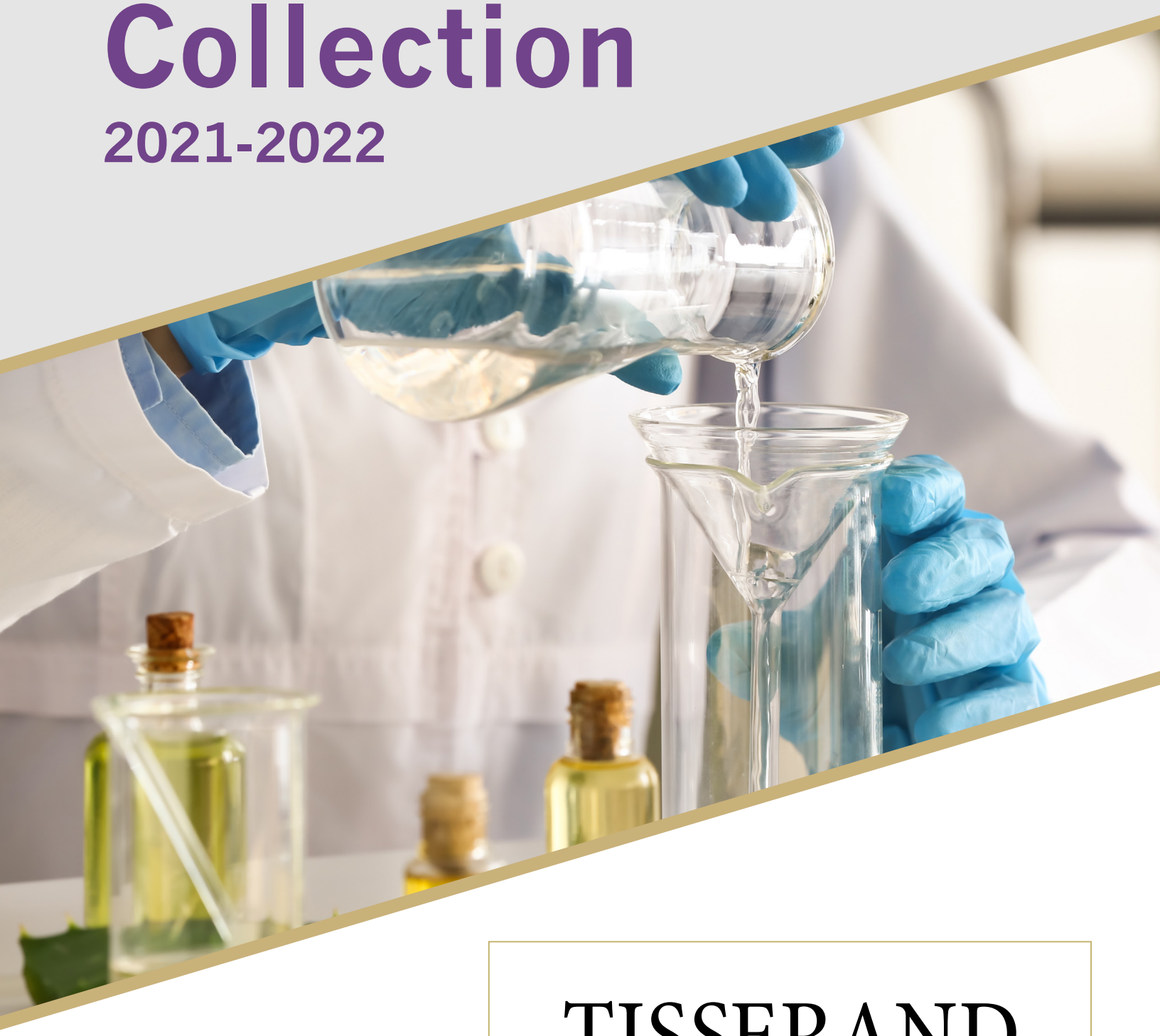
Research Collection

2021-2022



TISSERAND INSTITUTE

2021-2022 Research Collection

Research highlights are written by Robert Tisserand, Hana Tisserand or Dr. Shannon Becker.

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Research Highlight #1

The Effect of Lavender Oil Application via Inhalation Pathway on Hemodialysis Patient's Anxiety Level and Sleep Quality

