

Peppermint (*Mentha piperita* L.) Essential Oil in Systemic and Oral Health

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Abstract

Peppermint has been used since antiquity as a flavorant, but the oil also has been used for thousands of years to treat a variety of systemic health and skin conditions. Although the chemical make-up is complex, the primary components of the oil are the monoterpenes menthol and menthone together with various other terpenes.

The traditional medicinal use of peppermint oil has been to treat digestive disorders, especially irritable bowel syndrome (IBS) and as an anti-spasmodic, the latter being due to the effect of menthol on 5-HT₃ receptors. The ability of peppermint to disrupt biofilms and its antifungal activity has stimulated its use in dentistry and oral care.

Various clinical studies indicate that peppermint can markedly benefit participation in sports and athletic activities, inducing enhanced strength and performance.

There are indications that ingested peppermint oil can interact with certain prescription medications that are metabolized by the hepatic system, these include cyclosporin and Cytochrome P450 1A2 as well as some anti-depressants, the anti-psychotic drug haloperidol, anti-nausea drugs, the beta-blocker propranolol and hypertensives and angina drugs. There do not appear to be any problems of interactions with medications associated with drinking mint tea or with topical use of peppermint oil.

Keywords: Irritable Bowel Syndrome (IBS); Peppermint Oil; Mint Tea

The peppermint plant has been used by man since antiquity. Traditional and modern uses of peppermint leaves and oil include flavoring of foods and beverages and as a fragrance in soaps and cosmetics. Although the predominant use of peppermint oil in the USA is flavoring for candy, chewing gum and toothpaste, there has been increasing world-wide interest in the medicinal benefits of peppermint in recent decades.

The peppermint plant

Although the genus *Mentha* comprises over 25 species within the *Lamiaceae* family, the most commercially used species is peppermint which has the scientific name *Mentha piperita* (or *Mentha x piperita*, the "x" denoting that it is a hybrid). The peppermint plant has a variety of common names, including brandy mint, *Herba menthae*, *Mentha piperita*, mint, mint balm and Western peppermint. The harvested leaves typically are processed by steam distillation to produce worldwide some 2600 tons per year and the essential oil is also known as Peppermint Extract, Extract of *Mentha Piperita*, Extract of Peppermint, Extrait de Feuilles de Menthe de Poivrée and Peppermint Leaf Extract. In the context of this paper, "peppermint essential oil" refers to the essential oil extracted from *Mentha piperita*.

India produces about 550 tons of *M. piperita* but a far greater amount, roughly 60,000 tons, of *M. arvensis* each year. *Mentha arvensis*, also known as Japanese mint, cornmint, field mint and wild mint, is a species within the mint family *Lamiaceae*. Interestingly, in India and

elsewhere, farmers prefer to grow cornmint (*Mentha arvensis*) instead of peppermint (*Mentha piperita*) because the former generates a higher price per acre. This price/value differential arises from differences in the menthol content of cornmint (70 - 80%) compared to that of peppermint (35 - 45%). Nevertheless, despite the high menthol contents of cornmint essential oil and even DMO, these EOs are not peppermint and do not exert the same therapeutic effects.

Spearmint, one of the plants involved in the creation of the *Mentha x piperita* hybrid, also has several common names, notably garden mint, common mint, lamb mint and mackerel mint. Although originally native to the Balkans and Turkey, it is now found throughout Europe, Asia, parts of Africa, and North and South America. The annual United States production of spearmint (*M. spicata*) is about 750 tons and that of Scotch spearmint (*M. cardiaca*) is about 300 tons each year.

Interestingly, the wild mint (*Mentha longifolia*) and which has the common name of horse mint is a mint species native to Europe (but not to Great Britain and Ireland), Western and Central Asia as well as Northern and Southern Africa. This *Mentha* species, like all varieties of mint, has antibacterial properties and apparently is an ingredient in workout and recovery supplements used in the body-building industry. The underlying theory is that it helps to increase the amount of testosterone in the body which, in turn, builds muscle mass and promotes faster and more complete post-exercise recovery. However, there is very limited data on this subject and what is available appears to be based on a short-term study with a small number of participants [1]. Accordingly, not only is this oft-touted application of peppermint questionable, the effects on testosterone levels appear to be short-term if indeed they actually exist and it has not received FDA approval.

