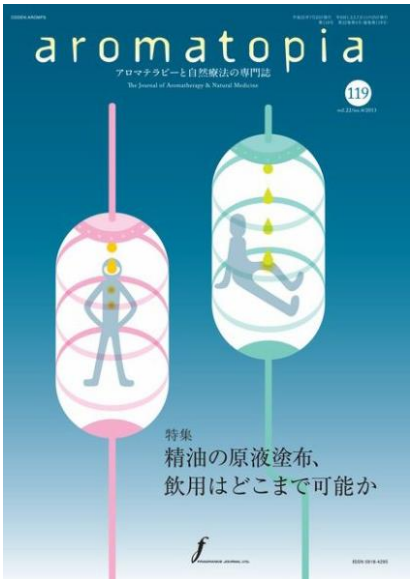

Aromatopia. 2013 Jul; 22(4):43-48.

Topical and oral administration of essential oils—safety issues

Johnson S, Boren K.

Abstract. Multiple aromatherapy models exist, both advocating and discouraging neat topical and oral administration of essential oils. Recently, attention to these safety issues has expanded as a growing number of health care professionals and individuals adopt aromatherapy as an adjunct therapeutic practice. The safety issues of neat topical and oral administration are discussed, including the available scientific data and corroborating evidence. Based on historical usage, available scientific data, the FDA GRAS list, The German Commission E approval, and the balancing effect of total compounds in essential oils it is our opinion that a wide variety of essential oils are safe to administer orally and apply neat topically without harm to the human organism, when a pure essential oil is used.

Introduction. Multiple aromatherapy models exist, both advocating and discouraging neat topical and oral administration of essential oils. As aromatherapy expands rapidly concerns about the safety of these two administration techniques have emerged. In writing about aromatherapy, Jane Buckle, PhD, RN, stated that “Aromatic plants were used in Neanderthal times and have played a part in healing throughout history. Most cultures have included aromatic plants in their use of herbal medicine, as shown by references from ancient Chinese, Indian, Tibetan, Australian and New Zealand, North America, South America, Egyptian, Roman, and Middle Eastern sources.”[1]

Historical evidence suggests these ancient cultures inhaled, ingested, and applied topically the volatile parts of aromatic plants. Aromatherapy is the second most common complementary therapy used among nurses,[2] especially in mental health care.[3] Nurses in the United States, Australia, Canada, Germany, United Kingdom, Switzerland, and New Zealand augment patient care through essential oils.[4]

Topical Application of Essential Oils—Safety Issues. The French model of aromatherapy involves three methods of essential oil use: inhalation, topical, and oral use. When Marguerite Maury introduced

essential oils in England in the 1960s, she recommended dilution, as little as 1 to 3 percent essential oils to cold-pressed carrier oil. This dilution ratio is generally not followed in Europe or in the United States.

Essential oils are listed in numerous pharmacopoeia. The seventh edition of the American Medical Association's book *Useful Drugs* includes eight essential oils: clove, cinnamon, eucalyptus, peppermint, wintergreen, and sandalwood, with the volatile oil of rose in water and thymol, the phenol constituent of thyme oil. Also included were the resins of *Styrax benzoin* and *Commiphora myrrha.*[5] In addition, according to Dr. Buckle, "Of the 200 or so essential oils in common use, eight essential oils are specifically named by the Commission E list of approved herbs. Therefore, to some extent, aromatherapy is recognized, even approved, by the Commission E."[6]

There are certain "hot" oils that always must be diluted before skin application: lemongrass, cinnamon bark, and cassia, for example. But use of other oils "neat" or at 100 percent has been safely documented in many studies. An Italian study stated: "It's important to notice the route of administration . . . being the oils are highly volatile and fat-soluble substances, they are easily absorbed through the skin. . . In fact, EOs could stimulate both the immune system and the cheratocytes for improving local defences, the horny layer and lipid intercellular material."[7] In addition, caution is advised with photosensitizing oils, like citrus oils, which may discolor the skin when exposed to the sun within 12 to 72 hours after application.