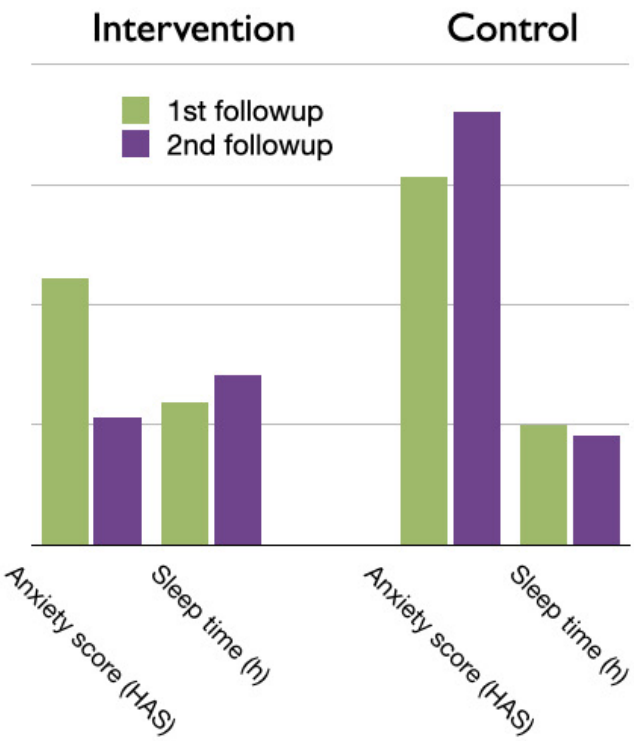
Şentürk & Kartin, 2018

"Sleep and anxiety problems occur in hemodialysis (HD) patients due to physical symptoms, lifestyle changes, and psychosocial changes. To remove these sleep and anxiety problems, lavender oil inhalation is one of the non-pharmacological treatment options with less adverse effects than pharmacological methods. The purpose of this study was to determine the effect of lavender oil application via inhalation pathway on HD patients' anxiety level and sleep quality."

[Excerpt from abstract at: https://pubmed.ncbi.nlm.nih.gov/30320657/]

Patients undergoing life-saving hemodialysis (HD) suffer from fatigue, exhaustion, sleep disturbances, mental health changes including anxiety, and lack of appetite, in addition to the physiological complications that accompany HD treatment. The majority of HD patients (60.6%) report poor sleep due to HD treatments. In two studies examining anxiety in HD patients, 48% were classified with borderline anxiety, and 33% were classified as morbidly anxious. Sleeping disorders also affect anxiety levels, and lead to daytime sleepiness. They also cause reductions in their energy levels and ability to perform daily tasks, and their ability to carry out self-care activities. Overall, HD patients report low quality of life. Pharmaceutical treatments to manage these symptoms can lead to additional side effects, and are costly. In an effort to improve the experiences of HD patients while limiting side effects and system toxicity, this study proposed the use of lavender essential oil (LEO) to manage anxiety and sleep.

This study was conducted in Turkey, in two HD centers that operate with similar treatment protocols. Participants over the age of 18 were chosen who had undergone HD for at least 6 months and received HD treatment 3 times a week. In addition, participants scored at least a 6 on the Hamilton Anxiety Assessment Scale (HAM-A) diagnostic for anxiety, and scored at least 5 on the Pittsburgh Sleep Quality Index (PSQI) diagnostic for sleeping disturbances. Exclusion criteria were allergies to LEO or other aromas, inability to smell, discomfort with the LEO aroma, having visual or auditory impairments, inability to communicate or consent to the study, or having a respiratory disease.



Inhalation of Lavender essential oil via a cotton pad placed 20cm from pillow was tested on hemodialysis patients for its effect on anxiety levels and sleep quality.

The graph shows increased sleep time and decreased anxiety score in the experimental group compared to control.

DOI: 10.1097/HNP.0000000000000292

The researcher conducting the study participated in an 8-hour aromatherapy course prior to the study, organized by the Congress on Complementary and Alternative Medicine Practices. A total of 34 participants were chosen from a pool of 142 screened individuals undergoing HD treatment. Two groups of 17 were randomly chosen for the experimental or the control group. Participants in the experimental group were supplied with cotton pads and LEO. They were instructed to drop 2 drops of LEO onto a cotton pad in a provided box, and to place this box 15-20cm from their bed pillow 30 minutes before bedtime. This was done daily for 1 week. It is unclear whether participants in the control group were supplied with the same box and cotton pads, and instructed to use water on the pads. This would control for the placebo effect of placing a liquid on a cotton pad, and placing the pad near their bed. It is also unclear how the control group behaved during the same week. Table 1 in the publication describes the experimental workflow, and it appears the control group did not participate in a control experiment. Instead, they underwent the same data collection methods as the experimental group, without receiving a control intervention. This is a weakness of the study.

Data was collected using interviews, according to the rubrics found in the PSQI, HAM-A, and Visual Analog Scale (VAS) to determine daytime sleepiness level. The study reported significant changes for the experimental group in sleep quality and sleep duration (improvement), daytime sleepiness (reduction), mean sleeping time (increase), and anxiety levels (reduction in anxiety). There was no change in mean time needed to fall asleep. Because of these results, the authors recommend the use of LEO for HD patients.

This is a promising pilot study that reiterates previous studies showing lavender essential oil is an effective anxiolytic agent with sedative properties. Unfortunately, the sample sizes are small and the controls in this study are not ideal. Overall, I think this study can be added to the mounting evidence of LEO as a safe, effective, complementary treatment for anxiety and sleep disturbances in medical settings. However, without adequate controls, the significance of the research is limited.

Holist Nurs Pract. 2018 Nov/Dec;32(6):324-335. doi: https://pubmed.ncbi.nlm.nih.gov/30320657/
This article is not available for free.