On the other hand, many experimental studies and clinical evaluations [2-4] indicate that only the essential oil obtained from *Mentha piperita* appears to possess the health benefits that are described in this article. Further, as discussed later, there are known and scientifically-validated benefits in exercise performance found with peppermint and spearmint.

Chemical composition

Peppermint essential oil has a complex chemical make-up which varies on an annual basis depending upon where it was grown, the local soil and climate conditions as well as the harvesting and extraction conditions [2]. Dried peppermint leaf typically contains 0.3 - 0.8% of volatile oil and the approximate contents of the major chemical components are indicated in table 1. There are small amounts of many other components, including the terpenes limonene, pulegone, caryophyllene, viridiflorol and pinene [3]. In addition to menthol and menthone, peppermint oil also contains other terpenoids and flavonoids such as eriocitrin, hesperidin and kaempferol 7-O-rutinoside [5].

Major components	Approximate content (%)
Menthol	32 - 49
Menthone	13 - 28
Methyl acetate	2 - 8
Menthofuran	1 - 8
1,8-Cineol	3 - 8

Table 1: Major chemical components of peppermint oil (ranges per ISO 856).

It is the variety and biochemical versatility of these various components that make peppermint oil such a useful culinary ingredient and healthcare adjunct. Peppermint oil is commercially available as an herbal supplement and can be taken orally or used topically as a skin ointment. Unfortunately, although there is at least one ISO standard for herbals (ISO 18664:2015) that specifies determination methods of lead, arsenic, cadmium and mercury in herbal medicines used in Traditional Chinese Medicine (TCM), many herbal compounds and supplements are reportedly contaminated with toxic metals or other components. Accordingly, consumers should only purchase herbal and healthcare supplements from a reliable source to minimize the risk of ingesting or topically applying contaminated or adulterated products. It is also worth mentioning that unscrupulous suppliers will sell synthetic menthol and extracts of *M. arvensis* as peppermint.

Peppermint oil in healthcare

Lamiaceae is one of the most important botanical families used as sources of essential oils because of their antioxidant and antimicrobial properties [2,3,6,7] and this family includes rosemary, thyme, sage and peppermint. The growing scientific interest and active research into aromatic plants and their derived essential oils has been discussed elsewhere in detail [2,3,8].

Peppermint has been used throughout the ages to flavor beverages and food, but peppermint oil also has been used for thousands of years to treat a variety of systemic health and skin conditions (Table 2).

<p>Digestive problems</p> <ul style="list-style-type: none"> • Irritable bowel syndrome • Indigestion • Heartburn • Cramping of the upper GI tract and bile ducts • Diarrhea • Flatus • Nausea • Vomiting <p>Respiratory issues</p> <ul style="list-style-type: none"> • Colds • Coughs • Inflammation of the mouth and throat • Sinus and respiratory infections <p>Skin conditions</p> <ul style="list-style-type: none"> • Itching • Shingles pain • Rashes <p>Other conditions</p> <ul style="list-style-type: none"> • Pain • Dysmenorrhea (menstrual pain). • Migraines • Hot flashes
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Table 2: Medical uses of peppermint oil.

Despite the claimed anecdotal and apocryphal effectiveness of peppermint in Traditional Medicine^a, many of the purported health benefits in table 2 are not supported by clinical research. Nevertheless, modern medicinal applications of peppermint oil therapy include anti-spasmodic action during endoscopic and colon examinations. Peppermint extract is also used to provide relief for periodontal disease, oral malodor, muscle pain, toothache and the pain associated with shingles and to treat a variety of skin conditions. Further, peppermint oil has been used in CAM to treat gastric and digestive problems (see below) as well as for tension headaches, nausea and discomfort during breast feeding. In the latter case, topical peppermint oil apparently alleviates soreness from cracked nipples caused by nursing.

There are studies that report that the administration of peppermint aroma improves performance in clerical tasks [9]. The study findings suggest that peppermint odor may promote a general stimulation of attention such that participants remained focused on their task and increased performance. Interestingly, peppermint inhalation did not appear to affect duration of working time or memorization. Nevertheless, this rather dated study certainly deserves to be revisited since its findings may offer significant advantages in today's high pressure world and the need for repetitive procedures to be performed by so many different categories of workers.

