine Comprehensive Database, 2003)	• n-3 polyunsaturated fatty acids directly attenuate the neuronal and glial processes that underlie neuropathic and inflammatory pain (Data from Shapiro, 2003). Type II, B • People with musculoskeletal pain experience less pain if they take cod liver oil (Data from Eriksen, Sandvik, & Bruusgaar, 1996) Type II, B • Cod liver oil as supplemental to NSAID therapy in treating osteoarthritis showed no significant benefit vs placebo (Data from Stammers, Sibbald, & Freeling, 1992) Type II, B	• Likely safe when used orally and appropriately (Natural Medicine Comprehensive Database, 2003) • Increased risk of bleeding when used with anticoagulants/antiplatelet drugs (Natural Medicine Comprehensive Database, 2003) • Decreased effectiveness of antidiabetes drugs (Natatural Medicine Comprehensive Database, 2003) • May have additive effects on antihypertensive drugs (Natural Medicine Comprehensive Database, 2003) • May cause nosebleeds, halitosis, and heartburn (Natural Medicine Comprehensive Database, 2003)

Also known as: n-3 Fatty Acids, Cod Oil, Fish Oil, Liver Oil, Omega-3 Fatty Acids, Polyunsaturated Fatty Acids				
• Devil's Claw (*Harpagophytum procumbens*)	• Used to treat joint pain and inflammation (Data from Skidmore-Roth, 2004) • Loss of appetite, dyspepsia, supportive therapy of degenerative disorders of the musculoskeletal system (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998)	• Oral: To stimulate appetite, 1.5 g of root per day: 1–4.5 g of root per day for other uses • Tea: 4.5 g in 300 mL water boiled for 8 hours	• Devil's Claw lacks the anti-inflammatory properties possessed by NSAIDS (Data from Whitehouse, Znamirowska, & Paul, 1983). Type II, B • Devil's Claw extract is effective in treating pain associated with arthrosis of the hip or knee (Data from Wegener & Lupke, 2003), Type II, B • Effective in treatment of slight to moderate muscular pain (Data from Gobel et al., 2001) Type II, B • Effective in treatment of chronic nonradicular back pain (Data from Laudahn & Walper, 2001) Type II, B	• Possibly safe when used orally and appropriately for short term. Well tolerated for up to 16 weeks (Natural Medicine Comprehensive Database, 2003) • May decrease blood glucose levels in diabetes (Natural Medicine Comprehensive Database, 2003) • May increase bile production in patients with gallstones (Natural Medicine Comprehensive Database, 2003) • Adversely effects acid-inhibiting drugs, blood pressure therapy, and cardiac drugs (Natural Medicine Comprehensive Database, 2003) • Orally, devil's claw is well tolerated. Most common adverse effect is diarrhea (Natural Medicine Comprehensive Database, 2003)
• Dong Quai *(Angelica sinensis)* • *Also known as:* Chinese Angelica, Dang Gui, Dong Qua, Dong-Quai, Tang Kuei, Tan Kue Bai Zhi	• Used primarily for gynecologic ailments including menstrual cramps, irregularity, retarded flow, weakness during the menstrual period, and symptoms of menopause (Natural Medicine Comprehensive Database, 2003) • It is also used orally as a "blood purifier" to manage hypertension, rheumatism, ulcers, anemia, and constipation (Natural Medicine Comprehensive Database, 2003)	• Oral: 3–4 g daily with meals (Natural Medicine Comprehensive Database, 2003) • Tea: Extract of dong quai in a dose of 1 mL three times daily (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Orally, dong quai is well tolerated (Natural Medicine Comprehensive Database, 2003) • Theoretically, may increase effects of warfarin and may potentiate the effects of other anticoagulants and antiplatelet drugs (Nutrition in Cancer Care, 2004; Data from Paice et al., 2000) • Interacts with hormone sensitive cancers/ conditions, especially for women with hormone sensitive conditions (Natural Medicine Comprehensive Database, 2003)

TABLE 3.
Herbal Therapies for the Relief of Pain (Cont'd)

Agent	Possible Uses	Dose/Routes	Studies	Safety/Adverse Reactions
• Echinacea *(echinacea angustifolia)* • *Also known as:* American Cone Flower, Indian Head, Purple Cone Flower, Black Sampson, Kansas Snakeroot, Red Sunflower	• Supportive therapy for colds and chronic infections of the respiratory tract and lower urinary tract (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Externally for poorly healing wounds and chronic ulcerations (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1198) • Also used for migraines, dyspepsia, pain, and dizziness (Natural Medicine Comprehensive Database, 2003)	• Oral: Varying dosages for various illnesses (Natural Medicine Comprehensive Database, 2003) • Topical: Semi-solid preparation containing at least 15% pressed juice of Echinacea purpurea herb • Tea: Prepared by pouring 8 oz of boiling water over a tea bag and steeping for 10–15 min (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Orally, echinacea is usually well tolerated (Natural Medicine Comprehensive Database, 2003) • Has been used safely in trials lasting up to 12 weeks when used topically and appropriately (Natural Medicine Comprehensive Database, 2003) • Theoretically, may interfere with immunosuppressive therapy (Nutrition in Cancer Care, 2004) • May experience allergic reactions, fever, nausea, vomiting, unpleasant taste, abdominal pain, diarrhea, sore throat, and dizziness (Natural Medicine Comprehensive Database, 2003) • Theoretically may increase hepatotoxicity risk when coadministered with acetaminophen (Data from Paice et al., 2000)

