OVERVIEW
Peppermint is one of the most popular herbs for use in teas, flavorings, and candies. Both peppermint leaf and peppermint oil are official in the U.S. National Formulary, while peppermint water and peppermint spirit have official monographs in the United States Pharmacopeia. The U.S. is the world’s leading producer of peppermint oil, supplying more than 4,000 metric tons of oil annually. Three peppermint products are ranked among the top ten best-selling single-herb teas. Although the traditional use of peppermint is primarily as a tea to improve digestion, most clinical studies have investigated the actions of peppermint oil in enteric-coated capsules used internally to treat irritable bowel syndrome and externally to treat tension headache.

PRIMARY USES
Internal
Gastrointestinal
Crude Preparations
• Indigestion and relief of bloating due to excess gas production
• Spastic complaints of the gastrointestinal tract, gallbladder, and bile ducts
Essential Oil
• Non-ulcer or functional dyspepsia
• Irritable bowel syndrome
External
Neurology
Essential Oil
• Tension headaches (solutions rubbed on forehead and temples)

OTHER POTENTIAL USES
Internal
Essential Oil
• Catarrh of the respiratory tract and inflammation of the oral mucosa
• Colonic spasm during barium enema
• Colonic spasm during colonoscopy

External
Essential Oil
• Myalgia and neuralgia
• Fecal odor in patients with colostomies

PHARMACOLOGICAL ACTIONS
Internal
Crude Preparations: Antispasmodic action on the smooth muscles of the digestive tract; choleretic; carminative.
Essential Oil: Antispasmodic; carminative; chologenic; antibacterial; secretolytic/mucolytic; relaxes smooth muscle; relieves colonic spasms; carminative on lower esophageal sphincter.

External
Essential Oil: Analgesic in tension headache; menthol vapors stimulate cold receptors in nose.

DOSAGE AND ADMINISTRATION
The Health Canada labeling standard warns patients not to take peppermint internally for more than two weeks, or if symptoms recur when treating indigestion, unless directed by a healthcare provider. [EDITORS’ NOTE: In Canada, all non-prescription drugs are given a duration use related to the indicated condition. This is based on the reasoning that the patient should be checked by a healthcare practitioner to look for underlying causes if the symptoms have not cleared up in the specified time.] The German Standard License monograph warns that for acute gastrointestinal complaints that last for more than one week or recur periodically, the patient should see a healthcare provider.

Internal
Crude Preparations
DRIED LEAF: 1–4 g, 3 times daily after meals for flatulent digestive pains.
INFUSION: Approximately 150 ml of boiled water poured over 1.5 g of dried leaf, steeped for 5–10 minutes in a covered vessel, tea bag squeezed over the cup, can be administered 2–5 times daily on an empty stomach to relieve upset stomach.
TINCTURE: 2–5 ml, 3 times daily [1:5 (g/ml), 45% ethanol].
Essential Oil

**ESSENTIAL OIL:** 6–12 drops total daily dose [*Editors’ note: Caution: Peppermint oil is highly concentrated; therefore, divide into 3 doses and dilute in water or juice.*] 0.05–0.2 ml 3 times daily.

**ESSENTIAL OIL IN ENTERIC-COATED CAPSULE:** 0.2 ml oil (187 mg), 3 times daily with water before meals, for irritable colon.

**INHALANT:** 3–4 drops of essential oil added to hot water and the steam vapor inhaled deeply.

**Combination Preparations**

**ESSENTIAL OIL:** 90 mg peppermint oil and 50 mg caraway oil, 1 enteric-coated capsule, 3 times daily, before meals, for non-ulcer dyspepsia.

**External**

**Essential Oil**

**ESSENTIAL OIL:** Drops, diluted with lukewarm water or vegetable oil, rubbed in the affected skin areas.

**ESSENTIAL OIL:** 10 g in ethanol 90% solution, spread across forehead and temples. Repeated application after 15–30 minutes for tension headache.

**NASAL OINTMENT:** Semi-solid preparation containing 1–5% essential oil.

**TINCTURE:** Aqueous-alcoholic preparation containing 5–10% essential oil for local application.

**CONTRAINDICATIONS**

**CRUDE HERB:** Gallstones, esophageal reflux.

**ESSENTIAL OIL:** Achlorhydria (absence of free hydrochloric acid in gastric juice), obstruction of bile ducts, gallbladder inflammation, and severe liver damage. A healthcare provider should be consulted before using peppermint oil in cases of gallstones. Peppermint oil should not be used on the faces (particularly the noses) of infants and small children. Peppermint oil is contraindicated for infants and small children due to the potential risk of spasms of the tongue or respiratory arrest.

**PREGNANCY AND LACTATION:** No known restrictions.

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**ADVERSE EFFECTS**

Twelve cases of oral-contact sensitivity to peppermint oil and/or menthol have been reported in patients with intra-oral symptoms in association with burning-mouth syndrome, recurrent oral ulceration, or a lichenoid reaction.

**DRUG INTERACTIONS**

Menthol-containing preparations may interfere with gastrointestinal-stimulant drugs (e.g., cisapride) used to treat nighttime heartburn due to the reflux of stomach acid into the esophagus. Concurrent administration of peppermint oil with antacids or ingestion during meals can cause the oil to be released from capsules prematurely, resulting in a loss of effectiveness.