A recent study [10] evaluated the efficacy of peppermint extract in treating dysmenorrhea compared to a standard approach with mefenamic acid (Ponstel®). Although peppermint extract had little effect on the amount of bleeding, it was found to reduce pain and other clinical signs and symptoms of dysmenorrhea but without the side effects of pharmaceutical agents. The effectiveness of the peppermint treatment was ascribed to its menthol content, with the analgesic effect being due to its effect on a group of temporary protein receptors.

Interestingly, it has been suggested that topical application of peppermint oil and inhalation peppermint oil aroma may be effective in the treatment of tension headaches and migraine [8,11]. Whether this pain relief is due to transdermal permeation of the oil or a combination of aromatherapeutic and psychological effects is unknown. There is, however, clinical research indicating that peppermint aroma enhances cognitive performance and memory while increasing alertness [12]. In contrast, ylang-ylang impaired memory and lengthened processing speed but whereas peppermint increased alertness and ylang-ylang decreased it but significantly increased calmness [11].

Digestive problems

Peppermint leaf and peppermint oil both have a long history of use in traditional medicine for digestive disorders, with peppermint oil being used as a digestive aid and to treat irritable bowel syndrome (IBS) [13,14] and heartburn [15].

Irritable bowel syndrome (IBS) is a common gastric/digestive disorder frequently encountered in medical practices. Effective medical (pharmaceutical) interventions in the clinical treatment of IBS are limited and, consequently, the focus is largely focused on symptom control. The literature on the use of peppermint oil to treat irritable bowel syndrome indicates that clinical studies appear to yield variable results although it is possible that patients in some trials may have been suffering from such conditions as celiac disease, lactose intolerance or even bacterial overgrowth within the small intestine, all of which can produce symptoms similar to IBS [13].

In a detailed and the most comprehensive meta-analysis to date [16], it was found that peppermint oil was a safe and effective therapy for pain and multiple symptoms in adults with IBS. This report confirmed the findings of a comparable and earlier systematic review and meta-analysis [17] of the efficacy and safety of enteric-coated peppermint oil capsules for the treatment of active IBS. In 9 clinical studies involving 726 patients, peppermint oil was significantly superior to placebo for improving IBS symptoms whereas this same review also indicated that in 5 studies involving 392 patients, there was a marked improvement in abdominal pain. It appears that although peppermint oil patients were more likely to experience an adverse event such as heartburn, these adverse reactions were mild and transient in nature. The overall conclusion was that peppermint oil is a safe and effective short-term treatment for IBS.

^aTraditional or folk medicine is commonly referred to as Alternative and Complementary Medicine or CAM.

These reviews and meta-analyses confirmed previously reported studies on the effectiveness of peppermint oil in treating IBS [18-20]. The conclusions of these earlier studies were that peppermint may be the medicament of first choice to alleviate general symptoms and to improve quality of life in IBS patients with non-serious constipation or diarrhea. A slightly later clinical double-blind study likewise showed that a 4-week treatment with peppermint oil improved abdominal symptoms in IBS patients [21].

Despite the long history of ingesting peppermint oil for its beneficial impact on digestion and IBS, the actual mechanism of action is not clear although the indications are that it is associated with its menthol and menthone content. In particular, the active principle ingredient in peppermint oil is the cyclic monoterpene menthol which has anti-spasmodic properties due to its ability to block the calcium channel of intestinal smooth muscles [12,14]. More recent research [22] indicated that menthol at pharmacologically appropriate levels is an allosteric^b inhibitor of 5-HT₃ receptors.

Other researchers [23] suggest that peppermint oil may have several mechanisms of action including smooth muscle relaxation (via calcium channel blockade or direct enteric nervous system effects), visceral sensitivity modulation (via transient receptor potential cation channels), anti-microbial effects, anti-inflammatory activity and modulation of psychosocial distress. In this literature review, it was reported that peppermint oil affected esophageal, gastric, small bowel, gall bladder and colonic physiology. It was concluded from the findings of placebo-controlled studies that the use of peppermint was effective in the treatment of irritable bowel syndrome, functional dyspepsia, childhood functional abdominal pain and post-operative nausea. Apparently, few adverse effects have been reported in peppermint oil trials.

With regard to the anti-spasmodic effect of menthol, an effect that might be predicted from its action on 5-HT₃ receptors, recent research findings suggest that enteric-coated peppermint oil may be effective in relieving some of the symptoms of irritable bowel syndrome [8,24,25]. It has also been stated that due to the relaxing effects on smooth muscle, peppermint oil given via enema is moderately effective in relieving colonic spasm in patients undergoing barium enemas [8].