• Epsom Salt (*Magnesium*) • *Also known as:* Chelated Magnesium, Magnesium Sulfate, Milk of Magnesia	• Used for treating and preventing hypomagnesemia, may also be used orally as a laxative or for treating symptoms of asthma (Natural Medicine Comprehensive Database, 2003) • Reduces swelling, muscle ache, and pain resulting from bruised or irritated tissues (Data from Koenig, 2003) • Topically, used for treating infected skin ulcers (Natural Medicine Comprehensive Database, 2003) • Reduce neuropathic and other pain when pure magnesium is used IV	• Oral, topical, or parenteral • Dosages are very illness specific and varies (Natural Medicine Comprehensive Database, 2003) • Tea: Steep 4.5 g of root in 300 mL boiled water for 8 hours at room temperature and then strain (Natural Medicine Comprehensive Database, 2003)	• Infusion may be used as an adjunct for reducing analgesic consumption after spinal anaesthesia (Data from Apan et al., 2004) Type II, B • Use as an adjuvant analgesic in patients undergoing open cholecystectomy resulted in better pain relief during first postoperative hour but did not significantly decrease postoperative morphine requirement (Data from Bhatia et al., 2004) Type II, B • In a rat model, magnesium amplifies the analgesic effect of low-dose morphine in conditions of sustained pain (Data from Begon et al., 2002) Type II, B • Found magnesium can be an adjuvant for perioperative analgesic management to reduce perioperative pain (Data from Kara et al., 2002). Type II, B • For patients with chronic limb pain, the addition of magnesium to a Bier's block with lignocaine improves and prolongs pain relief (Data from Tramer & Glynn, 2002). Type II, B • The addition of magnesium sulfate to the opioid fentanyl prolonged analgesia with no increase of side effects (Data from Buvanendran et al., 2002). Type II, B • 500-mg and 1-g bolus doses of IV magnesium were well tolerated and potentially effective in patients with neuropathic pain due to cancer (Data from Crosby, Wilcock, & Corcoran, 2000). Type V, B	• Likely safe when used orally and appropriately. • Parenteral magnesium sulfate is an FDA-approved prescription product (Natural Medicine Comprehensive Database, 2003) • Interacts with malabsorption syndromes, renal disease, excretion-enhancing/reducing drugs, and skeletal muscle relaxants (Natural Medicine Comprehensive Database, 2003) • Orally, magnesium can cause gastrointestinal irritation, nausea, vomiting, and diarrhea (Natural Medicine Comprehensive Database, 2003)

Table 3.
Herbal Therapies for the Relief of Pain (Cont'd)

Agent	Possible Uses	Dose/Routes	Studies	Safety/Adverse Reactions
• Gamma Linolenic Acid *(Octadeca-6,9,12-trienoic acid)* • *Also known as:* Gamolenic Acid, GLA	• Rheumatoid arthritis, hyperlipidemia, heart disease, syndrome-X, systemic sclerosis, diabetic neuropathy, and cancer prevention (Natural Medicine Comprehensive Database, 2003) • Also used for ADHD, depression, postpartum depression, chronic fatigue syndrome (Natural Medicine Comprehensive Database, 2003)	• Oral: For rheumatoid arthritis 1.1 g daily, for diabetic neuropathy 360 to 480 mg per day, for hyperlipidemia 1.5–6 g daily (Natural Medicine Comprehensive Database, 2003)	• Control group, placebo study found GLA may produce mild improvement in rheumatoid arthritis, but the placebo, olive oil, may have unrecognized benefits (Data from Brzeski, Madhok, & Capell, 1991). Type II, B • Meta-analysis of a small number of studies suggest that GLA is effective treatment for patients with rheumatoid arthritis (Data from Rothman, DeLuca, & Zurier, 1995). Type I, B • A review of 11 studies found there is some potential benefit for the use of GLA in rheumatoid arthritis. More studies on dosage and duration are needed (Data from Little & Parsons, 2001). Type I, B • Meta-analysis found moderate support for GLA for reducing pain, tender joint count and stiffness. In general, GLA herbal medicines were relatively safe to use (Data from Soeken, Miller, & Ernst, 2003). Type I, C	• Appears safe when taken in oral doses of 2.8 g per day or less for up to a year (Natural Medicine Comprehensive Database, 2003) • May interact with herbs that have coumarin constituents or affect platelet aggregation to theoretically increase the risk of bleeding (Natural Medicine Comprehensive Database, 2003) • Taking with other anticoagulants or antiplatelet drugs might increase risk of bruising and bleeding (Natural Medicine Comprehensive Database, 2003)
• Ginger *(Zingiber Officinale)* • *Also known as:* African Ginger, Black Ginger, Gingembre, Ginger Root, Zingiberis rhizoma	• Motion sickness, nausea, dyspepsia, flatulence, chemotherapy-induced nausea (Natural Medicine Comprehensive Database, 2003) • Can be used for treating thermal burns (Natural Medicine Comprehensive Database, 2003) • The essential oil of ginger is used topically as an anlgesic (Natural Medicine Comprehensive Database, 2003)	• Oral: 550–1100 mg three times daily (Natural Medicine Comprehensive Database, 2003) • Topical: No typical dosage	• Extract as effective as placebo during first 3 months of study, but at end of 6 months, extract group experienced better relief from pain associated with symptomatic gonarthritis (Data from Wigler et al., 2003) Type II, B • Randomized, placebo-controlled, cross-over study found no difference between ginger extract and a placebo in treating osteoarthritis of the hip or knee. Ibuprofen was significantly more effective than ginger extract (Data from Bliddal et al., 2000). Type II, B	• Generally Recognized as Safe Status in the US (Data from Altman & Marcussen, 2001) • Usually well tolerated when used in typical doses (Data from Altman & Marcussen, 2001) • Theoretically, may increase the risk of bleeding, or interfere with diabetic, cardiac, therapy for heart conditions and acid-inhibiting drugs (Data from Altman & Marcussen, 2001)