**CLINICAL REVIEW**

In twenty-three clinical studies on peppermint conducted on a total of 1,186 participants, all but one demonstrated positive results for various gastrointestinal and neurological conditions. These include 14 double-blind (DB) studies investigating the treatment of non-ulcer or functional dyspepsia, irritable bowel syndrome, spasm during barium enema, and tension headaches. In 1998, a meta-analysis of DB, placebo-controlled trials concluded that peppermint oil could provide symptomatic relief of irritable bowel syndrome, though the authors cited methodological flaws in most of the studies. In 2000, a systematic review of randomized, controlled trials concluded that using peppermint oil to treat irritable bowel syndrome requires further study.
Peppermint

Mentha × piperita L.  
[Fam. Lamiaceae]

Overview
Peppermint is one of the most popular herbs in teas, candies, and chewing gums. The U.S. is the world’s leading producer of peppermint oil, making an average of 4,117 tons annually. Although the traditional use is as a tea to improve digestion, most clinical trials have studied the oil in enteric-coated capsules used internally to treat irritable bowel syndrome and externally to treat tension headache.

Uses
**Internal:** Peppermint leaf: General indigestion and non-ulcer dyspepsia. Peppermint oil: Irritable bowel syndrome (enteric-coated capsules); colonic spasm during barium enema and during colonoscopy; catarrh of upper respiratory tract and inflammation of mucous linings of the mouth.

**External:** Peppermint oil: Tension headaches (oil solution rubbed on forehead and temples; use extreme caution with undiluted peppermint oil); for muscle and nerve pain (usually in the form of liniments).

Dosage
**Internal**

**Concentrated peppermint water:** 0.25–1.0 ml.

**Dried leaf:** 1–4 g, 3 times daily after meals for flatulent digestive pains.

**Infusion (tea):** Pour about 150 ml of boiled water over 1.5 g of dried leaf, steep for 5–10 minutes in a covered vessel, squeeze tea bag over the cup, and take 2–5 times daily on an empty stomach to relieve upset stomach.

**Peppermint spirit:** 20 drops (1 ml) with water.

**Tincture:** 2–5 ml; 3 times daily [1:5 (g/ml), 45% ethanol].

**Essential oil:** 6–12 drops total daily dose [EDITOR’S NOTE: Caution: Peppermint oil is highly concentrated; therefore, divide into 3 doses and dilute in water or juice.]; 0.05–0.2 ml 3 times daily.

**Essential oil in enteric-coated capsule:** 0.2 ml oil (187 mg), 3 times daily with water before meals for irritable colon.

**Inhalant:** 3–4 drops of essential oil added to hot water and the steam vapor inhaled deeply.

Combination Preparations
**Essential oil:** 90 mg peppermint oil and 50 mg caraway oil, 1 enteric-coated capsule, 3 times daily, before meals, for non-ulcer dyspepsia.

**External**

**Essential oil:** Spread on forehead and temples. Repeat after 15–30 minutes for tension headache.

**Essential oil:** Drops rubbed in the affected skin areas, should be diluted with lukewarm water or vegetable oil.

**Nasal ointment:** Semi-solid preparation containing 1–5% essential oil.

**Tincture:** Aqueous-alcoholic preparation containing 5–10% essential oil for local application.

Contraindications
**Crude herb:** Gallstones, esophageal reflux.

**Essential oil:** Achlorhydria (absence of free hydrochloric acid in gastric juice), obstruction of bile ducts, gallbladder inflammation, and severe liver damage. Consult with a healthcare provider before using peppermint oil in cases of gallstones.

Peppermint oil should not be used on the faces (particularly the noses) of infants and small children. Peppermint oil is contraindicated for infants and small children because of the potential risk of spasms of the tongue or respiratory arrest.

**Pregnancy and lactation:** No known restrictions.

Adverse Effects
No adverse effects are known. Oral-contact sensitivity to peppermint oil and/or menthol has caused side effects of burning-mouth syndrome, recurrent oral ulceration, or a skin condition known as lichenoid reaction.

Drug Interactions
Peppermint preparations may interfere with gastrointestinal-stimulant drugs (e.g., cisapride) used to treat nighttime heartburn. Use of peppermint oil capsules with antacids or during meals can cause the oil to be released prematurely, resulting in a loss of effectiveness.

Comments
When using a dietary supplement, purchase it from a reliable source. For best results, use the same brand of product throughout the period of use. As with all medications and dietary supplements, please inform your healthcare provider of all herbs and medications you are taking. Interactions may occur between medications and herbs or even among different herbs when taken at the same time. Treat your herbal supplement with care by taking it as directed, storing it as advised on the label, and keeping it out of the reach of children and pets. Consult your healthcare provider with any questions.

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**Peppermint**  
*Mentha x piperita* L.  
[Fam. Lamiaceae]

**OVERVIEW**

Peppermint is one of the most popular herbs for use in teas, flavorings, and confections (e.g., chewing gum and candies). Both peppermint leaf and peppermint oil are official in the U.S. *National Formulary*, while peppermint water and peppermint spirit have official monographs in the *United States Pharmacopeia* (USP, 2002). The U.S. is the world’s leading producer of peppermint oil (Fugmann *et al.*, 1997), supplying more than 4,000 metric tons of oil annually (NASS/USDA, 2000). Three peppermint products are ranked in the top ten list of best selling single-herb teas (SPINS, 2000). Although most traditional uses of peppermint are based on teas used as a digestive aid, most clinical studies have investigated the actions of peppermint oil in enteric-coated capsules used internally to treat irritable bowel syndrome (IBS) and externally to treat tension headache.

**DESCRIPTION**

Peppermint leaf preparations consist of the fresh or dried leaf of *Mentha x piperita* L. [Fam. Lamiaceae]. The whole, dried leaf must contain not less than 1.2% (ml/g), and the cut leaf must contain not less than 0.9% volatile oil (Ph.Eur., 1997). Peppermint oil consists of the essential oil, obtained by steam-distilling freshly harvested, flowering sprigs (Blumenthal *et al.*, 1998), and is neither partially, nor wholly dementholized (USP, 2002).