Inhalation of peppermint oil to reduce the severity or even eliminate nausea and vomiting in pregnancy has been a traditional CAM therapy. Two clinical studies, however, have shown that inhaling peppermint oil, as in aromatherapy, actually has no effect on pregnancy nausea and vomiting [26,27]. In contrast to these findings, it has been reported that inhaled peppermint oil is a viable first-line nausea treatment for postoperative cardiac surgery patients [28]. This application of peppermint oil inhalation avoids many of the adverse effects such as dysrhythmia and/or drowsiness of antiemetics commonly used to manage postoperative nausea.

It should be noted that the FDA does not regulate the use of essential oils *per se* because they are neither a dietary supplement, drug or cosmetic. Consequently, there is no single category for the FDA to approve the use of essential oils in healthcare applications. Accordingly, ingesting peppermint oil capsules, with or without an enteric coating, for any purpose has no approval by the FDA. However, it should be noted that essential oils are regulated in that wintergreen oil, for example, is required to be marketed in tamper-resistant packaging because of safety concerns over its ingestion.

Respiratory and other inhalation effects

There is a long-standing tradition of using menthol and peppermint essential oil vapor to relieve nasal and respiratory congestion. In fact, menthol (and oil of eucalyptus) is approved as an OTC medication by the FDA for respiratory issues and antitussive effects. Recent research indicates that inhaled peppermint oil vapor has antibacterial properties against respiratory tract pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa* [29].

^bAllosteric regulation is the control of an enzyme by the binding of an effector molecule at a site other than the enzyme's active site.

Although inhalation of peppermint oil vapor and menthol to relieve nasal congestion is common, little scientific data actually support this use and the consensus is that it has no effect on air flow but does increase the perception of nasal patency [30]. This effect apparently is due to the ability of menthol to stimulate the oral and nasal cold receptors (i.e. the TRPM8 receptors^c) and which might explain the popularity and wide consumption of products containing peppermint oil and menthol [31,32].

Interestingly, it has been suggested that topical application of peppermint oil may be effective in the treatment of tension headaches [33]. Whether this relief is due to transdermal permeation of the oil or a combination of aromatherapeutic and psychological effects is unknown. The rationale for using essential oils to alleviate headache is based on certain assumptions, notably that local application of peppermint oil generates a long-lasting cooling effect on the skin, caused by a steric alteration of the calcium channels of the cold receptors. In particular, peppermint oil non-competitively inhibits 5-HT receptor induced smooth muscle contraction in animal models.

It is also known that peppermint oil induces a significant increase in the skin blood flow of the forehead after local application. The cited study [28] investigated the effects of peppermint oil and eucalyptus oil preparations on neurophysiological, psychological and experimental algometric^d parameters in 32 healthy subjects in a double-blind, placebo-controlled, randomized cross-over design. The test media comprised solutions of peppermint oil with and without eucalyptus in an ethanol solution applied to large areas of the forehead and temples using a small sponge. The combination of peppermint oil, eucalyptus oil and ethanol was found to increase cognitive performance while having a muscle-relaxing and mentally relaxing effect, but little influence on pain sensitivity. On the other hand, a significant analgesic effect with a reduction in sensitivity to headaches was produced by the combination of peppermint oil and ethanol.

Antibacterial and antifungal action

Peppermint oil possesses anti-bacterial and anti-fungal properties. The activity of inhaled peppermint oil against respiratory pathogens was mentioned above [15]. Peppermint oil, however, is also reported to possess antioxidant, antibiofilm and cytotoxic properties [2,6,34]. Although the antimicrobial mechanism of action of peppermint oil, like that of most essential oils, is poorly understood, a recent study has shown that the antifungal activity of peppermint oil is through reduction of ergosterol levels and inhibition of PM-ATPase which leads to intracellular acidification and, ultimately, cell death [35].

Peppermint and oral health

Although peppermint (and spearmint) has been recognized for its ability to control and ameliorate oral malodor and halitosis, e.g. with breath mints, candies and chewing gum, there appears to have been little scientific study of the control and treatment of oral pathogens. The potential use of peppermint oil as an antifungal agent has stimulated interest in the therapeutic properties of essential oils within dentistry [36]. In particular, oral candidiasis (oral thrush) and *candida*-induced denture stomatitis constitute oral and systemic health hazards and using a readily available non-toxic and GRAS^e antifungal agent like peppermint oil to treat *candida* infestations has great appeal.