We list five studies discussing the safety of topical application of essential oils. A university study in Portugal concluded that the oil and essential oil of *Laurus novocanariensis* "were well tolerated by the skin and did not cause significant perturbation of the barrier or irritation."[8] A patient in London suffered extreme pain from herpes zoster infection for three years. Doctors at a pain management clinic recommended she apply peppermint essential oil neat as menthol has been shown to reduce thermal C-fiber activity. After a stinging sensation, the woman experienced almost complete pain relief. After three full weeks of neat application, the skin began to redden upon application so she was directed to dilute to a 1:5 ratio with almond oil. The study reported that "The diluted oil prevented reddening and produced adequate pain relief . . . The patient said she still used undiluted oil when the pain was particularly bad."[9]

An Irish study reported on the successful treatment of hand warts in a young girl using neat application of 100 percent tea tree oil. The researchers stated, "Employment of TTO [tea tree oil] itself may carry the risk of allergy and skin irritation in certain individuals; therefore, patients need to be made aware of such potential problems. In this case, employment of TTO proved efficacious with no side effects to the patient."[10] Additionally, a small study in Louisiana reported on a 100% geranium oil treatment for neuralgic pain relief. Among the 24 subjects that completed the study, there were "10 minor adverse reactions among 7 patients for the five treatments, none of which were serious and all resolved in 1 hour."[11] The researchers stated that "Geranium oil relieves pain in minutes and is well tolerated."[12]

Another report from a group of nine doctors in Germany and Australia employed an essential oil blend to enhance quality of life among terminal patients with tumor necrosis and the resulting malodor that magnifies the patients' suffering. A solution of antibacterial essential oils: tea tree, grapefruit, and eucalyptus oil was sprayed on the cancerous ulcers. The doctors found that "The foul smell associated

with the necrotic ulcers normally recedes entirely after 2-3 days of treatment."[13] The patients also reported pain relief due to the anesthetic properties of the eucalyptus oil. The doctors noted, "We have not observed any allergic reactions to the essential oils as has been reported in earlier studies."[14]

Oral Administration of Essential Oils—Safety Issues. Several studies and supplementary evidence suggest oral consumption of a diversity of essential oils is safe when observing appropriate dosage guidelines. Essential oils are utilized extensively in the food industry as safe flavoring agents and natural preservatives.[15,16,17,18,19,20] The U.S. Food and Drug Administration (FDA) records 160 essential oils, oleoresins and distillates considered safe for direct addition to food for human consumption on the Generally Recognized as Safe list (GRAS), adding further evidence that various essential oils are harmless when taken orally.[21]

The safety of orally administering essential oils has been reported in animal studies. The acute oral toxicity of *Croton cajucara* Benth (Euphorbiaceae) was assessed in male Swiss albino mice in 2000. The study authors concluded that the essential oil exhibited low toxicity in mice and offered gastroprotective benefits.[22] No teratogenic, genotoxic, mutagenicity, or adverse effects to the cardiovascular, central nervous or respiratory functions were observed in an animal study using a lavender oil preparation.[23] A 2009 report investigating the safety of black cumin essential oil in normal Sprague dawley rats through hematological indices, serum biochemistry, cardiac enzyme levels, and serum electrolytes. The results revealed that the essential oil was safe as a food additive based on "serological indices like liver and kidney functioning tests, serum protein profile, level of cardiac enzymes, electrolytes balance . . . remained in the normal ranges even after 56 days of study. Similarly, indices of red and white blood cells remained within the defined limits."[24]

The absorption rate in the buccal cavity mucosa is considered more than 3 to 9 times greater than that of the gastrointestinal system,[25] and up to 4,000 times more permeable than the skin making it a very efficient delivery method for essential oils.[26] This suggests that a significant amount of essential oils rapidly enters the bloodstream when introduced into the oral cavity. Essential oil containing mouthwashes have been safely used for decades. Studies using essential oil mouthrinses for up to 6 months concluded that they were safe to use orally with no serious adverse events.[27,28,29,30]