**PRIMARY USES**

**Internal**

**Gastrointestinal**

Crude Preparations

- Indigestion and relief of bloating due to excess gas production (Health Canada, 1996)
- Spastic complaints of gastrointestinal tract, gallbladder, and bile ducts (Blumenthal *et al.*, 1998; Braun *et al.*, 1996)

**Essential Oil**

- Non-ulcer or functional dyspepsia (Freise and Köhler, 1999; Madisch *et al.*, 1999; May *et al.*, 1996, 2000)

**External**

**Neurology**

Essential Oil

- Tension headaches (Göbel *et al.*, 1994, 1996)

**OTHER POTENTIAL USES**

**Internal**

Essential Oil

- Catarrh of the respiratory tract and inflammation of the oral mucosa (Blumenthal *et al.*, 1998)
- Colonic spasm during barium enema (Sparks *et al.*, 1995; Jarvis *et al.*, 1992)
- Colonic spasm during colonoscopy (Duthie, 1981; Leicester and Hunt, 1982)
- Fecal odor in patients with colostomies (McKenzie and Gallacher, 1989)

**External**

Essential Oil

- Myalgia and neuralgia (Blumenthal *et al.*, 1998)

**DOSAGE**

**Crude Preparations**

**Internal**

**CONCENTRATED PEPPERMINT WATER (BP):** 0.25–1.0 ml (BP, 1980; Karnick, 1994).

**DRIED LEAF:** 3–6 g (Blumenthal *et al.*, 1998); 2–3 g, 3 times daily after meals for flatulent digestive pains (Bradley, 1992) 2–4 g, 3 times daily (Health Canada, 1996).

**INFUSION:** Approximately 150 ml of boiled water poured over 1.5 g of dried leaf, steeped for 5–10 minutes in a covered vessel, tea bag squeezed over the cup, can be administered 2–5 times daily (Health Canada, 1996).

**Note:** Peppermint tea infusion yields ca. 21% of total available essential oil (Duband *et al.*, 1992). At 10 minutes of steeping time, the maximum amount of volatile oil is obtained including ca. 24% of the menthol and 19.5% of the menthone (Hänself *et al.*, 1992–1994; Meyer-Buchtel, 1999), on an empty stomach to relieve upset stomach (Robbers and Tyler, 1999).

**External**

**Essential Oil**

- Myalgia and neuralgia (Blumenthal *et al.*, 1998)

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300 The ABC Clinical Guide to Herbs
Peppermint spirit USP: 20 drops (1 ml) with water (Robbers and Tyler, 1999).

TINCTURE [1:5 (g/ml), 45% ethanol]: 5–15 ml (Blumenthal et al., 1998; Erg.B.6, 1953); 2–3 ml, 3 times daily (Bradley, 1992; Health Canada, 1996).

**Essential Oil**

**Internal**

**ESSENTIAL OIL:** 6–12 drops total daily dose, according to German Commission E (Blumenthal et al., 1998) [EDITORS’ NOTE: Caution: Peppermint oil is highly concentrated; therefore, divide into 3 doses and dilute in water or juice.]; 0.05–0.2 ml 3 times daily (Health Canada, 1996).

**ESSENTIAL OIL IN ENTERIC-COATED CAPSULE:** 0.2 ml oil (187 mg), 3 times daily with water before meals, for irritable colon (Morant and Ruppanner, 2001; Blumenthal et al., 1998; Krogh, 1989; Liu et al., 1997).

**External**

**ESSENTIAL OIL:** Drops rubbed in the affected skin areas, should be diluted with lukewarm water or vegetable oil (Blumenthal et al., 1998). 10 g in ethanol 90% solution, spread across forehead and temples. Repeated application after 15–30 minutes for tension headache (Göbel et al., 1996).

**INHALANT:** 3–4 drops of essential oil added to hot water and the steam vapor inhaled deeply (Blumenthal et al., 1998).

**NASAL OINTMENT:** Semi-solid preparation containing 1–5% essential oil (Blumenthal et al., 1998).

**TINCTURE:** Aqueous-alcoholic preparation containing 5–10% essential oil for local application (Blumenthal et al., 1998).

**Combination Preparations**

**Internal**

**ESSENTIAL OIL:** 90 mg peppermint oil, 50 mg caraway oil, in enteric-coated capsule, 1 capsule 3 times daily, with water before meals, for non-ulcer dyspepsia (Freise and Köhler, 1999; Madisch et al., 1999).

**Duration of Administration**

The Health Canada labeling standard warns patients not to take peppermint internally for more than two weeks, or if symptoms recur when treating indigestion, unless directed by a healthcare provider (Health Canada, 1996). [EDITORS’ NOTE: In Canada, all non-prescription drugs are given a duration use related to the indicated condition. This is based on the reasoning that the patient should be checked by a healthcare practitioner to look for underlying causes if the symptoms have not cleared up in the specified time.] The German Standard License monograph warns that for acute gastrointestinal complaints that last for more than one week or periodically recur, see a doctor (Braun et al., 1996).

**Chemistry**

Peppermint leaf contains up to 7% phenolic acids (caffeic, chlorogenic, and rosmarinic) (Bruneton, 1999); 3.5–4.5% labiate tannins; 0.5–4.0% terpene rich volatile oil, and flavonoids (glycosides of apigenin, diosmetin, and luteolin) (Hänsel et al., 1992–1994; Meyer-Buchtela, 1999). Peppermint oil (European pharmacopeial grade) must contain 30–55% menthol, 14–32% menthone, 2.8–10.0% menthyl acetate, 3.5–14.0% cineole, 1.5–10.0% isomenthone, 1–5% menthofuran, 1–5% limonene, and no more than 4% pulegone or 1% carvone (Ph.Eur., 1997).

**Pharmacological Actions**

**Human**

**Cruude Preparations:** Antispasmodic action on the smooth muscles of the digestive tract, choleric, carminative (Blumenthal et al., 1998; Bradley, 1992).