^cTransient receptor potential cation channel subfamily M (melastatin) member 8 (TRPM8), also known as the cold and menthol receptor 1 (CMR1), is a protein encoded by the TRPM8 gene. The TRPM8 channel is the primary molecular transducer of cold somatosensation in humans. Peppermint can desensitize a region through the activation of TRPM8 receptors (the cold and menthol receptor).

^dThe acuteness of pain perception.

^eGRAS or Generally Recognized as Safe is a United States Food and Drug Administration (FDA) designation that a chemical or substance added to food is considered to be safe by experts.

The ability of peppermint to disrupt biofilms is another very useful attribute since dental caries originate from bacteria within biofilms on teeth and in sulci whereas growth of such films on restorations and appliances such as dentures leads to bacterial infestation and malodor. Clearly, the presence of peppermint oil in dentifrices has greater significance than simply providing a pleasant taste.

Further, a recent clinical study [37] has shown that a commercial mouthwash containing peppermint oil had a remarkably beneficial effect on periodontal health, with daily use markedly reducing the depth of periodontal pockets. The mechanism involved in this outcome is under investigation but may involve either disruption of biofilms within the sulcus or anti-bacterial effects, or possibly a combination of both effects. Regardless of the precise mechanism involved, this treatment modality offers a convenient and highly effective prophylactic approach towards periodontal disease.

In the context of the antifungal properties of peppermint, there have been studies of the antifungal activity of peppermint (*Mentha piperita* L) against *Candida albicans* [38,39]. In particular, *Mentha x piperita* L. has been found to disrupt the cell membrane and interfere with the ergosterol biosynthesis pathway of *Candida albicans*, *C. tropicalis* and *C. glabrata* [40]. These findings are not only important with regard to denture stomatitis but also to otolaryngology and the systemic health of elderly patients.

Interestingly, within the past 2 - 3 years, there has been increasing interest in the potential application of the antibacterial properties of peppermint in preventing dental caries through its effect on *Streptococcus mutans* [41-44]. Research in this area is ongoing and, to a degree, tends to be contradictory but overall shows great promise as a means of preventing dental caries. However, most reports appear to be based on *in vitro* studies and clearly, clinicians will require *in vivo* data before embracing peppermint as a caries prophylactic treatment.

The optimal (and safe) ingestion levels of peppermint oil have yet to be determined and at least one near-fatal case of presumed oral ingestion of peppermint oil has been reported [45]. Apparently, in this particular case, the patient in question was of an advanced age and very sick. Other than this one case, it is not clear at this stage, however, what constitutes a fatal or toxic dose of peppermint oil.

Peppermint and exercise

The cooling effect of peppermint oil is ascribed to its content of L-menthol stimulating cutaneous thermoreceptors and inducing cool sensations to improve thermal comfort. These chemesthetic sensations are presumably mediated by the transient receptor potential (TRP) channel. Although the use of menthol sprays for cooling during exercise in warm, humid conditions [46] and with time trial cycling in the heat [47] does induce perceptions of cooling, apparently there was no detectable effect on performance. These findings have been confirmed by other work on the effect of dermal applications of menthol on exercise performance in hot, humid environments [48]. Although the cooling sensation induced by topical application of menthol (and peppermint oil) may help alleviate heat-induced fatigue, greater performance benefits were found with internal use rather than external application.

In fact, there have been several recent studies which clearly demonstrated that essential oils, especially peppermint oil, can markedly benefit participation in sports and other activities. One study [49] investigated the effects of peppermint oil on human exercise performance. In this, the blood pressure (BP) and respiratory indices were measured for 12 healthy male students who drank 500 ml of mineral water containing 0.05 ml peppermint oil a day for 10 days. The treadmill-based test indicated that the peppermint oil improved exercise performance based on measurements of BP, gas analysis and respiratory rate. The improved performance was ascribed to relaxation of the bronchial smooth muscles, leading to substantially increased respiratory and ventilation rates, i.e. enhanced lung function, as well as greater brain oxygen concentration and a decrease in blood lactate levels. It was also noted that the peppermint oil significantly increased the time to exhaustion by 24.9% and the distance covered by the test subjects on the treadmill.