Research Highlight #2

Effect of Cardamom Inhalation Therapy on Intra- and Postoperative Nausea & Vomiting of Mothers Undergoing Spinal Anesthesia for Elective Cesarean Section

Khatiban et al., 2021

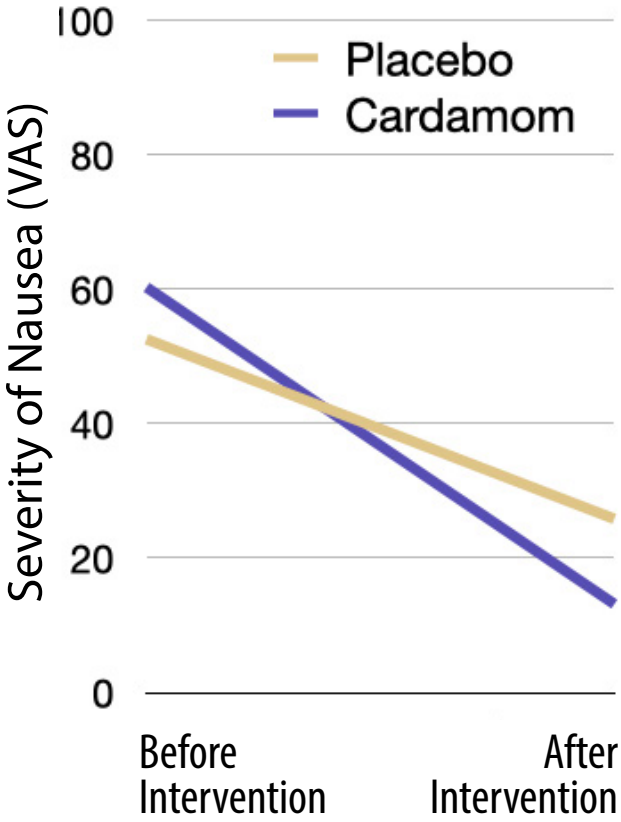
A 2021 single-blind, randomized, placebo controlled clinical study conducted in Iran looked at the effectiveness of inhaled Cardamom essential oil as a possible perioperative intervention to alleviate nausea and vomiting in women undergoing elective Cesarean section.

A total of 70 women were selected and then randomly assigned either to the intervention or the placebo group. Both the groups were presented with a plastic bag with two wet gauze squares, and the intervention group had two drops of the essential oil applied to the gauze. All women were instructed to practice controlled breathing (inhale from the bag for 4 seconds through the nose, hold breath, exhale through mouth for 7 seconds) three times. This happened as the patients reported nausea and then after 2 and 5 minutes.

VAS (visual analog scale) of 0-100 was used to assess the severity of nausea before the intervention and after, and the frequencies of emetic episodes (nausea, retching, vomiting) was recorded after the intervention. If nausea persisted after the intervention, conventional anti-emetic drugs were administered.

Both groups showed a statistically significant decline in nausea severity post intervention, yet the intervention group showed a more pronounced decline than the placebo group ($P < 0.01$). Emetic episode frequency as well as the number of participants who received antiemetic medications were both lower in the intervention group.

The researchers noted that the study results support the effectiveness of Cardamom aromatherapy in reducing the severity of nausea, and as such can be considered as a palliative treatment for inter- and postoperative nausea and vomiting.



Controlled breathing with 2 drops of Cardamom essential oil was tested against just controlled breathing in 70 women undergoing elective C-section to alleviate nausea and vomiting.

Both groups showed decline in nausea severity, however the decline was more pronounced in the intervention group, which also showed lower numbers of nausea episodes and retching.

DOI: 10.1016/j.jopan.2021.09.008

Mahnaz Khatiban, PhD, Masoumeh Mirzaie, MSN, Akbar Fazeli, MD, Leili Tapak, PhD Zahra Khalili, MSNe

Journal of PeriAnesthesia Nursing, 2022. doi: https://doi.org/10.1016/j.jopan.2021.09.008

This article is not available for free.

https://www.sciencedirect.com/science/article/abs/pii/S1089947221003294

Research Highlight #3

The Effect of Aromatherapy on Blood Pressure and Stress Responses by Inhalation and Foot Massage in Patients with Essential Hypertension.

Çiçek et al., 2022

This is not the first study using essential oils on patients with high blood pressure, but it is the first to compare inhalation of an essential oil with foot massage using the same oil. It is one of very few studies in which a single essential oil was used, and not a blend (single oil research is actually more useful, at least initially). The 20 stages of the foot massage are described in detail (it was not reflexology) and, perhaps surprisingly, the results showed that inhalation was the more effective intervention.

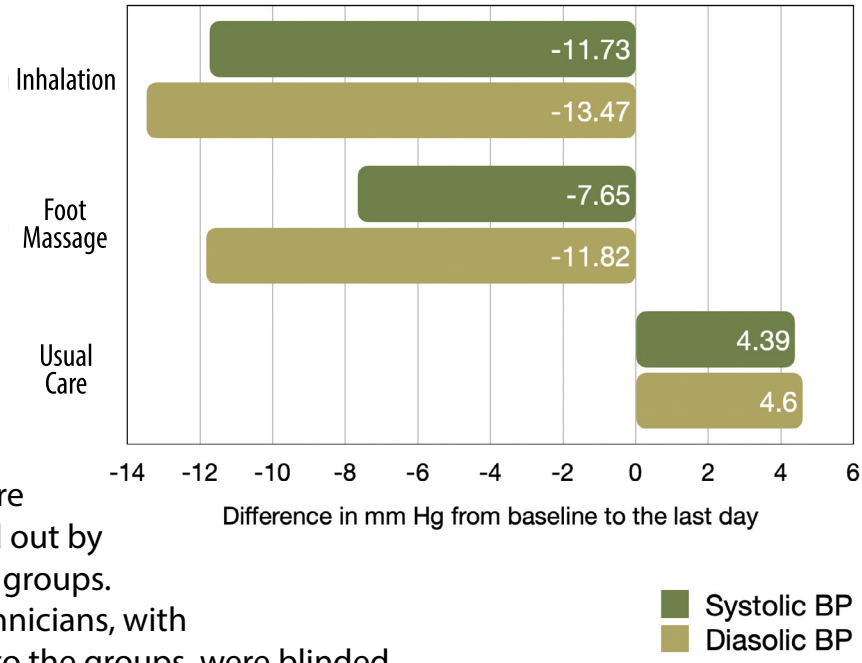
Subjects were recruited from two hospitals in Bolu, Turkey, and all had diagnosed essential hypertension for at least 6 months. There were 37 males, 32 females, and 38 subjects had suffered from hypertension for more than 10 years. Essential, primary, or idiopathic hypertension is defined as high BP with no known secondary cause such as renovascular disease.