**Essential oil:** Antispasmodic, carminative, cholagogue, antibacterial, secretolytic/mucolytic (Blumenthal et al., 1998); relaxes smooth muscle (Micklefield et al., 2000); relieves colonic spasms (Leicester and Hunt, 1982); carminative on lower esophageal sphincter (Sigmund and McNally, 1969).

**External**

**Essential oil:** Analgesic in tension headache (Göbel et al., 1994, 1996); menthol vapors stimulate cold receptors in nose (Burrow et al., 1983).

**Internal**

**Animal**

Peppermint tea increases bile secretion (Steinmetzer, 1926); peppermint oil applied locally suppresses free acid flow (Necheles and Meyer, 1935); peppermint oil shortens emptying time of stomach by 46% (Sapoznik et al., 1935); and inhibits serum cholinesterase (Caujolle et al., 1944); flavonoids are choleric (Pasechnik, 1966; Pasechnik and Gella, 1966); aqueous extract acts as a sedative and diuretic (Della Loggia et al., 1990).

**In vitro**

Oil is bacteriostatic against Candida albicans, Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa (Koscik, 1955); and bactericidal against Bacillus anthracis and swine erysipelas bacteria (Abdullin, 1962) and isolated human coli (Taylor et al., 1984b). Leaf extract is antiviral against Newcastle disease (NDV), herpes simplex, vaccinia, Semliki Forest, and West Nile viruses (Herrmann and Kucera, 1967); flavonoids inhibit ileum muscular contractions and relax gastrointestinal smooth muscle (Lallement-Guilbert and Bézanger-Beaumesne, 1970; Hill and Aaronson, 1991); alcoholic extract is antispasmodic (Forster et al., 1980; Forster, 1983); and inhibits colonic motility (Taylor et al., 1984a).

**Mechanism of Action**

- The pharmacological actions are due partly to the volatile oil (Harries et al., 1978), to flavonoids and phenolic acids (Bruneton, 1999; Steinegger and Hänsel, 1988), and to the labiate tannins (Schilcher, 1997).
- Some studies have proposed that the mechanism for the carminative action is peppermint’s ability to reduce the tonus of the esophageal sphincter, releasing entrapped air (Demling and Steger, 1969; Giachetti et al., 1988).
- Based on in vitro experiments, the antispasmodic effect of the volatile oil is due to the inhibition of smooth muscle contractions through blocking calcium influx into muscle cells (Hawthorne et al., 1988; Hills and Aaronson, 1991; Taylor et al., 1984b). Based on in vitro experiments, the antispasmodic effect of the volatile oil is due to the inhibition of smooth muscle contractions through blocking calcium influx into muscle cells (Hawthorne et al., 1988; Hills and Aaronson, 1991; Taylor et al., 1984b). Based on in vitro experiments, the antispasmodic effect of the volatile oil is due to the inhibition of smooth muscle contractions through blocking calcium influx into muscle cells (Hawthorne et al., 1988; Hills and Aaronson, 1991; Taylor et al., 1984b).
- Peppermint inhibits enterocyte glucose uptake by direct action at the brush border membrane. In serous membranes, it inhibits the response to acetylcholine without reducing the effect of mucosal glucose. This is consistent with a reduced availability of calcium, which causes a relaxing effect on the intestinal smooth muscle (Beesley et al., 1996).
• After ingestion of an enteric-coated capsule, the menthol is not metabolized in the small or large intestine, but it reaches the colon. A third of the menthol is reabsorbed, and the rest acts locally on the smooth muscle. About 35% of the applied menthol is found in the urine after 24 hours (Morant and Ruppanner, 2001).

**CONTRAINDICATIONS**

**CRUDE HERB:** Gallstones (Blumenthal et al., 1998; Braun et al., 1996); esophageal reflux (Sigmund and McNally, 1969).

**ESSENTIAL OIL:** Achlorhydria (absence of free hydrochloric acid in gastric juice) (Morant and Ruppanner, 2001; Rees et al., 1979); obstruction of bile ducts, gallbladder inflammation, and severe liver damage. In case of gallstones, to be used only after consultation with a healthcare provider. Peppermint oil should not be used on the faces (particularly the noses) of infants and small children (Blumenthal et al., 1998). Peppermint oil is contraindicated for infants and small children due to the potential risk of spasms of the tongue or respiratory arrest (Schulz et al., 1998).

**PREGNANCY AND LACTATION:** No known restrictions (Blumenthal et al., 1998; McGuffin et al., 1997).

**ADVERSE EFFECTS**

None known according to Commission E (Blumenthal et al., 1998; Braun et al., 1996). Twelve cases of oral-contact sensitivity to peppermint oil and/or menthol have been reported in patients with intra-oral symptoms in association with burning-mouth syndrome, recurrent oral ulceration, or a lichenoid reaction (Morton et al., 1995).

**DRUG INTERACTIONS**

None known (Braun et al., 1996; Blumenthal et al., 1998; ESCOP, 1997). Menthol-containing preparations may interfere with gastrointestinal-stimulant drugs (e.g., cisapride) used to treat nighttime heartburn due to the reflex of stomach acid into the esophagus (Austin et al., 2000). Concurrent administration of peppermint oil with antacids or ingestion during meals can cause the oil to be released from capsules prematurely resulting in a loss of effectiveness (Morant and Ruppanner, 2001).

**AMERICAN HERBAL PRODUCTS ASSOCIATION (AHPA) SAFETY RATING**

**CLASS 1:** Herb that can be consumed safely when used appropriately (McGuffin et al., 1997).

**REGULATORY STATUS**

**AUSTRIA:** Dried leaf official in *Austrian Pharmacopoeia*, ÖAB 1990–1996 (Meyer-Buchtela, 1999; Reynolds et al., 1993; Wichtl, 1997).