Two of the most well-researched and documented essential oils administered orally in clinical investigations are *Mentha piperita* (peppermint) and *Lavandula angustifolia* (lavender). Research suggests that peppermint is a safe and effective remedy for a variety of gastrointestinal disorders, including irritable bowel syndrome (IBS). Studies examining the oral administration of peppermint essential oil indicate that it is well tolerated even among children. A systematic review and meta-analysis, which included 3 studies reporting adverse events found only 5 of 174 participants in the active treatment groups experienced an adverse event reaction (AER).[31] That equates to a 3% AER, which is much lower than a report suggesting up to 26 percent of placebo control groups experienced AERs[32]. Another prospective double blind placebo-controlled randomized trial administering 2 enteric-coated peppermint oil capsules daily for 4 weeks concluded that "when peppermint oil is administered for a short 4-week period, it is safe and effective for patients with IBS."[33] Only 1 participant left the active treatment group as a result of the trial medication, reporting prolonged heartburn and a minty taste in

the mouth. This reaction may have been due to the patient chewing the capsule or premature dissolution, leading to esophageal reflux of gastric juice and menthol. The harmlessness of oral ingestion of peppermint was confirmed in a small randomized, double-blind controlled trial of 42 children with IBS. Children received an oral solution containing 187 mg of peppermint oil three times daily. No AERS or side effects were reported in the active treatment group during the two-week trial.[34] Two additional studies that combined peppermint with an additional essential oil, either caraway or spearmint, reported similar findings of good tolerance and very few side effects related to the study medication, with the most common being eruction, and a burning sensation behind the sternum.[35,36] Furthermore, fennel essential oil is considered safe to administer orally to infants to alleviate colic.[37,38]

Lavender essential oil has a similar safety and efficacy record. Lavender is well-known for anxiolytic properties. A multi-center, double-blind, randomized study of lavender essential oil for generalized anxiety disorder reported that orally administered lavender is effective in relieving anxiety and a well-tolerated alternative to benzodiazepines.[39] Physical examinations, vital signs, 12-lead ECG, and routine laboratory parameters remained normal in the active treatment group and only mild gastrointestinal events, such as nausea, eruction, and dyspepsia were reported. The study authors also concluded that lavender essential oil has no potential for drug abuse or hangover effects, which is of significance as benzodiazepines are highly associated with both addiction and hangover effects when taken chronically. A subsequent review of the same orally administered lavender oil preparation involving 280 patients concluded there is a "large safety margin of the recommended therapeutic dose," with no AERs noted among participants receiving up to 8-fold of the therapeutic dose after single administration and 4-fold of the therapeutic dose in subjects on steady state.[40]

Synergy of Essential Oil Compounds Promotes Safety. Aromatic extracts from various plant parts naturally contain myriad of chemical compounds, many of which have not been identified, but provide important therapeutic properties. It has been reported in plant medicine that using whole plants with all the naturally occurring compounds reduces the side effects experienced.[41,42] Isolating single compounds from plants removes safety checks and balances innately developed in the plant, allowing pharmacological effects that differ significantly from whole plants. Moreover, when naturally occurring compounds are left whole a synergistic and therapeutically enhancing effect is produced as these compounds are believed to act at different receptor targets involved in health and human disease.[43,44,45] While inactive compounds in the plant may exert little or no direct activity on the root cause of disease they assist the active compound(s) in a synergistic, additive, modifying, or antagonistic manner. According to reports they enhance bioactivity, stimulate natural and adaptive defense mechanisms, reverse resistance, modulate adverse effects, or decrease metabolism and excretion.[41,46,47] Equally, essential oils, when distilled properly to preserve the optimal compound profile of naturally occurring constituents, verified through gas chromatography-mass spectrometry (GC/MS), offer comparable benefits, including a reduction in side effects.[48,49,50]

Conclusion. Based on the existing body of evidence including historical usage, available scientific data, the FDA GRAS list, The German Commission E approval, and the balancing effect of total compounds in essential oils it is our opinion that a wide variety of essential oils are safe to administer orally and apply topically without harm to the human organism.