			• Randomized, double-blind, placebo-controlled, 6-week study found highly purified ginger extract had a statistically significantly effect of reducing pain in patients with osteoarthritis of the knee compared with a control group that received a placebo (Data from Altman & Marcussen, 2001) Type II, B	
• Ginkgo Biloba *(Ginkgo biloba)* • *Also known as:* Baiguo, Fossil Tree, Ginkyo, Yinhsing, Kew Tree,	• Used as an antitussive and expectorant (Data from Altman & Marcussen, 2001) • Fatigue (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Thought to increase blood flow to the brain and to treat/prevent Alzheimer's/dementia	• Oral: 120–240 mg ginkgo tablets or capsules in 2 or 3 divided doses (Data from Altman & Marcussen, 2001)	• A study of rats looked at several models of nociceptive pain, tail-electric stimulation assay, and capsaicin-induced paw licking, results suggest Ginkgo biloba extract may be of clinical value as an anti-inflammatory and analgesic alone or in conjunction with NSAIDs (Data from Abdel-Salam et al., 2004) Type II, B	• May increase bleeding with NSAIDS (Data from Abebe, 2002), acetaminophen (Data from Abebe, 2002), dipyridamole, and warfarin (Nutrition in Cancer Care, 2004) • Ginkgo fruit and pulp can cause redness of the mouth, rectal burning, and painful anal sphincter spasms (Natural Medicine Comprehensive Database, 2003) • May increase blood pressure when used with thiazide diuretics (Nutrition in Cancer Care, 2004) • Reportedly causes seizures (Natural Medicine Comprehensive Database, 2003) • Theoretically, might interfere with the effectiveness of anticonvulsants (Natural Medicine Comprehensive Database, 2003) • Can cause coma when combined with trazodone (Data from Hu et al., 2005)
• Ginseng *(Panax quinquefolius)* • *Also known as:* American Ginseng, Ren Shen, Sang, Red Berry	• For symptomatic treatment of: memory deficits, disturbances in concentration, depressive emotional condition, dizziness, and headache (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Increase physical endurance and lessen fatigue, to improve ability to cope with stress (Data from Skidmore-Roth, 2004)	• Oral: 0.25–0.5 g of the root 2 times daily (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• No adverse reactions have been reported specifically with the use of American ginseng (Natural Medicine Comprehensive Database, 2003) • Expected to increase risk of bleeding if taken with NSAIDS (Data from Abebe, 2002) • Varying dosages for various illnesses (Natural Medicine Comprehensive Database, 2003) • May interfere with antipsychotic drugs, hormones, MAOs (Nutrition in Cancer Care, 2004) • Ginseng may diminish the effect of immunosuppressants (Data from Skidmore-Roth, 2004) • May cause anxiety, insomnia, restlessness, headache (Data from Skidmore-Roth, 2004)

Table 3.
Herbal Therapies for the Relief of Pain (Cont'd)

Agent	Possible Uses	Dose/Routes	Studies	Safety/Adverse Reactions
				• May reduce concentration of blood alcohol (Data from Lee, 1987; Data from Lee, 1993) and warfarin (Data from Hu et al., 2005) • May reduce opioid-induced analgesia (Data from Abebe, 2002) • May induce mania when used concomitantly with phenelzine (Data from Hu et al., 2005)
• Japanese Mint (*Mentha arvensis*) • *Also known as:* Brook mint, Chinese Mint Oil, Cornmint Oil, Minzol	• Orally to reduce flatulence (Natural Medicine Comprehensive Database, 2003) • Topically, for musculoskeletal or neuropathic pain, pruritus, and urticaria (Natural Medicine Comprehensive Database, 2003)	• Oral: 3–6 drops of oil daily (Natural Medicine Comprehensive Database, 2003) • Topically: Rub several drops of oil on affected areas of skin (Natural Medicine Comprehensive Database, 2003) • Inhalation: 3–4 drops of oil in hot water (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Possibly safe when the oil is used orally or topically and appropriately (Natural Medicine Comprehensive Database, 2003) • May worsen bronchial spasms, gallbladder conditions, or liver disease (Natural Medicine Comprehensive Database, 2003) • No known interactions with drugs (Natural Medicine Comprehensive Database, 2003) • Can cause upset stomach when taken orally (Natural Medicine Comprehensive Database, 2003)
• Kava Kava (*Piper methysticum*) • *Also known as:* Ava, Ava Pepper, Awa Root, Kava, Yagona	• Treat anxiety disorders, stress, insomnia, and restlessness (Natural Medicine Comprehensive Database, 2003) • Orally, for depression, headaches, common cold, cancer prevention, and musculoskeletal pain (Natural Medicine Comprehensive Database, 2003)	• Oral: 100 mg 3 times a day (Natural Medicine Comprehensive Database, 2003) • Tea: 2–4 g in 150 mL boiling water for 5–10 minutes, then strain (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Taken orally, may induce hepatotoxicity and liver failure (Natural Medicine Comprehensive Database, 2003; Nutrition in Cancer Care, 2004) • Banned in Switzerland, Germany, and Canada (Natural Medicine Comprehensive Database, 2003) • Decreases platelets, lymphocyte, bilirubin, protein, increased red blood cell volume (Data from Skidmore-Roth, 2004) • Adverse interactions with alprazolam, he patotoxic drugs, and levodopa (Natural Medicine Comprehensive Database, 2003) • Given hepatotoxic effects, avoid concurrent use with acetaminophen (Natural Medicine Comprehensive Database, 2003). • Expected to enhance CNS depression/ sedation caused by opioids (Natural Medicine Comprehensive, 2003)