**BELGIUM:** Permitted as Traditional Herbal Medicine (THM) digestive aid (Bradley, 1992; WHO, 1998).

**CANADA:** Peppermint Leaf Labeling Standard: Schedule OTC Traditional Herbal Medicine as an aid to digestion (Health Canada, 1996). Also permitted as a homeopathic drug. In both cases requires premarket authorization and assignment of a Drug Identification Number (DIN) (Health Canada, 2001). Food ingredient without claim (Health Canada, 1997).

**EUROPEAN UNION:** Whole, dried leaf containing no less than 1.2% essential oil; cut, dried leaf containing not less than 0.9% essential oil; and steam-distilled oil from fresh, flowering, aerial parts are official in the *European Pharmacopoeia* (Ph.Eur., 1997).


**GERMANY:** Peppermint leaf and oil are approved drugs of the Commission E monographs (Blumenthal et al., 1998). Peppermint leaf tea is an approved drug in the German Standard License monographs (Braun et al., 1996).

**ITALY:** Dried leaf official in *Italian Pharmacopoeia* (Reynolds et al., 1993).

**RUSSIAN FEDERATION:** Dried leaf official in the *State Pharmacopoeia of the Union of Soviet Socialist Republics*, Ph.USSR X (Bradley, 1992; Reynolds et al., 1993).

**SWITZERLAND:** Dried leaf official in *Swiss Pharmacopoeia* Ph.Helv.VII (Reynolds et al., 1993; Wichtl, 1997). Peppermint oil is a Category C nonprescription drug with sale limited to pharmacies. Peppermint tea is a Category D nonprescription drug with sale limited to pharmacies and drugstores (Morant and Ruppanner, 2001; WHO, 1998).


**U.S.:** Generally Recognized as Safe (GRAS) (US FDA, 1998). Dietary supplement or conventional food depending on label claim statement (USC, 1994). Peppermint leaf and oil have official monographs in the *National Formulary*. Peppermint water and peppermint spirit have official monographs in the *United States Pharmacopeia* (USP, 2002).

**CLINICAL REVIEW**

Twenty-three studies (1,185 total participants) are outlined in the following table, “Clinical Studies on Peppermint.” All but one of these studies (Nash, et al., 1986) demonstrated positive results for various gastrointestinal and neurological conditions. Included are 14 double-blind (DB) studies investigating treatment of non-ulcer or functional dyspepsia (Freise and Köhler, 1999; Madisch et al., 1999; May et al., 1996, 2000), IBS (Liu et al., 1997; Carling et al., 1989; Lawson et al., 1988; Nash et al., 1986; Dew et al., 1984; Rees et al., 1979); spasm during barium enema (Sparks et al., 1995); and tension headaches (Göbel et al., 1998). In 1998, a meta-analysis of DB, placebo-controlled trials indicated that peppermint oil could provide symptomatic relief of IBS, though the authors cited methodological flaws in most of the studies (Pittler and Ernst, 1998). In 2000, a systematic review of randomized, controlled trials concluded that peppermint oil for irritable bowel syndrome requires further study (Jailwala et al., 2000).

**BRANDED PRODUCTS**

Enteroplast®: Dr. Willmar Schwabe Pharmaceuticals / International Division / Willmar Schwabe Str. 4 / D-76227 Karlsruhe / Germany / Tel: +49-721-4005 ext. 294 / www.schwabepharma.com / Email: melville-caves@schwabe.de.

Enterico-coated capsules containing 90 mg peppermint leaf oil and 50 mg caraway seed oil.

Euminz®: Lichtwer Pharma AG / Wallenroder Strasse 8-14 / 13435 Berlin / Germany / Tel: +49-30-40-3700 / Fax: +49-30-40-3704-49 / www.lichtwer.de. Liquid preparation containing 10 g of peppermint leaf oil and ethanol (30%).

Peppermint oil BP: Manufacturer information unavailable.

*American equivalents, if any, are found in the Product Table beginning on page 398.

REFERENCES


BP: See: British Pharmacopoeia.


ESCOP: See: European Scientific Cooperative on Phytotherapy.


GSL: See: General Sale List.


Herrmann E, Kucera L. Antiviral substances in plants of the mint family (Mentha). Pharmazie 1993;48(1):2410.


Ph.Eur. 3. See: Europäisches Arzneibuch.

Ph.Eur. See: European Pharmacopoeia.


SPINS. See: Spence Information Services.


USC. See: United States Congress.

US FDA. See: United States Food and Drug Administration.

USP. See: United States Pharmacopoeia.


WHO. See: World Health Organization.