This was a randomized, controlled clinical trial with three groups, 23 in each group: (1) Lavender inhalation for 5 minutes per day, (2) Foot massage of 10 minutes per foot, and (3) usual care. Group 1 was first checked for anosmia, and group 2 was tested for skin reaction to Lavender oil. The average age in each group was 68.4, 70.8 and 72.1 years respectively. All subjects were taking antihypertensive medication.

Group 1 smelled 5 drops of Lavender oil on a gauze cloth 10 cm from the nose, and the foot massage was performed using 5 drops of Lavender oil per foot, apparently with no dilution. Interventions were performed at the same time of day, Monday, Wednesday and Friday over six days.

Measurements were taken of systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate and serum cortisol. Measurements were taken both before, and 5-10 minutes following, each of the 3 intervention days. Subjective stress (state anxiety) was also measured, but only at baseline and after the final intervention. Baseline scores were not significantly different between groups.

The Table compares the blood pressure differences for both SBP and DBP between baseline and the last day. This shows that both of the Lavender oil interventions were more effective than usual care, with inhalation being moderately more effective than foot massage.



Outcome measures (blood pressure and stress responses) were carried out by another researcher blinded to the groups. Clinical nurses and laboratory technicians, with patients assigned independently to the groups, were blinded to the groups.

Heart rate barely changed for group 2, while for group 1 it reduced by 5.1 beats per minute, and for group 3 it increased by 3.2. Serum cortisol reduced by 3.27 ug/dL for group 1, reduced by 2.65 for group 2, and increased by 1.25 for group 3. State anxiety reduced by 2.43 for group 1, 10.52 for group 2, and increased by 2.17 for group 3. Whether cause or effect, this study shows a strong correlation between high BP and signs of stress, although foot massage with Lavender showed the greatest reduction in state anxiety, while Lavender inhalation showed a greater reduction in BP.

The authors acknowledge that it would be useful to see longer-term effects using Lavender oil, and that it is difficult to separate pharmacological and placebo effects.

Hypertension is a primary risk factor for chronic renal failure and cardiovascular disease. Globally, it is estimated that 1.13 billion people (about 30% of the world's population) had either primary or secondary hypertension in 2015, and that increased blood pressure accounted for 10.4 million deaths.

Saadet Can Çiçek 1, Şeyma Demir, Dilek Yılmaz, Aynur Açıkgöz, Sedat Yıldız, Özgür Mehmet Yis

https://pubmed.ncbi.nlm.nih.gov/35708557/

Research Highlight #4

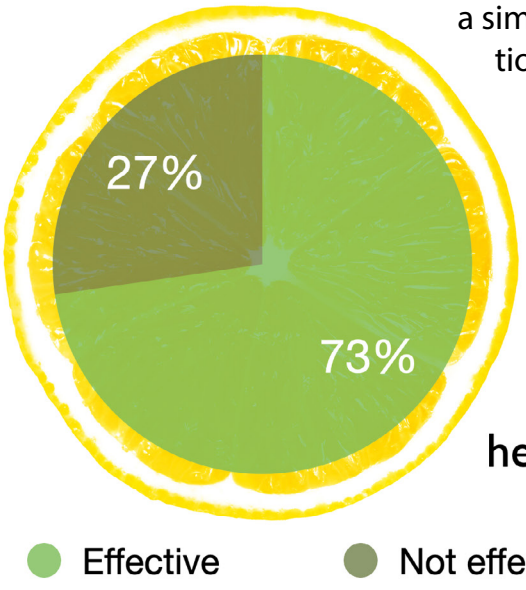
Aromatherapy in Palliative Care: A Single Institute Retrospective Analysis Evaluating the Effect of Lemon Oil Pads against Nausea and Vomiting in Advanced Cancer Patients

Kreye et al., 2022

The University Hospital in Krems, Austria, regularly uses aromatherapy within their palliative care unit. In 2022 the hospital team published a retrospective analysis looking at the effectiveness of Lemon essential oil inhalation on nausea and vomiting in advanced cancer patients. A total of 205 applications of Lemon oil in 66 patients were evaluated with a significant effect observed for the inhaled oil. There was no control group.