• Ma Huang *(Ephedra distachya)* • *Also known as:* Ephedra, Cao Mahuang, Herbal Ecstasy, Sea Grape	• Used for weight loss and enhancing athletic performance (Natural Medicine Comprehensive Database, 2003) • Also used for allergies, allergic rhinitis, respiratory tract conditions, colds, flu, fever, headache, joint and bone pain (Natural Medicine Comprehensive Database, 2003)	• Oral: 15–20 mg of ephedra taken up to three times daily (Natural Medicine Comprehensive Database, 2003) • Tea: 1–4 g in 150 mL boiling water for 5–10 minutes and then strain (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• *FDA recently banned ephedra (1/1/2004)* • Increases toxicity with beta-blockers, monoamine oxidase inhibitors, caffeine, and St. John's Wart (Nutrition in Cancer Care, 2004) • Side effects—insomnia, motor restlessness, irritability, headaches, nausea, vomiting, disturbances of urination, tachycardia; in high doses, increase in blood pressure, cardiac arrhythmia, herb dependency (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Reports of serious life-threatening or debilitating adverse effects, psychosis, and hepatitis (Natural Medicine Comprehensive Database, 2003)
• Mustard (*Brassica*)	• Topically, used as a poultice for bronchial pneumonia, pleurisy, arthritis, lumbago, aching feet, rheumatism, and as a counterirritant (Natural Medicine Comprehensive Database, 2003) • To treat inflammation and joint pain (Data from Skidmore-Roth, 2004)	• Topical: Prepare a mustard plaster; 100 g of mustard flour mixed with warm water to make a paste. Put mustard paste into a linen and apply for 10 min (Natural Medicine Comprehensive Database, 2003) • Orally: No known suggested dose (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Has Generally Recognized as Safe status in the US (Natural Medicine Comprehensive Database, 2003) • Can irritate asthma and the GI tract (Natural Medicine Comprehensive Database, 2003) • Orally, large amounts of black mustard seed can lead to vomiting, stomach pain, diarrhea, somnolence, cardiac failure, breathing difficulties, coma, and possibly death (Natural Medicine Comprehensive Database, 2003)

Table 3.
Herbal Therapies for the Relief of Pain (Cont'd)

Agent	Possible Uses	Dose/Routes	Studies	Safety/Adverse Reactions
• Oil of Wintergreen *(Gaultheria Proxumbens)* • *Also known as:* Boxberry, Canada Tea, Deerberry, Mountain Tea, Partridge Berry	• Topically, wintergreen oil is used as a counterirritant for musculoskeletal pain and as an antiseptic (Natural Medicine Comprehensive Database, 2003) • May be useful in the treatment of neuropathic pain (Data from Skidmore-Roth L, 2004)	• Topical: Apply as gels, lotion, or ointments 3–4 times daily (Natural Medicine Comprehensive Database, 2003) • Orally: No known suggested dose (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Symptoms of toxicity include tinnitus, nausea, and vomiting (Natural Medicine Comprehensive Database, 2003) • May aggravate gastrointestinal inflammation, and increases INR and bleeding if used with warfarin (Natural Medicine Comprehensive Database, 2003) • Likely unsafe when used orally for medicinal purposes (Natural Medicine Comprehensive Database, 2003)
• St. John's Wort *(Hypericum perforatum)* • *Also known as:* Amber, Demon Chaser, Goatweed, Tipton Weed, Hypericum, Millepertuis, John's Wort	• Depressive moods, anxiety and/or nervous unrest (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • No studies have yet examined the effects of St. John's Wort on chronic pain in the absence of depression (Data from Koenig, 2003) • Also used for dysthymia, exhaustion, fibrositis, headache, heart palpitations, muscle pain, OCD, and neuralgia (Natural Medicine Comprehensive Database, 2003)	• Oral: for mild depression, 300 mg times daily (Natural Medicine Comprehensive Database, 2003) • For long-term maintenance therapy, 300–600 mg have been used (Natural Medicine Comprehensive Database, 2003)	• Found no significant effect of St. John's wort on painful polyneuropathy or measures of pain processing (Data from Sindrup et al., 2001) Type II, B	• Likely safe when used orally and appropriately, short term for up to 8 weeks (Natural Medicine Comprehensive Database, 2003) • May cause serotonin syndrome when used with some selective seratonin reuptake inhibitors (Nutrition in Cancer Care, 2004) • Increases the effects of triptans and opioids (Natural Medicine Comprehensive Database, 2003) • Decreases the effects of amitriptyline, barbiturates, digoxin, irinotecan, and protease inhibitors (Natural Medicine Comprehensive Database, 2003) • Increase side effects of antidepressants, cyclosporine, nefazodone, paroxetine, and sertraline (Natural Medicine Comprehensive Database, 2003) • Side effects can include insomnia, restlessness, anxiety, irritability, fatigue, headache (Natural Medicine Comprehensive Database, 2003) • Avoid with all concurrent chemotherapy • May decrease blood concentrations of cyclosporine, midazolam, tacrolimus, amitriptyline, indinavir, warfarin, phenprocoumon and theophylline (Data from Hu et al., 2005) • May cause breakthrough bleeding and unplanned pregnancy when used concomitantly with oral contraceptives (Data from Hu et al., 2005)