Scott Johnson

The author of two books and more than 250 articles in online publications, Scott Johnson is an expert on health, fitness, and nutraceuticals. He earned a doctor of naturopathy degree, graduating with highest honors, and is a board certified Alternative Medical Practitioner. Scott draws upon his wealth of experience and diverse educational background to share ancient knowledge and modern scientific research surrounding natural healing modalities as an international lecturer. His passion lies in bringing the secrets of natural healing to those who seek greater wellness.

Karen Boren

Karen Boren has worked in the essential oils field for 11 years, currently serving as a research writing manager. A former newspaper and grant writer, she conducted research for a neurological presentation for D. Gary Young, founder and CEO of Young Living Essential Oils, in Ecuador and traveled the Frankincense Trail with Gary and his team in 2009. She has a deep interest in religion and has published a book on biblical archaeology. Karen works on special projects and assists with the writing and editing of scientific studies published in peer-reviewed journals.

Potential Conflicts of Interest. The authors of this research paper are currently employed by Young Living Essential Oils, a cultivator, distiller, and producer of pure, therapeutic-grade essential oils and aromatherapy oils.

***Corresponding authors*.**
Scott Johnson. Address - 3125 W Executive Parkway, Lehi UT 84043. Phone – 801-418-8900. Fax – 1-801-766-3633. Email – scjohnson@youngliving.com.

Karen Boren. Address - 3125 W Executive Parkway, Lehi UT 84043. Phone – 801-418-8900. Fax – 1-866-203-5666. Email – kboren@youngliving.com.

---

[1] Jane Buckle, Aromatherapy: What Is It? *HerbalGram, The Journal of the American Botanical Council,* Austin: American Botanical Council, 2003, Issue 57, p. 50.
[2] Tseng YH. Aromatherapy in nursing practice. *Hu Li Za Zhi.* 2005 Aug;52(4):11-5.

[3] Van der Watt G, Hanca A. Aromatherapy in nursing and mental health care, *Contemp Nurse*. 2008 Aug;30(1):69-75.

[4] Buckle J. The role of aromatherapy in nursing care. *Nurs Clin North Am*. 2001 Mar;36(1):57-72.

[5] Useful Drugs: A List of Drugs Selected to Supply the Demand for a Less Extensive Materia Medica with a Brief Discussion of Their Actions, Uses and Dosage, *The American Medical Association*, 1926, Chicago.
[6] Jane Buckle, Aromatherapy: What Is It? *HerbalGram, The Journal of the American Botanical Council,* Austin: American Botanical Council, 2003, Issue 57, p. 55.
[7] Pisseri F, et al., Essential oils in medicine: principles of therapy, *Parassitologia,* 50: 89-91, 2008.
[8] Viciolle E, et al., *In vitro* and *in vivo* assessment of the effect of *Laurus novocanariensis* oil and essential oil in human skin, *International Journal of Cosmetic Science,* 2012, 34, 546-550.
[9] Op cited.

[10] Miller BC, Moore JE, Successful treatment of hand warts in a paediatric patient with tea tree oil (*Melaleuca alternifolia*), *Complementary Therapies in Clinical Practice,* 2008 14, 225-227.
[11] Greenway FL, et al., Temporary Relief of Postherpetic Neuralgia Pain with Topical Geranium Oil, *The American Journal of Medicine,* November 2003, Volume 115, 586.
[12] Ibid.
[13] Warnke PH, et al., "Tumor Smell Reduction with Antibacterial Essential Oils," *Cancer,* February 15, 2004, Vol. 100, No. 4.
[14] Ibid.
[15] Smith-Palmer A, Stewart J, Fyfe L. The potential application of plant essential oils as natural food preservatives in soft cheese. *Food Microbiol.* 2001;18:463-70.
[16] Burdock GA, Carabin IG. Safety assessment of Ylang-Ylang (*Cananga spp.*) as a food ingredient. *Food Chem Toxicol.* 2008 Feb;46(2):433-45.
[17] Burdock GA, Carabin IG. Safety assessment of coriander (Coriandrum sativum L.) essential oil as a food ingredient. *Food Chem Toxicol.* 2009 Jan;47(1):22-34.