All patients were in a palliative care setting and were no longer receiving systemic anticancer therapy. They all suffered from advanced hemato-oncological disease. This includes such conditions as leukemias and lymphomas, as well as cancers of other organs.

After patient consent, two drops of Lemon oil were applied to a cotton pad, which was then either given to the patient to smell as needed, or pinned to their clothing. Ten minutes later the patient was asked about the efficacy of the intervention with a simple yes/no question. Patients were given other medication if the Lemon oil was not effective.



Of the total 205 reported interventions the patients reported effectiveness in 149 cases.

Inhalation of Lemon essential oil helped nausea and vomiting in 73% of cases.

A total number of 66 patients received 222 interventions, of which 205 could be evaluated. In 149 cases (73%) the inhaled Lemon oil was effective in alleviating the nausea. The other 56 cases (27%) required further medication.

Lemon oil has already been studied and found effective for nausea and vomiting in pregnancy (see a paper we reported on previously here) and other essential oils, such as Ginger, Peppermint and Cardamom, have been researched for nausea in palliative care and cancer care settings.

Essential oil inhalation is a low risk and highly effective intervention for nausea and vomiting. Future studies may compare the efficacy of single and/or blended essential oils, and may involve larger patient groups.

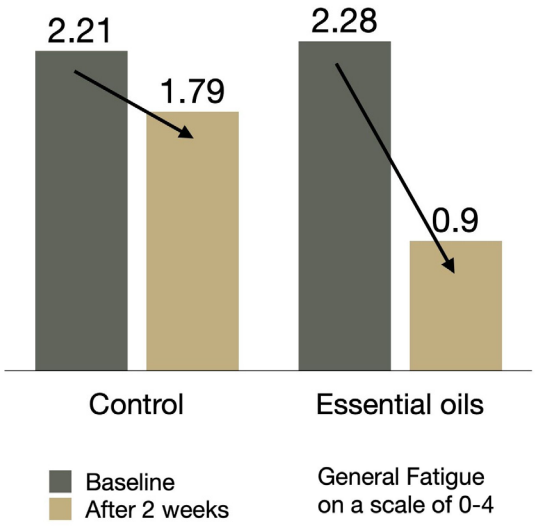
Gudrun Kreye, Manuela Wasl, Andrea Dietz, Daniela Klaffel, Andrea Groselji-Strele, Katharina Eberhard, Anna Glechner | https://pubmed.ncbi.nlm.nih.gov/35565260/

Research Highlight #5

Peppermint Inhalation Reduces Fatigue in Women with Hypothyroidism

Hawkins et al., 2019

A clinical trial by Hawkins et al and published in 2019 looked at the effects of aromatherapy on fatigue in women aged 18 - 55 with diagnosed hypothyroidism. The study ran over two weeks, and fatigue was measured by means of a questionnaire – the Multidimensional Fatigue Symptom Inventory (MFSI) - which assesses 10 types of fatigue. 41 participants completed the study – 21 in the aromatherapy group and 20 in the placebo group.



Participants were instructed to put three drops of a liquid preparation into a personal inhaler and inhale for 15 minutes once a day. At the beginning and the end of week one there was little difference in MFSI scores, but by the end of week two, only the aromatherapy group showed significant improvements in some measures of fatigue, especially "general fatigue" ($p=0.015$). It is notable that this effect was seen only from a few minutes of daily inhalation.

This study was faced with a particular combination of challenges. One, the placebo effect is notoriously good for pain, and two, the study involved essential oil inhalation (and establishing a genuine placebo for aromatherapy is difficult). The researchers addressed this by having the placebo group sniff avocado oil, while the intervention group sniffed a blend of essential oils. The exact blend is not reported, but consisted primarily of Peppermint, with smaller amounts of Black Pepper, Clove bud, Grapefruit and Bergamot.

All participants knew they were in one of two groups in an aromatherapy study, and at one point during the study, they were asked if they had any comments about the essential oil blend. From the responses it was clear that some in the placebo group thought they were in the intervention group, and vice versa. This helped to establish the authenticity of the placebo group.

Hawkins et al (2019) Aromatherapy reduces fatigue among women with hypothyroidism: A randomized placebo-controlled clinical trial. https://pubmed.ncbi.nlm.nih.gov/31437124/

Research Highlight #6

Spicae aetheroleum (Spike Lavender) Essential Oil Tested for Efficacy in Patients with Acute Bronchitis

Kähler et al., 2019

There are several essential oil-based capsules that are approved over-the-counter medicines, and many are sold in pharmacies, especially in Europe. Most of these come in enterically-coated capsules, are formulated for slow release, and are recommended for a variety of ailments, such as IBS, anxiety, and upper respiratory issues. Tavipec® (Spike Lavender oil capsules) is one such preparation and has performed well in clinical studies.

In a double-blind, placebo-controlled randomized clinical trial Tavipec® (an Austrian product) was given to patients with acute bronchitis. The test substance was 150 mg of Spike Lavender oil, taken in identical gastric resistant capsules as the placebo. The Spike Lavender oil used conforms to the European Pharmacopeia standard (35-50% linalool, 16-39% 1,8-cineole, 8-16% camphor). Patients took two capsules three times daily. The full 10 day study was completed by 119 patients in the treatment group and 100 in the placebo group (18-75 years of age, about 50/50 male and female, minimal BSS score of 5).