• White Willow (*Salix alba*) • *Also known as:* Willow Bark, Bay Willow, Reifweide, Violet Willow	• Diseases accompanied by fever, rheumatic ailments, headaches (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • For pain caused by inflammation, muscles, and joint aches (Natural Medicine Comprehensive Database, 2003)	• Oral: 1–3 g dried bark 3–4 times daily (Natural Medicine Comprehensive Database, 2003) • Tea: 1–3 g bark in 150 mL of boiling water, then strain (Natural Medicine Comprehensive Database, 2003)	• Willow bark extract may be a useful and safe treatment for low back pain (Data from Chrubasik et al., 2000) Type II, B • No efficacy shown for use of willow bark extract in treatment of osteo- and rheumatoid arthritis (Data from Biegert et al., 2004) Type II, B	• Possibly safe when used orally and appropriately, short term (Natural Medicine Comprehensive Database, 2003) • Theoretically, may interact with kidney or liver dysfunction and an anticoagulant/ antiplatelets and oral drugs (Natural Medicine Comprehensive Database, 2003) • Salicylates are part of the compound that makes up aspirin
• Yohimbe *(Pausinystalia yohimbe)* • *Also known as:* Johimbi, Yohimbehe, Yohimbine	• Used to treat impotence, fatigue, hypertension, diabetic neuropathy, and postural hypotension (Natural Medicine Comprehensive Database, 2003)	• Oral: 15–30 mg daily (Natural Medicine Comprehensive Database, 2003)	• No published research related to pain	• Not recommended because of insufficient proof of efficacy and significant adverse effects (The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines, 1998) • Decreases effects of antidepressants, antihypertensives, hyperglycemic agents, and monoamine oxidase inhibitors (Nutrition in Cancer Care, 2004) • Can cause excitation, tremor, insomnia, anxiety, hypertension, tachycardia, dizziness, gastric intolerance, salivation, sinusitis, irritability, headache, urinary frequency, fluid retention, nausea, and vomiting (Natural Medicine Comprehensive Database, 2003) • Higher doses have significantly more adverse effects (Natural Medicine Comprehensive Database, 2003)

NSAID, Nonsteroidal anti-inflammatory drug; *FDA,* Food and Drug Administration; *ADHD,* attention-deficit hyperactivity disorder; *CNS,* Central nervous system; *GI,* gastrointestinal; *HIV,* human immunodeficiency virus; *CAM,* complementary and alternative medicine; *INR,* international normalized ratio.

*This table includes only herbal supplements, dietary supplements or other forms of CAM therapy were not included.

**Refer to Table 1 for study review criteria.

Understanding these interactions is complicated by the fact that the precise composition of many herbal therapies is not fully known. Impurities and lack of quality testing may result in elements in herb mixtures that are not intended to be included. Furthermore, patients may be lured into a false sense of security believing that because herbal therapies are "natural" and are not regulated by the FDA, they are inherently safe. These misconceptions may lead herbal therapy users to believe the therapies are safer than they really are.

Patient Care Strategies

It is important for nurses to openly communicate with patients who use CAM therapies. With use of herbal therapy on the rise, nurses are encouraged when taking drug histories to routinely ask for information about a patient's use of CAM therapies (Drew & Myers, 1997). It is important to be nonjudgmental and to keep in mind that patients may not consider "natural" substances in the same way as pharmaceuticals. When addressing adverse drug reactions, question possible CAM use, do not discount long-term use of CAM preparations as causing side effects because there may be batch-to-batch differences, and contact Drug and Poison Information Centers for information on CAM relating to a suspected adverse drug reaction (Drew & Myers, 1997). Education on what is understood about herbal therapies may also greatly benefit the patient. Education about alternative means to treat pain, such as medication or another CAM therapy, may also be suggested. To learn more about CAM, a list of educational web sites is included (Table 2).

Limitations

This study is limited by several methodologic constraints. Publications were identified using only three search engines; more publications may have been identified through more diverse search means. In addition, only publications written in English were reviewed. There may be a larger body of research in non-English speaking countries, where use of herbal therapies is more prevalent. Review and translation of these articles were beyond our resources.

CONCLUSION

The use of CAM, especially herbal therapies, to reduce pain has dramatically increased. Although use has increased, scientific evidence of the efficacy of herbal therapies to moderate pain is still limited. This review summarized the empirical evidence available for 24 herbal therapies and also detailed uses, dosages, routes of administration, and side effects related to these herbal therapies. This information will help pain management nurses educate themselves about herbal therapies to be better equipped to advise and treat patients who use herbal therapies.

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REFERENCES

Abebe, W. (2002). Herbal medication: Potential for adverse interactions with analgesic drugs. *Journal of Clinical Pharmacy & Therapeutics, 27*, 391-401.

Abbot, N. C., White, A. R., & Ernst, E. (1996). Complementary medicine. *Nature, 381*, 361.

Abdel-Salam, O. M., Baiuomy, A. R., El-batran, S., & Arbid, M. S. (2004). Evaluation of the anti-inflammatory, antinociceptive and gastric effects of ginkgo biloba in the rat. *Pharmacological Research, 49*, 133-142.

Altman, R. D., & Marcussen, K. C. (2001). Effects of a ginger extract on knee pain in patients with osteoarthritis. *Arthritis & Rheumatism, 44*, 2531-2538.

Apan, A., Buyukkocak, U., Ozcan, S., Sari, E., & Basar, H. (2004). Postoperative magnesium sulphate infusion reduces analgesic requirements in spinal anaesthesia. *European Journal of Anaesthesiology, 21*, 766-769.