[18] Prakash B, Singh P, Mishra PK, Dubey NK. Safety assessment of Zanthoxylum alatum Roxb. essential oil, its antifungal, antiaflatoxin, antioxidant activity and efficacy as antimicrobial in preservation of Piper nigrum L. fruits. *Int J Food Microbiol.* 2012 Feb 1;153(1-2):183-91.

[19] Saei-Dehkordi SS, Fallah AA, Saei-Dehkordi SS, Kousha S. Chemical composition and antioxidative activity of Echinophora platyloba DC.essential oil, and its interaction with natural antimicrobials against food-borne pathogens and spoilage organisms. *J Food Sci.* 2012 Nov;77(11):M631-7.

[20] Amerah AM, Mathis G, Hofacre CL. Effect of xylanase and a blend of essential oils on performance and Salmonella colonization of broiler chickens challenged with Salmonella Heidelberg. *Poult Sci.* 2012 Apr;91(4):943-7.

[21] Available at http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=172.510&SearchTerm=olibanum.
[22] Hiruma-Lima CA, Gracioso JS, Rodriguez JA, et al. Gastroprotective effect of essential oils from *Croton cajucara* Benth. (Euphorbiaceae). *J of Ethnopharmacol.* 2000 Mar;69(3):229-34.
[23] Carter RM, Wittchen HU, Pfister H, et al. One-year prevalence of subthreshold and threshold DSM-IV generalized anxiety disorder in a nationally representative sample. *Depress Anxiety*. 2001;13(2):78-88.
[24] Sultan MT, Butt MS, Anjum FM. Safety assessment of black cumin fixed essential oil in normal Sprague dawley rats: Serological and hematological indices. *Food Chem Toxicol.* 2009 Nov;47(11):2768-75.
[25] Thosar MM. Intra oral sprays – An overview. *Int J of Pharm and Life Sci.* 2011 Nov:2(11):1235-46.
[26] Galey WR, Lonsdale HK, Nacht S. The in vitro permeability of skin and buccal mucosa to selected drugs and tritiated water. *J Invest Dermat.* 1976;67:713-17.
[27] Sharma NC, Araujo WB, Wu MM, Qaqish J, Charles CH. Superiority of an essential oil mouthrinse when compared with 0.05% cetylpyridinium chloride containing mouthrinse: a six-month study. *Int Dent J.* 2010 Jun;60(3):175-80.
[28] Jandourek A, Vaishampayan JK, Vazquez JA. Efficacy of melaleuca oral solution for the treatment of fluconazole refractory oral candidiasis in AIDS patients. *AIDS*. 1998 Jun 18;12(9):1033-7.

[29] Vasquez JA, Zawawi AA. Efficacy of alcohol-based and alcohol-free melaleuca oral solution for the treatment of fluconazole-refractory oropharyngeal candidiasis in patients with AIDS. *HIV Clin Trials.* 2002 Sep-Oct;3(5):379-85.

[30] Samuels N, Grbic JT, Saffer AJ, Wexler ID, Williams RC. Effect of an herbal mouth rinse in preventing periodontal inflammation in an experimental gingivitis model: a pilot study. *Compend Contin Educ Dent.* 2012 Mar;33(3):204-6, 209-11.
[31] Ford AC, Talley NJ, Spriegel BM, et al. Effect of fibre, antispasmodics, and peppermint oil in the treatment of irritable bowel syndrome: systematic review and meta-analysis. *BMJ.* 2008 Nov 13;337:a2313.
[32] Rief W, Avorn J, Barsky AJ. Medication-attributed adverse effects in placebo groups: implications for assessment of adverse events. *Arch Intern Med.* 2006 Jan 23;166(2):155-60.

[33] Cappello G, Spezzaferro M, Grossi L, Manzoli L, Marzio L. Peppermint oil (Mintol®) in the treatment of irritable bowel syndrome: A prospective double blind placebo-controlled randomized trial. *Dig Liver Dis*. 2007 Jun;39(6):530-6.

[34] Kline RM, Kline JJ, Di Palma J, Barbero GJ. Enteric-coated, pH-dependent peppermint oil capsule for the treatment of irritable bowel syndrome in children. *J Pediatri.* 2001 Jan;138(1):125-8.