Shown above are the results for the Bronchitis Severity Score (BSS) a recognized way to assess five symptoms: cough, sputum production, rales (rattling on listening to chest), pain on coughing, and dyspnea (shortness of breath). The authors acknowledge that acute bronchitis is a self-limiting disease – most patients are going to get better, with or without treatment. They also mention that 60-93% of patients are prescribed antibiotics, even though studies have shown that this is not beneficial. (Note that antibiotic use may be appropriate in severe cases.)

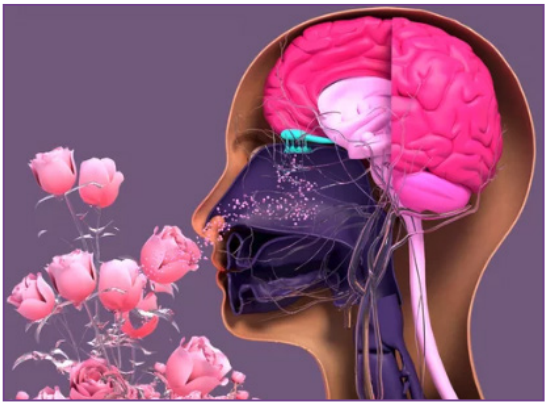
By the end of both 7 days and 10 days, all measured parameters showed significant improvement in the treatment group compared to the placebo group with the exception of sputum production. The significance for the BSS score was $p < 0.005$ at day 7, and $p < 0.009$ at day 10. This suggests that Tavipec® is an effective treatment for the symptoms of acute bronchitis.

Kähler et al (2019) Spicae aetheroleum in uncomplicated acute bronchitis: a double-blind, randomized clinical trial. Wiener Medizinische Wochenschrift 169:137-148
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6435634/pdf/10354_2017_Article_612.pdf

Research Highlight #7

Olfactory Training has Positive Results in Patients Suffering from Anosmia.

Konstandinidis et al., 2013



Olfactory training, also known as smell training, is currently the only known intervention to help with loss of smell (anosmia). The protocol was devised by Thomas Hummel of Dresden University Faculty of Medicine, and involves smelling four fragrant substances intentionally, for 10-30 seconds each, twice a day. Anosmia is most commonly caused either by trauma such as head injury, or viral infection of the upper respiratory tract.

The odorants were selected based on Henning's odor categories - a flowery odor (Rose or phenyl ethyl alcohol), a fruity odor (Lemon, Lemongrass or citronellal), an aromatic one (Clove or eugenol), and a resinous one (Eucalyptus, or 1,8-cineole).

This prospective clinical controlled study of olfactory dysfunction in 119 people was divided into two groups based on the origin of their smell loss. There were 72 in the post-infectious group and 47 in the post-traumatic group. Each of these groups was then further divided into intervention and control groups.

The intervention groups were instructed to perform smell training with the four odorants (phenyl ethyl alcohol, 1,8-cineole, citronellal and eugenol) twice daily for five minutes. During those five minutes they would smell each odor for 10 seconds and then take a 10 second break before moving to the next one. They continued like this for 16 weeks total.

Their olfactory function was assessed at baseline, and then at 8 and 16 weeks, using the Sniffin' Sticks battery test. At the end of the study period, 68% of the post-infectious intervention group reported improvement (compared to 33% in the control group), and 33% of the post-traumatic intervention group also increased their sense of smell acuity (compared to 13% in the respective control group).

This case-controlled study is one of several that show the efficacy of smell training to improve sense of smell in patients with olfactory dysfunction. Smell training is an easily available and safe intervention that shows a lot of promise in the area of smell loss.

Konstandinidis et al, 2013 | https://doi.org/10.1002/lary.24390

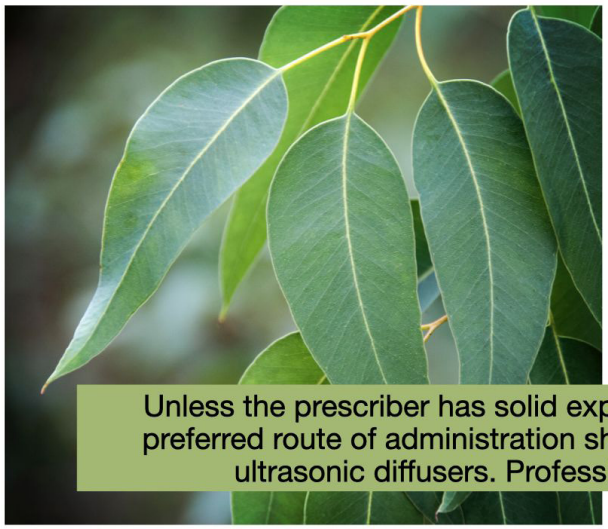
Research Highlight #8

Appropriate use of Essential Oils and their Components in the Management of Upper Respiratory Tract Symptoms in Patients with Covid-19

Valussi et al., 2021

This is a review of clinical and non-clinical evidence for essential oils that may be useful for the management of upper respiratory tract symptoms, such cough, mucus, nasal congestion, runny nose and sore throat. Most of the clinical research is either for chest-rub type products (e.g. Pinimenthol©, Vick's Vaporub©), or gel caps for oral ingestion (e.g. Myrtol©, Tavipec©). There is a particular focus on cineole and menthol, since both are commonly found in such products. No studies are reported in COVID-19 patients.