Astin, J. A. (1998). Why patients use alternative medicine: Results of a national study. *JAMA, 279*, 1548-1553.

Barnes, P., Powell-Griner, E., McFann, K., & Nahin, R. (2004). Complementary and alternative medicine use among adults: United States, 2002. *Advanced Data, 343*, 1-20.

Begon, S., Pickering, G., Eschalier, A., & Dubray, C. (2002). Magnesium increases morphine analgesic effect in different experimental models of pain. *Anesthesiology, 96*, 627-632.

Bhatia, A., Kashyap, L., Pawar, D. K., & Trikha, A. (2004). Effect of intraoperative magnesium infusion on perioperative analgesia in open cholecystectomy. *Journal of Clinical Anesthesia, 16*, 262-265.

Biegert, C., Wagner, I., Ludtke, R., Kotter, I., Lohmuller, C., Gunaydin, I., et al. (2004). Efficacy and safety of willow bark extract in the treatment of osteoarthritis and rheumatoid arthritis: Results of 2 randomized double-blind controlled trials. *Journal of Rheumatology, 31*, 2121-2130.

Bliddal, H., Rosetzsky, A., Schlichting, P., Weidner, M. S., Andersen, L. A., Ibfelt, H. H., et al. (2000). A randomized, placebo-controlled, cross-over study of ginger extracts and ibuprofen in osteoarthritis. *Osteoarthritis and Cartilage, 8*, 9-12.

Boon, H., Stewart, M., Kennard, M. A., Gray, R., Sawka, C., Brown, J. B., et al. (2000). Use of complementary/alternative medicine by breast cancer survivors in Ontario: Prevalence and perceptions. *Journal of Clinical Oncology, 18*, 2515-2521.

Brzeski, M., Madhok, R., & Capell, H. A. (1991). Evening primrose oil in patients with rheumatoid arthritis and side-effects of non-steroidal anti-inflammatory drugs. *British Journal of Rheumatology, 30*, 370-372.

Buvanendran, A., McCarthy, R. J., Kroin, J. S., Leong, W., Perry, P., & Tuman, K. J. (2002). Intrathecal magnesium prolongs fentanyl analgesia: A prospective, randomized, controlled trial. *Anesthesia & Analgesia., 95*, 661-666, table of contents.

Cassileth, B., & Deng, G. (2004). Complementary and alternative therapies for cancer. *The Oncologist, 9*, 80-89.

Chrubasik, S., Eisenberg, E., Balan, E., Weinberger, T., Luzzati, R., & Conradt, C. (2000). Treatment of low back pain exacerbations with willow bark extract: A randomized double-blind study. *American Journal of Medicine, 109*, 9-14.

The complete German commission E monographs: Therapeutic guide to herbal medicines. (1st ed.) (1998). 1st ed. Boston: American Botanical Council.

Crosby, V., Wilcock, A., & Corcoran, R. (2000). The safety and efficacy of a single dose (500 mg or 1 g) of intravenous magnesium sulfate in neuropathic pain poorly responsive to strong opioid analgesics in patients with cancer. *Journal of Pain & Symptom Management, 19*, 35-39.

Dangerous supplements: Still at large. (2004). *Consumer Reports, 69,* 12-18.

Deal, C. L., Schnitzer, T. J., Lipstein, E., Seibold, J. R., Stevens, R. M., Levy, M. D., et al. (1991). Treatment of arthritis with topical capsaicin: A double-blind trial. *Clinical Therapeutics, 13*, 383-395.

Department of Agriculture. (2000). *Detention without physical examination of bulk shipments of high-risk tissue from BSE-countries—bovine spongiform encephalopathy.* (2000). Retrieved March 10, 2004, from http://www.fola.gov/ora/fiars/ora_import_ia1704.html.

Dini, D., Bertelli, G., Gozza, A., & Forno, G. G. (1993). Treatment of the post-mastectomy pain syndrome with topical capsaicin. *Pain, 54*, 223-226.

Drew, A. K., & Myers, S. P. (1997). Safety issues in herbal medicine: Implications for the health professions. *Medical Journal of Australia, 166*, 538-541.

Eisenberg, D. M., Kessler, R. C., Foster, C., Norlock, F. E., Calkins, D. R., & Delbanco, T. L. (1993). Unconventional medicine in the United States. Prevalence, costs, and patterns of use. *New England Journal of Medicine, 328*, 246-252.

Eisenberg, D. M., Kessler, R. C., Van Rompay, M. I., Kaptchuk, T. J., Wilkey, S. A., Appel, S., et al. (2001). Perceptions about complementary therapies relative to conventional therapies among adults who use both: Results from a national survey. *Annals of Internal Medicine, 135*, 344-351.

Eliason, B. C., Huebner, J., & Marchand, L. (1999). What physicians can learn from consumers of dietary supplements. *Journal of Family Practice, 48*, 459-463.

Ellison, N., Loprinzi, C. L., Kugler, J., Hatfield, A. K., Miser, A., Sloan, J. A., et al. (1997). Phase III placebo-controlled trial of capsaicin cream in the management of surgical neuropathic pain in cancer patients. *Journal of Clinical Oncology, 15*, 2974-2980.

Eriksen, W., Sandvik, L., & Bruusgaard, D. (1996). Does dietary supplementation of cod liver oil mitigate musculoskeletal pain? *European Journal of Clinical Nutrition, 50*, 689-693.

Ernst, E. (1998). Harmless herbs? A review of the recent literature. *American Journal of Medicine, 104*, 170-178.

Ernst, E. (2000). Herbal medicines: Where is the evidence? *British Medical Journal, 321*(7258), 395-396.