The mechanism involved in the improved athletic performance is not fully understood but it was conjectured that peppermint had

an effect on the central nervous system, increased carbohydrate metabolism, lowered the lung surface tension and improved pulmonary function. The findings suggested that peppermint lowered heart rate and the systolic blood pressure, and possibly decreased arterial smooth muscle tonicity.

Another research study [50] showed that placing a few drops (50 µl) of peppermint oil on the tongue before exercise markedly improved exercise performance. In this study, muscle strength parameters for athletes were measured before administration of peppermint

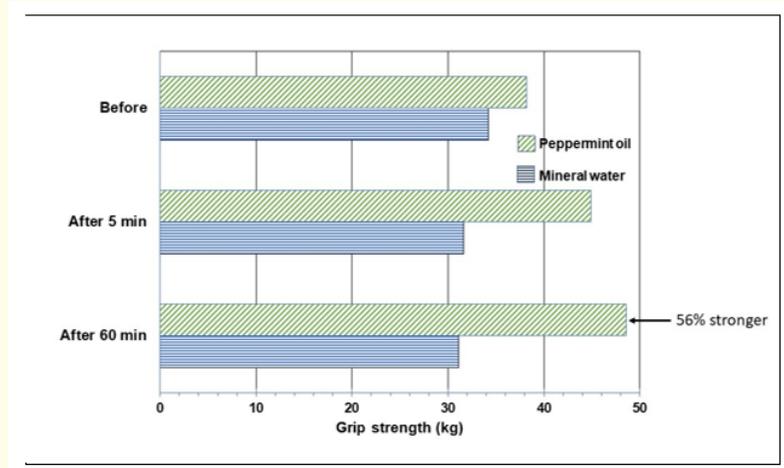


Figure 1: Effect of peppermint oil on grip strength.

oil, after 5 minutes and then again after 1 hour compared to drinking mineral water (Figure 1).

The performance data showed that the peppermint oil markedly increased grip strength compared to drinking mineral water. Peppermint oil was also shown to improve performance in standing vertical jumping, standing horizontal jumps as well as in reaction times compared to ingesting mineral water. Interestingly, whereas the peppermint oil drops increased performance, controls that did not receive peppermint oil (i.e. only ingested mineral water) showed either a decrease in strength or minimal change over the test period. These findings have been confirmed by the authors in *ad hoc* studies with various people who exercised regularly and all of whom reported enhanced performance in strength and other exercise regimens.

Another and more recent study [51] looked at the effect of orange oil and spearmint (*M. spicata*) oil inhalation on lung function and exercise performance. In the study, two groups of 10 physical therapy students who were fairly closely matched with regard to age, weight, etc., were timed running a distance of 1500 meters. Lung function of each participant was measured with a spirometer. After a 3-day break, one group of participants inhaled orange essential oil and the other spearmint essential oil.

It was found that inhalation of orange and spearmint oil improved running performance by 15.3 and 11.8% respectively (Figure 2). Spirometer measurements likewise showed a significant improvement in lung function for participants after inhalation of the two essential oils.

These findings support those of earlier studies which found that inhaling peppermint and spearmint oils improved running performance under different conditions, and lowered heart rates while running. Interestingly, studies have also confirmed that inhalation of oils from various species of peppermint were effective in reducing muscle pain and fatigue as well as having a muscle relaxation effect [50].

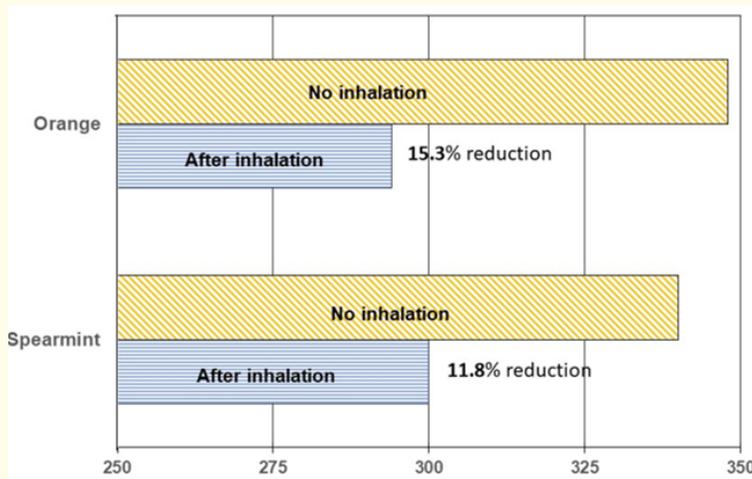


Figure 2: Effect of inhaling essential oils on running 1500 meters.