### Gastrointestinal

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Subject</th>
<th>Design</th>
<th>Duration</th>
<th>Dosage</th>
<th>Preparation</th>
<th>Results/Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tate, 1997</td>
<td>Postoperative nausea</td>
<td>R, PC, Cm, n=18 patients</td>
<td>3 days (day of operation and 2 postoperative days)</td>
<td>Essential peppermint oil vs. peppermint essence (placebo) vs. no treatment</td>
<td>Peppermint oil vs. peppermint essence (placebo) vs. no treatment</td>
<td>Using Mann-Whitney U-test, symptom improvement in peppermint oil group was significantly better (p&lt;0.05) compared to placebo. In peppermint group 79% experienced alleviation of severity of abdominal pain (29 were pain-free); 83% had less abdominal distension, 83% had reduced stool frequency; 73% had fewer borborygmi; 79% had less flatulence. Colpermin® peppermint leaf oil was effective and well-tolerated.</td>
</tr>
<tr>
<td>Liu et al., 1997</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>P, R, DB, PC, n=110</td>
<td>4 weeks</td>
<td>1 capsule, 3–4x/day, 15–30 minutes before meals vs. placebo</td>
<td>Colpermin® enteric-coated capsule containing 187 mg peppermint oil vs. placebo</td>
<td>Significant decrease in spasm was observed in treatment group (60%) compared with control group (35%) (p&lt;0.001). Fewer in peppermint group required intravenous buscopan (5 vs. 9) or exhibited spasm (23 vs. 39). Authors concluded that addition of peppermint oil to barium suspension appears to reduce incidence of colonic spasm during examination. Technique is simple, safe and economical and may lessen the need for intravenous administration of spasmolytic agents.</td>
</tr>
<tr>
<td>Sparks et al., 1995</td>
<td>Spasm during barium enema</td>
<td>R, DB, C, n=141, mean age=60 years</td>
<td>3 days bowel preparation before 1 day treatment and examination</td>
<td>Barium suspension with added peppermint oil, 1x/day vs. standard barium sulfate</td>
<td>Barium suspension with 370 ml water and 30 ml peppermint preparation (16 ml peppermint oil BP and 0.4 ml polysorbate) plus 10 ml peppermint preparation added to enema tubing</td>
<td>Two-thirds of patients enrolled in the stress management program found it effective in relieving symptoms (p=0.002) and experienced fewer attacks (p=0.004), of less severity, with benefit maintained for at least 12 months compared to the Colpermin® group.</td>
</tr>
<tr>
<td>Shaw et al., 1991</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>R, C, n=35</td>
<td>Average of 6, 40-minute sessions with physiotherapist over 6 months</td>
<td>40 minutes of stress management program vs. treatment with Colpermin® enteric-coated capsule containing 187 mg peppermint oil vs. conventional management</td>
<td>Stress management program vs. treatment with Colpermin® enteric-coated capsule containing 187 mg peppermint oil vs. conventional management</td>
<td>Evaluation of all signs and symptoms, both pre-treatment and post-treatment, confirmed statistically significant decrease of symptoms.</td>
</tr>
<tr>
<td>Fernández, 1990</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>O, MC, n=50</td>
<td>4 weeks</td>
<td>1 capsule, 3x/day, 30 minutes before meals</td>
<td>Capsule containing 0.2 ml peppermint oil</td>
<td>Two-thirds of patients enrolled in the stress management program found it effective in relieving symptoms (p=0.002) and experienced fewer attacks (p=0.004), of less severity, with benefit maintained for at least 12 months compared to the Colpermin® group.</td>
</tr>
<tr>
<td>McKenzie and Gallacher, 1989</td>
<td>Trial 1: Fecal odor in colostomy bags; Trial 2: Effect on colostomy acceptance</td>
<td>O, U, Trial 1: n=10 patients, Trial 2: n=20 patients</td>
<td>Trial 1: 1 day starting on third post-operative day</td>
<td>Capsule containing 0.2 ml peppermint oil in a thixotropic paste (brand not stated)</td>
<td>Enteric-coated capsule containing peppermint oil vs. placebo</td>
<td>Trial 2: 14 of 20 patients found odor improved and 1 found it worse. 15 found their colostomies more acceptable and wished to continue taking peppermint. Consistency of feces and frequency of bag-changing appeared to improve.</td>
</tr>
<tr>
<td>Carling et al., 1989</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>R, DB, CO, n=40</td>
<td>2 weeks</td>
<td>Enteric-coated capsule containing 0.2 ml peppermint oil vs. 0.2 mg hyoscyamine or placebo</td>
<td>Peppermint oil treatment tended to have more pronounced effect on symptoms than placebo or hyoscyamine but was not statistically significant. Findings favor the short-term use of enteric-coated peppermint oil as an antispasmodic for IBS.</td>
<td></td>
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</table>

**KEY:** C = controlled; CC = case-control; CH = cohort; CI = confidence interval; CM = comparison; CO = crossover; CS = cross-sectional; DB = double-blind; E = epidemiological; LC = longitudinal cohort; MA = meta-analysis; MC = multi-center; n = number of patients; O = open; OB = observational; OL = open label; OR = odds ratio; P = prospective; PB = patient-blind; PG = placebo-controlled; PG = parallel group; PS = pilot study; R = randomized; RC = reference-controlled; RCS = retrospective cross-sectional; RS = retrospective; S = surveillance; SB = single-blind; SC = single-center; U = uncontrolled; UP = unpublished; VC = vehicle-controlled.

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**Clinical Studies on Peppermint (Mentha x piperita L.)**

Statistically significant differences were demonstrated on day of operation using Kruskal-Wallis test (p=0.0487). Using Mann-Whitney U-test, a difference between placebo and experimental groups was shown (U=3; p=0.02). Experimental group required less conventional antiemetics and received more opioid analgesia postoperatively. Author concludes that peppermint oil may improve postoperative nausea in gynecological patients.
### Clinical Studies on Peppermint (*Mentha x piperita* L.) (cont.)