[35] Tayarani-Najaran Z, Talasaz-Firoozi E, Nasiri R, Jalali N, Hassanzadeh MK. Antiemetic activity of volatile oil from *Mentha spicata* and *Mentha piperita* in chemotherapy-induced nausea and vomiting. *Ecancermedicalscience.* 2013;7:290.

[36] May B, Kuntz HD, Kieser M, Kohler S. Efficacy of a fixed peppermint oil/caraway oil combination in non-ulcer dyspepsia. *Arzneimittelforschung*. 1996 Dec;46(12):1149-53.

[37] Alexandrovich I, Rakovitskaya O, Kolmo E, Sidorova T, Shushunov S. The effect of fennel (*Foeniculum vulgare)* seed oil emulsion in infantile colic: A randomized, placebo-controlled study. *Altern Ther Helath Med.* 2003 Jul-Aug;9(4):58-61.

[38] Gori L, Gallo E, Mascherini V, Mugelli A, Vannacci A, Firenzuoli F. Can estragole in fennel seed decoctions really be considered a danger for human health? A fennel safety update. *Evid Based Compliment Alternat Med.* 2012;2012:860542.

[39] Woelk H, Schlafke S. A multi-center, double-blind, randomised study of the Lavender oil preparation Silexan in comparison to Lorazepam for generalized anxiety disorder. *Phytomedicine.* 2010 Feb;17(2):94-9.

[40] Kasper S, Gastpar M, Volz HP, Moller HJ, Dienel A, Schlafke S. Efficacy and safety of silexan, orally administered lavender oil preparation, in subthreshold anxiety disorder — evidence from clinical trials. *Wien Med Wochenschr*. 2010 Dec;160(21-22):547-56.

[41] Rasoanaivo P, Wright CW, Willcox ML, Gilbert B. Whole plant extracts versus single compounds for the treatment of malaria: synergy and positive interactions. *Malar J*. 2011 Mar 15;10 Suppl 1:S4.

[42] Williamson EM. Review Synergy and other interactions in phytomedicines. *Phytomedicine.* 2001 Sep; 8(5):401-9.

[43] Wright CW, Linley PA, Brun R, Wittlin S, Hsu E. Ancient Chinese methods are remarkably effective for the preparation of artemisinin-rich extracts of Qing Hao with potent antimalarial activity. *Molecules.* 2010 Feb 4; 15(2):804-12.

[44] Houghton PJ. In: Evaluation of Herbal Medicinal Products. Houghton PJ, Mukherjee PK, editor. London: *Pharmaceutical Press*; 2009. Synergy and polyvalence: paradigms to explain the activity of herbal products; pp. 85–94.

[45] Kisa K, Sasaki K, Yamauchi K, Kuwano S. Potentiating effect of sennoside C on purgative activity of sennoside A in mice. *Planta Med*. 1981 Jul;42(3):302-3.

[46] Pizarro F, Olivares M, Hertrampf E, Walter T. Factors which modify the nutritional state of iron: tannin content of herbal teas. *Arch Latinoam Nutr*. 1994 Dec;44(4):277-80.

[47] Jerissen SM, Punt A, Delatour T, Rietjens IM. Basil extract inhibits the sulfotransferase mediated formation of DNA adducts of the procarcinogen 1'-hydroxyestragole by rat and human liver S9 homogenates and in HepG2 human hepatoma cells. iFood Chem Toxicol. 2008 Jun;46(6):2296-302.

[48] Onawunmi GO, Yisak WA, Ogunlana EO. Antibacterial constituents in the essential oil of Cymbopogon citratus. *J. Ethnopharmacol.*1984 Dec;12(3):279-86.

[49] Veras HN, Rodrigues FF, Colares AV, et al. Synergistic antibiotic activity of volatile compounds from the essential oil of Lippia sidoides and thymol. *Fitoterapia.* 2012 Apr;83(3):508-12.

[50] Hyldgaard M, Mygind T, Meyer RL. Essential oils in food preservation: mode of action, synergies, and interactions with food matrix components. *Front Microbiol.* 2012;3:12.