It should be mentioned, however, that there are several different varieties of peppermint plant but the optimal effects on athletic performance are associated with *Mentha piperita* [51].

At this time, the mechanisms underlying these reported effects of peppermint on athletic performance are not clear but these more recent findings support the body of research work performed by Raudenbush and his research team at the then Wheeling Jesuit University in the early 2000s [52-54]. These collective research data indicate that both ingested and inhaled essential oils benefit athletic performance. What is interesting is that inhaling peppermint essential oil appears to be beneficial to lung function, indicating a possible natural approach to relieving the effects of asthma, COPD and other breathing difficulties. Further, exposure to peppermint aroma induces a higher level of vigor and lower level of fatigue while demonstrating a decrease in anxiety, fatigue, frustration, and temporal demand, and an increase in alertness while driving [54].

The overall conclusions are that inhalation of peppermint essential oil can stimulate task performance and help achieve better psychological states.

Interactions with medications

There are some indications that peppermint oil may cause side effects such as heartburn as well as possibly interacting with certain medications. However, when used as directed, dietary supplements and skin preparations containing peppermint oil are generally considered to be safe for most adults. Nevertheless, the medicinal use of peppermint has not been approved by the FDA although menthol (See table 1) is an approved OTC medication.

It is important to note that enteric-coated peppermint oil capsules can interact with many prescription medications, especially those that are metabolized by the liver, since peppermint might decrease the rate at which the liver metabolizes some medications. Any effect of peppermint oil on drugs metabolized by the hepatic system can influence the effects (and side-effects) of those medications. Consequently, caution should be exercised, and medical advice sought, when intending to take cyclosporin and Cytochrome P450 1A2 in conjunction with peppermint oil.

Likewise, medical advice should be sought when taking peppermint oil capsules and probably liquid peppermint oil with prescription medications that are changed by the liver. These include the anti-depressant amitriptyline (Elavil®), the anti-psychotic drug haloperidol (e.g. Haldol®), anti-nausea drugs like ondansetron (e.g. Zofran®), the beta-blocker propranolol (e.g. Inderal®), bronchodilators such as theophylline (e.g. Theo-Dur®) and hypertensives and angina drugs such as verapamil (e.g. Calan®, Isoptin®) [55].

There do not appear to be any problems of interactions with medications associated with drinking mint tea or with topical use of peppermint oil.

Conclusion

Peppermint (*Mentha piperita*) and spearmint (*Mentha spicata*) possess remarkable health benefits, many of which derive from their antioxidant and antimicrobial properties. Although both oils have been used throughout the ages to flavor beverages and food, peppermint in particular has been used for thousands of years to treat a variety of systemic health and skin conditions.

Modern medicinal applications of peppermint oil therapy include its anti-spasmodic action during endoscopic and colon examinations, to provide relief for periodontal disease, oral malodor, muscle pain, toothache and the pain associated with shingles, and to treat a variety of skin conditions. Further, peppermint oil has been used in CAM to treat gastric and digestive problems as well as for tension headaches, nausea and discomfort during breast feeding. Further, there are studies that report that the administration of peppermint aroma improves performance in clerical tasks and study findings suggest that peppermint odor may promote a general stimulation of attention such that participants remained focused on their task with increased performance.

Detailed meta-analyses of the scientific literature found that peppermint oil was a safe and effective therapy for pain and multiple symptoms in adults with IBS. In dentistry, clinical studies indicate that mouthwash containing peppermint oil had a remarkably beneficial effect on periodontal health, with daily use markedly reducing the depth of periodontal pockets and other studies indicated antifungal against *Candida albicans*. Within the past 2 - 3 years, there has been increasing interest in the potential application of the antibacterial properties of peppermint in preventing dental caries through its effect on *Streptococcus mutans*.

Studies also have demonstrated that placing a few drops of peppermint oil on the tongue before exercise markedly improved exercise performance compared to drinking mineral water. Other studies have reported that inhalation of peppermint and spearmint oils improved running performance and lowered heart rates while running. Further, such inhalation reduced muscle pain and fatigue as well as having a muscle relaxation effect.

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55. See: Peppermint. Drugs (2021).

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