It is stressed that essential oils should only be used in "mild" cases, which by extrapolation would not include hospitalized patients. There is a list of recommended essential oils - mostly ones high in 1,8-cineole, such as Eucalyptus globulus - and three are specifically not recommended - Peppermint, Cornmint and Laurel leaf. Laurus nobilis leaf oil is not recommended because of the risk of allergic reactions.



Intervention using the following oils may be useful (for full selection see paper):

All cineole-rich **Eucalyptus** species, **Cajeput**, **Niaouli**, **Ravintsara** for upper respiratory symptoms

Cardamon, **Myrtle** for digestive symptoms

Melissa, **Lemongrass** for anxiety/sore throat

Unless the prescriber has solid experience with orally administered essential oils, the preferred route of administration should be through vaporization with boiling water or ultrasonic diffusers. Professional supervision is strongly recommended.

The authors state:
The primary aim of this research work is to outline the potential and evidence-based uses of essential oils and their major components for the safe clinical management of mild respiratory symptoms associated with uncomplicated infections caused by human coronaviruses like SARS-COV-2. A secondary aim is to discourage the spread of misinformation by providing an evidence-based dissertation on the topic.

The reference to misinformation could in part be in regard to Laurel leaf oil and unfounded claims that it can kill SARS-Cov-2.

On Peppermint and Cornmint
The authors state that essential oils with high concentrations of menthol are not recommended in patients with COVID-19, due to their ability to potentially reduce the self-perception of dyspnea (shortness of breath, difficulty breathing), which can lead infected patients to underestimate the actual severity of their disease and to dangerously delay medical intervention.

Other key points
• Essential oils as symptomatic remedies for mild SARS-CoV-2 infections still lack clinically-demonstrated effects on the etiology of the disease and they should not be used as a curative purposes remedy.
• Because of the potential for drug interactions, professional supervision is recommended, especially in patients with baseline comorbidities who take several drugs for chronic health conditions.

Recommended treatment protocol
Unless the prescriber has solid experience with orally administered essential oils, the preferred route of administration should be through vaporization with boiling water or ultrasonic diffusers. Patients should be advised to inhale vapors from above, while ideally covering their head with a towel. Each treatment should last 10-15 minutes and should be repeated 2-4 times a day. Patients should rest for at least 15 minutes after the treatment in order to avoid vasovagal reactions & falls.

Valussi, M., Antonelli, M., Donelli, D., & Firenzuoli, F. (2021). Appropriate use of essential oils and their components in the management of upper respiratory tract symptoms in patients with COVID-19. Journal of herbal medicine, 100451.

Advance online publication. https://doi.org/10.1016/j.hermed.2021.100451

Research Highlight #9

Effectiveness of Lavender Inhalation Aromatherapy on Pain Level and Vital Signs in Children with Burns

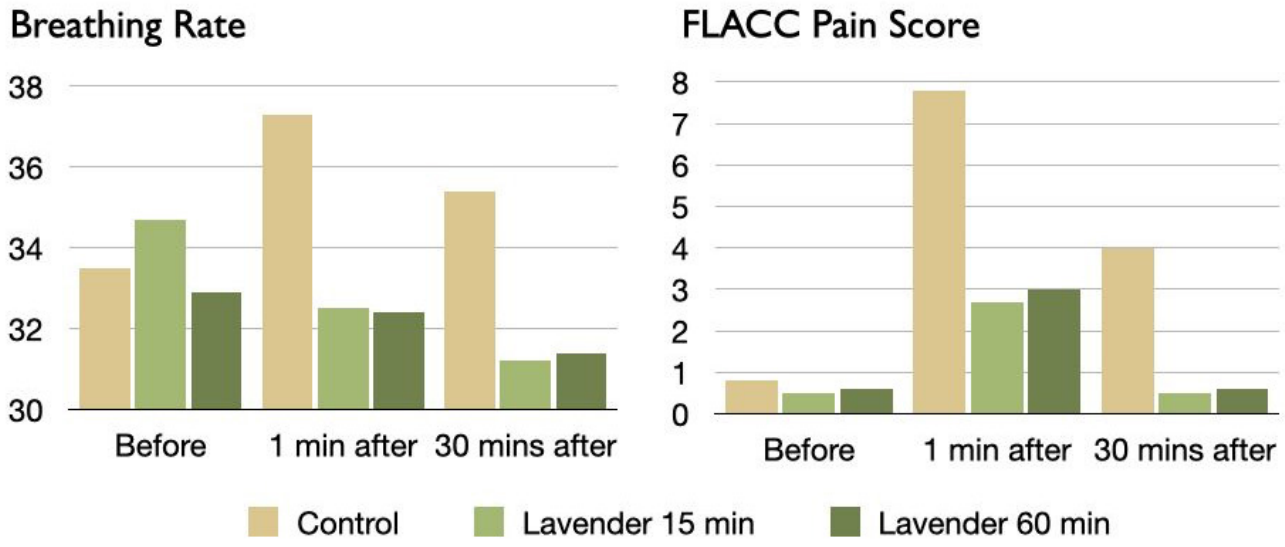
Akgül et al., 2021

Lavender oil inhalation for pain during wound dressing in children with burns.