<table>
<thead>
<tr>
<th>Author/Year</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lawson et al., 1988</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>R, DB, CO n=18</td>
<td>4 weeks</td>
<td>3 capsules, 3x/day</td>
<td>Enteric-coated capsule containing 0.2 ml peppermint oil (brand not stated)</td>
<td>Peppermint group had small, but statistically significant increase in frequency of defecation but no significant change in scores for global severity of symptoms or scores for specific symptoms of pain, bloating, urgent defecation, and sensation of incomplete evacuation.</td>
</tr>
<tr>
<td>Nash et al., 1986</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>R, DB, PC, CO n=34</td>
<td>4 weeks</td>
<td>2 capsules, 3x/day</td>
<td>Capsule containing 0.2 ml peppermint oil vs. placebo</td>
<td>In terms of overall symptoms, patients' assessments at end of 2 and 4 weeks of treatment showed no significant difference between peppermint oil and placebo.</td>
</tr>
<tr>
<td>Dew et al., 1984</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>R, DB, PC, CO, MC n=29 mean age 42 years</td>
<td>2 weeks</td>
<td>1–2 capsules, 3x/day</td>
<td>Elanco LOK gelatin capsules containing 0.2 ml peppermint oil coated with cellulose acetate phthalate vs. placebo</td>
<td>Patients in peppermint group were relieved of symptoms, while the number of their daily bowel movements was unaffected. Patients felt significantly better while taking peppermint compared with placebo (p&lt;0.001) and considered peppermint better than placebo in relieving abdominal symptoms (p=0.001). Study suggested beneficial effect of peppermint for treatment of IBS based on patient data.</td>
</tr>
<tr>
<td>Somerville et al., 1984</td>
<td>Pharmacokinetics of peppermint oil in spastic colon syndrome</td>
<td>Cm, U n=12 6 healthy volunteers (17–37 years) and 6 ileostomy patients (22–49 years)</td>
<td>24 hours</td>
<td>2 capsules, 3x/day</td>
<td>Colpermin® enteric-coated capsule containing 187 mg peppermint oil vs. peppermint oil in soft-gel capsules</td>
<td>Total 24-hour urinary excretion of menthol was similar in both preparations, but peak menthol excretion levels were lower and were delayed with enteric-coated capsule vs. soft gelatin capsules. Menthol excretion was reduced in ileostomy patients taking enteric-coated capsules, and moderate amounts of unmetabolized menthol were recovered from ileostomy effluent. Enteric-coated capsules can deliver unmetabolized oil directly to the colon.</td>
</tr>
<tr>
<td>Leicester and Hunt, 1982</td>
<td>Colonic spasm during endoscopy</td>
<td>U n=20</td>
<td>1 day</td>
<td>Peppermint oil injected along the biopsy channel of colonoscope into lumen of colon, 1x</td>
<td>Peppermint oil BP</td>
<td>Peppermint oil caused a relaxant effect on gastrointestinal tract that relieved colonic spasms within 30 seconds after injection in all 20 patients, allowing easier passage of the instrument or assisting in polypectomy.</td>
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<tr>
<td>Duthie, 1981</td>
<td>Colonic motility</td>
<td>R, PC, CO n=6</td>
<td>1 day</td>
<td>Peppermint oil injected into the lumen of the colon, 1x</td>
<td>Peppermint oil 0.2 ml in 50 ml of 0.9% sodium chloride with 1 in 10,000 polysorbate as suspending agent vs. vehicle alone (placebo)</td>
<td>Period of inhibition of all motor activity in all 6 subjects began within 2 minutes of peppermint oil administration lasting 7–23 minutes (mean 12 minutes). Decrease in percentage activity and motility index seen in all 6 subjects during first 10 minutes after introducing oil. Differences were statistically significant (actual statistics not stated). Decrease in motility index 10–20 minutes after oil was also statistically significant.</td>
</tr>
<tr>
<td>Rees et al., 1979</td>
<td>Irritable bowel syndrome (IBS)</td>
<td>DB, PC, CO n=16</td>
<td>6 weeks</td>
<td>1–2 capsules, 3x/day</td>
<td>Elanco LOK gelatin capsules containing 0.2 ml peppermint oil coated with cellulose acetate phthalate vs. placebo</td>
<td>Overall assessment showed that patients felt significantly better (p&lt;0.01) during peppermint treatment period compared to placebo and considered peppermint oil more effective than placebo in relieving abdominal symptoms (p&lt;0.005).</td>
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## Gastrointestinal Combination Preparations