Ernst, E., & Pittler, M. H. (1998). Efficacy of homeopathic arnica: A systematic review of placebo-controlled clinical trials. *Archives of Surgery, 133*, 1187-1190.

Frerick, H., Keitel, W., Kuhn, U., Schmidt, S., Bredehorst, A., & Kuhlmann, M. (2003). Topical treatment of chronic low back pain with a capsicum plaster. *Pain, 106*, 59-64.

Fugh-Berman, A., & Ernst, E. (2001). Herb-drug interactions: Review and assessment of report reliability. *British Journal of Clinical Pharmacology, 52*, 587-595.

Gobel, H., Heinze, A., Ingwersen, M., Niederberger, U., & Gerber, D. (2001). [Effects of Harpagophytum procumbens LI 174 (devil's claw) on sensory, motor and vascular muscle reagibility in the treatment of unspecific back pain.] *Schmerz, 15*, 10-18.

Government announces ban on ephedra. (2003). Retrieved April 29, 2004, from http://www.cnn.com/2003/HEALTH/12/30/ephedra/.

Hu, Z., Yang, X., Ho, P. C., Chan, S. Y., Heng, P. W., Chane, E., Duan, W., Koh, H. L., & Zhou, S. (2005). Herb-drug interactions: A literature review. *Drugs, 65*, 1239-82.

Hyodo, I., Nishina, T., Moriwaki, T., Endo, S., Terao, T., Hirao, K., et al. (2003). Perceptions and attitudes of clinical oncologists on complementary and alternative medicine: A nationwide survey in Japan. *Cancer, 97*, 2861-2868.

Izzo, A. A., & Ernst, E. (2001). Interactions between herbal medicines and prescribed drugs: A systematic review. *Drugs, 61*, 2163-2175.

Jacox, A., Carr, D. B., Payne, R., Berde, C. B., Brietbart, W., Cain, J. M., et al. (1994). *Management of cancer pain.* Rockville: Agency for Health Care Policy and Research.

Jeffrey, S. L., & Belcher, H. J. (2002). Use of arnica to relieve pain after carpal-tunnel release surgery. *Alternative Therapies in Health & Medicine, 8*, 66-68.

Kara, H., Sahin, N., Ulusan, V., & Aydogdu, T. (2002). Magnesium infusion reduces perioperative pain. *European Journal of Anaesthesiology, 19*, 52-56.

Kaziro, G. S. (1984). Metronidazole (Flagyl) and arnica montana in the prevention of post-surgical complications, a comparative placebo controlled clinical trial. *British Journal of Oral & Maxillofacial Surgery, 22*, 42-49.

Kimby, C. K., Launso, L., Henningsen, I., & Langgaard, H. (2003). Choice of unconventional treatment by patients with cancer. *Journal of Alternative & Complementary Medicine, 9*, 549-561.

Knuesel, O., Weber, M., & Suter, A. (2002). Arnica montana gel in osteoarthritis of the knee: An open, multicenter clinical trial. *Advances in Therapy, 19*, 209-218.

Koenig, H. G. (2003). *Chronic pain: Biomedical and spiritual approaches* (1st ed.). New York: The Haworth Pastoral Press.

Kurtzweil, P. (February 20, 1998). *A FDA guide to dietary supplements.* Retrieved February 20, 2004, from http://www.fda.gov/fdac/features/1998/598_guid.html.

Kyokong, O., Charuluxananan, S., Muangmingsuk, V., Rodanant, O., Subornsug, K., & Punyasang, W. (2002). Efficacy of chamomile-extract spray for prevention of postoperative sore throat. *Journal of the Medical Association of Thailand, 85*, *Suppl 1*:S180-S185.

Larsen, L. L., & Berry, J. A. (2003). The regulation of dietary supplements. *Journal of the American Academy of Nurse Practitioners, 15*, 410-414.

Laudahn, D., & Walper, A. (2001). Efficacy and tolerance of Harpagophytum extract LI 174 in patients with chronic non-radicular back pain. *Phytotherapy Research, 15*, 621-624.

Lee, F. C., Ko, J. H., Park, J. K., & Lee, J. S. (1987). Effects of panax ginseng on blood alcohol clearance in man. *Clinical & Experimental Pharmacology & Physiology, 14*, 543-546.

Lee, Y. J., Pantuck, C. B., & Pantuck, E. J. (1993). Effect of ginseng on plasma levels of ethanol in the rat. *Planta Medica, 59*, 17-19.

Little, C., & Parsons, T. (2001). Herbal therapy for treating rheumatoid arthritis. *Cochrane Database of Systematic Reviews.* CD002948.

Low, P. A., Opfer-Gehrking, T. L., Dyck, P. J., Litchy, W. J., & O'Brien, P. C. (1995). Double-blind, placebo-controlled study of the application of capsaicin cream in chronic distal painful polyneuropathy. *Pain, 62*, 163-168.

Mathias, B. J., Dillingham, T. R., Zeigler, D. N., Chang, A. S., & Belandres, P. V. (1995). Topical capsaicin for chronic neck pain. A pilot study. *American Journal of Physical Medicine & Rehabilitation, 74*, 39-44.

Morris, C. A., & Avorn, J. (2003). Internet marketing of herbal products. *JAMA, 290*, 1505-1509.

Natural medicine comprehensive database. (5th ed.) (2003). Stockton: Therapeutic Research Faculty.

Nutrition in cancer care. (2004). Retrieved May 23, 2004, from http://www.cancer.gov/cancerinfo/pdq/supportivecare/nutrition/healthprofessional.

Oldendick, R., Coker, A. L., Wieland, D., Raymond, J. I., Probst, J. C., Schell, B. J., et al. (2000). Population-based survey of complementary and alternative medicine usage, patient satisfaction, and physician involvement. South Carolina complementary medicine program baseline research team. *Southern Medical Journal, 93*, 375-381.

Overview of dietary supplements. (2001). Retrieved May 20, 2002, from http://vm.cfsan.fda.gov/~dms/ds-oview.html.

Paice, J. A., Ferrans, C. E., Lashley, F. R., Shott, S., Vizgirda, V., & Pitrak, D. (2000). Topical capsaicin in the management of HIV-associated peripheral neuropathy. *Journal of Pain & Symptom Management, 19*, 45-52.

Peikert, A., Hentrich, M., & Ochs, G. (1991). Topical 0.025% capsaicin in chronic post-herpetic neuralgia: Efficacy, predictors of response and long-term course. *Journal of Neurology, 238*, 452-456.

Petruzzi, M., Lauritano, D., De Benedittis, M., Baldoni, M., & Serpico, R. (2004). Systemic capsaicin for burning mouth syndrome: Short-term results of a pilot study. *Journal of Oral Pathology & Medicine, 33*, 111-114.

Phillips, L. G., Nichols, M. H., & King, W. D. (1995). Herbs and HIV: The health food industry's answer. *Southern Medical Journal, 88*, 911-913.

Rees, A.M. (2001) Complementary and alternative medicine: A new dimension in medical consumerism. In A.M. Rees (Ed.), *The complementary and alternative medicine information source book* (pp. 3-5). Phoenix: Oryx Press.

Rothman, D., DeLuca, P., & Zurier, R. B. (1995). Botanical lipids: Effects on inflammation, immune responses, and rheumatoid arthritis. *Seminars in Arthritis and Rheumatism, 25*, 87-96.

Scheffler, N. M., Sheitel, P. L., & Lipton, M. N. (1991). Treatment of painful diabetic neuropathy with capsaicin 0.075%. *Journal of the American Podiatric Medical Association, 81*, 288-293.

Scott, M. R., Will, R., Ironside, J., Nguyen, H. O., Tremblay, P., DeArmond, S. J., et al. (1999). Compelling transgenetic evidence for transmission of bovine spongiform encephalopathy prions to humans. *Proceedings of the National Academy of Sciences of the United States of America, 96*, 15137-15142.

Shapiro, H. (2003). Could n-3 polyunsaturated fatty acids reduce pathological pain by direct actions on the nervous system? *Prostaglandins Leukotrienes, and Essential Fatty Acids, 68*, 219-224.

Sindrup, S. H., Madsen, C., Bach, F. W., Gram, L. F., & Jensen, T. S. (2001). St. John's wort has no effect on pain in polyneuropathy. *Pain, 91*, 361-365.

Skidmore-Roth, L. (2004). *Mosby's handbook of herbs & natural supplements* (2nd ed.). St. Louis: Mosby.

Stammers, T., Sibbald, B., & Freeling, P. (1992). Efficacy of cod liver oil as an adjunct to non-steroidal anti-inflammatory drug treatment in the management of osteoarthritis in general practice. *Annals of the Rheumatic Diseases, 51*, 128-129.

Soeken, K. L., Miller, S. A., & Ernst, E. (2003). Herbal medicines for the treatment of rheumatoid arthritis: A systematic review. *Rheumatology, 42*, 652-659.

Tramer, M. R., & Glynn, C. J. (2002). Magnesium bier's block for treatment of chronic limb pain: A randomised, double-blind, cross-over study. *Pain, 99*, 235-241.

The Capsaicin Study Group. (1991). Treatment of painful diabetic neuropathy with topical capsaicin. A multicenter, double-blind, vehicle-controlled study. *Archives of Internal Medicine, 151*, 2225-2229.

Verhoef, M. J., Hilsden, R. J., & O'Beirne, M. (1999). Complementary therapies and cancer care: An overview. *Patient Education & Counseling, 38*, 93-100.

Watson, C. P. (1994). Topical capsaicin as an adjuvant analgesic. *Journal of Pain & Symptom Management, 9*, 425-433.

Watson, C. P., & Evans, R. J. (1992). The postmastectomy pain syndrome and topical capsaicin: A randomized trial. *Pain, 51*, 375-379.

Wegener, T., & Lupke, N. P. (2003). Treatment of patients with arthrosis of hip or knee with an aqueous extract of devil's claw (Harpagophytum procumbens dc.). *Phytotherapy Research, 17*, 1165-1172.

Whitehouse, L. W., Znamirowska, M., & Paul, C. J. (1983). Devil's claw (Harpagophytum procumbens): No evidence for anti-inflammatory activity in the treatment of arthritic disease. *Canadian Medical Association Journal, 129*, 249-251.

Widespread ignorance of regulation and labeling of vitamins, minerals and food supplements, according to a national Harris interactive survey. (2002). Retrieved June 18, 2004, 2004, from http://harrisinteractive.com/news/allnewsbydate.asp?NewsID=560.

Wigler, I., Grotto, I., Caspi, D., & Yaron, M. (2003). The effects of Zintona EC (a ginger extract) on symptomatic gonarthritis. *Osteoarthritis & Cartilage, 11*, 783-789.

Zhang, W. Y., & Li Wan Po, A. (1994). The effectiveness of topically applied capsaicin. A meta-analysis. *European Journal of Clinical Pharmacology, 46*, 517-522.

Zuk, C. E. (2000). Herbal remedies are not dietary supplements: A proposal for regulatory reform. *Hastings Women's Law Journal, 11*, 29-57.