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<tr>
<td>Freise and Köhler, 1999</td>
<td>Non-ulcer dyspepsia</td>
<td>P, Cm, R, DB, C, MC n=223</td>
<td>29 days plus a 1-week washout phase before study</td>
<td>1 capsule, 3x/day with water before meals</td>
<td>Enteroplant® enterico-coated capsule; 90 mg peppermint oil and 50 mg caraway oil vs. non-enterico-coated capsule of peppermint-caraway oil combination</td>
<td>Statistically significant decline in pain intensity observed in both groups. Equivalent efficacy of both preparations was demonstrated (p=0.001). Concomitant variable results were similar in both groups. Test preparation significantly better (p= 0.04) in pain frequency. Authors conclude that the enterico-coated capsule provides an advantage over the acid-soluble formulation because it not only reduces pain intensity, it also potentially decreases the number of side effects, including nausea and eructation, with peppermint taste.</td>
</tr>
<tr>
<td>Madisch et al., 1999</td>
<td>Functional dyspepsia</td>
<td>Cm, R, DB, C, MC n=118</td>
<td>4 weeks plus a 1-week washout phase before study</td>
<td>1 capsule, 2x/day with water, morning and noon, plus 1 placebo capsule/day in evening vs. 10 mg cisapride, 3x/day before meals</td>
<td>Enteroplant® enterico-coated capsule; 90 mg peppermint oil and 50 mg caraway seed oil vs. entero-soluble formulation containing 36 mg peppermint oil and 20 mg caraway oil</td>
<td>Reduction in visual analogue scale (VAS) pain intensity scores was comparable with drop of 4.62 points in peppermint/caraway group and 4.60 points in cisapride group (p=0.021). Reduction in frequency of VAS pain scores was equivalent by week 4 (p=0.0034). Flatulence decreased in peppermint group by 71.8% and 65.7% in cisapride group. Treating physicians concluded that 78.6% of peppermint group were very much or much improved compared to 70.9% in cisapride group. Peppermint/caraway oil preparation provides comparable effect to cisapride, is well-tolerated, is only one quarter the cost of cisapride therapy, and has fewer potential side effects.</td>
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<tr>
<td>May et al., 1996</td>
<td>Non-ulcer dyspepsia for at least 14 days</td>
<td>R, DB, PC, PG, MC n=45 mean age Enteroplant group=42 years, mean age placebo=47 years</td>
<td>4 weeks</td>
<td>1 capsule, 3x/day with water before meals</td>
<td>Enteroplant® enterico-coated capsule; 90 mg peppermint oil and 50 mg caraway seed oil vs. placebo</td>
<td>Clinical Global Impression (CGI) values were improved in 94.7% of treatment group vs. 55% placebo group (p=0.004). In treatment group, 63.2% were pain-free compared to only 25% in placebo group (p=0.005). Improvement in pain intensity was 89.5% in treatment group vs. 45% in placebo group (p=0.015). Authors conclude that treatment was equally successful for patients diagnosed with IBS and dyspepsia and that Enteroplant® has a risk-to-benefit ratio more favorable than standard treatment with synthetic chemical medcements.</td>
</tr>
<tr>
<td>May et al., 2000</td>
<td>Functional dyspepsia</td>
<td>R, DB, PC n=96</td>
<td>4 weeks</td>
<td>1 capsule, 2x/day with water before meals</td>
<td>Enteroplant® (PCC) enterico-coated capsule; 90 mg peppermint oil and 50 mg caraway seed oil vs. placebo</td>
<td>Primary efficacy variables were the intra-individual change in (1) pain intensity, and (2) sensation of pressure, heaviness, and fullness between days 1 and 29, and the investigators' rating of (3) global improvement. (Clinical Global Impressions [CGI] item 2) on day 29. The average intensity of pain was reduced by 40% vs. baseline in the PCC group and by 22% in the placebo group. Regarding pressure, heaviness, and fullness, a 43% reduction was observed for PCC vs. 22% for placebo. In CGI item 2, 67% (p=0.004). In treatment group, 63.2% were pain-free compared to only 25% in placebo group (p=0.005). Improvement in pain intensity was 89.5% in treatment group vs. 45% in placebo group (p=0.015). Authors conclude that treatment was equally successful for patients diagnosed with IBS and dyspepsia and that Enteroplant® has a risk-to-benefit ratio more favorable than standard treatment with synthetic chemical medications.</td>
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<td>Sullivan et al., 1998</td>
<td>Effects on vigilance performance in brain injury</td>
<td>R, C</td>
<td>30-minute vigilance task</td>
<td>Periodic whiffs of peppermint-scented air delivered by pumps that force air through plastic tubing into a glass reservoir</td>
<td>Peppermint-scented air vs. unscented air</td>
<td>Under fragrance conditions, controls reduced frequency of commissive errors (false alarms) over course of vigil, an adaptive strategy given the low probability of signals employed. False alarm rate of observers with brain injury increased precipitously toward end of vigil in unscented air condition. Exposure to scent of peppermint rendered false alarm scores of observers with brain injury similar to controls, a result that is consistent with evidence that olfactory stimulation activates brain areas vital for planning and judgement.</td>
</tr>
<tr>
<td>Gobel et al., 1996</td>
<td>Tension headaches</td>
<td>R, DB, PC, Cm, CO</td>
<td>Four headache episodes per patient</td>
<td>Topical application of peppermint oil or placebo solution to forehead and temples, repeated 1x after 15 or 30 minutes vs. oral 1,000 mg acetaminophen or 1,000 mg placebo vs. simultaneous application of 1,000 mg acetaminophen and 10% peppermint oil in ethanol solution</td>
<td>Euminox® (containing 10 g peppermint oil with ethanol 90%) vs. Paracetamol® (500 mg acetaminophen) vs. 90% ethanol solution with traces of peppermint oil for blinding purposes</td>
<td>Study involved analyses of 164 headache attacks of patients suffering from tension headaches. Compared to placebo, peppermint leaf oil significantly reduced clinical headache intensity within 15 minutes (p&lt;0.01) with a continuing effect over the one hour observation period. No significant difference between acetaminophen and peppermint. Simultaneous acetaminophen and peppermint use did not result in significant additive effect. Authors conclude that peppermint oil efficiently alleviates tension-type headaches as well as acetaminophen. It is well-tolerated and a cost-effective alternative to conventional therapies.</td>
</tr>
<tr>
<td>Gobel et al., 1994</td>
<td>Neurophysiological, psychological, and experimental algesimetric parameters</td>
<td>Cm, CO, R, DB, PC</td>
<td>1 day</td>
<td>Oil and ethanol mixture applied to forehead and temples with small sponge</td>
<td>Peppermint oil and ethanol</td>
<td>Peppermint oil demonstrated significant analgesic effect with reduction in sensitivity to headache. Peppermint oil with eucalyptus oil had little influence on pain sensitivity but increased cognitive performance and had a muscle-relaxing and mentally relaxing effect.</td>
</tr>
<tr>
<td>Warm et al., 1991</td>
<td>Effects on signal detectability in tasks demanding sustained attention</td>
<td>R, C</td>
<td>40 minutes divided into 4 consecutive 10-minute periods</td>
<td>Repeated exposure time of 150 milliseconds per 10-minute period</td>
<td>Peppermint-scented air vs. muguet-scented air (International Flavors and Fragrances, Inc.) vs. unscented air</td>
<td>A statistical difference was found between groups exposed to air scented with fragrance of peppermint (p&lt;0.05) or muguet (p&lt;0.05) vs. placebo. Authors concluded that this scented air can enhance rate of signal detections in a vigilance task without a concomitant increase in errors of commission vs. placebo. It is suggested that exposure to fragrance may serve as an effective form of ancillary stimulation in tasks demanding close attention for prolonged periods.</td>
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