A randomized controlled trial conducted at a children's hospital in Turkey measured the efficacy of Lavender oil inhalation on diminishing pain and stabilizing vital signs in pediatric patients with 2nd degree burns.

108 children with an average age of 36 months were divided into three groups: one group inhaled Lavender essential oil placed on a cotton gauze for 15 minutes before wound dressing, a second group inhaled the essential oil for 60 minutes before wound dressing, and the control group inhaled Jojoba oil on a cotton gauze for 15 minutes before wound dressing.

Pain levels were measured using the FLACC Pain Scale (used mostly for young children, who cannot be expected to assess their own pain), and vital signs were taken 1 minute and then 30 minutes after dressing of the burn wound.



Pain score and vitals were monitored for burn patient children before wound dressing and then 1 min and 30 minutes after. Compared to the Jojoba oil control group, both Lavender groups (inhaling Lavender EO for either 15 mins or 60 mins) showed lower pain scores and calmer breathing at both checkpoints.

Both the intervention groups showed significantly lower pain levels and more stabilized vital signs (heart rate, respiratory rate, mean arterial blood pressure) at both of the checkpoints, with values of $p < 0.000$ for the vital signs, and for pain. However here was no significant difference between those who inhaled Lavender essential oil for 15 and 60 minutes, showing that the shorter inhalation time is equally efficient.

Acute pain during wound dressing can be difficult to manage, and unmitigated pain can have an adverse effect on the healing process. This clinical study shows that non-pharmacological intervention, such as Lavender essential oil inhalation, can be usefully integrated into a pain management regime, even for small children.

It also shows the efficacy of inhaled Lavender oil. With subjects this young (all were between 2 months and 7 years), it is hard to imagine there was any preconceived notion of what they were smelling and how it was supposed to make them feel.

The study was blinded in that the children, their parents, and the researcher assessing pain and vital signs did not know which group any patient was in, and the researcher analyzing the statistics did not know which group the data was derived from.

Akgül E.A. et al (2021). Effectiveness of lavender inhalation aromatherapy on pain level and vital signs in children with burns: a randomized controlled trial. Complementary Therapies in Medicine 60, 102758 | https://www.sciencedirect.com/science/article/pii/S0965229921000996?via%3Dihub

Research Highlight #10

Prevalence of Endocrine Disorders Among Children Exposed to Lavender Essential Oil and Tea Tree Essential Oils

Hawkins et al., 2022

This is the first epidemiological study on the potential hormonal effects of essential oils on children, and epidemiological studies are the best way to find out whether or not there is a problem. The authors conclude that there is no increased risk of hormone disruption from using Lavender oil or Tea Tree oil.

Of the 412 participants who were exposed to one of the oils, 400 were exposed to Lavender oil, and of the more than 200 males exposed to Lavender oil, there were no cases of gynecomastia. This is less than would be expected even in the normal population, suggesting there could be a slight reduction in risk from using Lavender oil.

The abstract is reproduced in full below.

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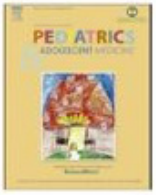

Prevalence of endocrine disorders among children exposed to Lavender Essential Oil and Tea Tree Essential Oils

Jessie Hawkins, PhD , Christy Hires, MPH , Elizabeth Dunne, MS, RNS , Lindsey Keenan, RDN

In 556 children with a mean age of 6.33, those who were regularly exposed to lavender or tea tree essential oils experienced the same risk of endocrine disorders as those were not exposed.

No cases of prepubertal gynecomastia were identified in either group, and prevalence of precocious puberty, delayed puberty, growth hormone deficiency, and hypothyroidism were all consistent with population norms.

Jessie Hawkins, PhD

Background:
Lavender essential oil and tea tree essential oil have become popular ingredients in personal care and household products in recent decades. Questions regarding the safety of these oils in pediatric populations have been raised, proposing a link between these essential oils and endocrine disruption in children, specifically prepubertal gynecomastia. To date, no epidemiological studies have been conducted to evaluate this proposed link.

Methods:
This is a cross sectional study conducted among parents of children in the United States to identify the prevalence of endocrine disruption in children aged 2-15 years old. This study also evaluates the potential for a relationship between the exposure of lavender essential oil and tea tree essential oil products and endocrine disrupting outcomes.

Results:
In 556 children with a mean age of 6.33 (SD = 3.92), prevalence of endocrine disruption was .016 (SD = 0.13). No cases of prepubertal gynecomastia were identified in either group, and prevalence of precocious puberty, delayed puberty, growth hormone deficiency, and hypothyroidism were all consistent with population norms. Total risk of endocrine disorders among those exposed (0.0194) did not differ from the risk of those unexposed (0.0069). The risk ratio was 2.796 (95% CI: 0.352, 22.163, P=.458).

Conclusion:
Children who were regularly exposed to lavender or tea tree essential oils experienced the same risk of endocrine disorders as those who were not exposed.

Hawkins, J., Hires, C., Dunne, E., Keenan, L.
International Journal of Pediatrics and Adolescent Medicine
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Research Highlight #11

Olfactory Training & Visual Stimulation Assisted by a Web Application for Patients with Persistent Olfactory Dysfunction after SARS-CoV-2 Infection

Denis et al., 2021

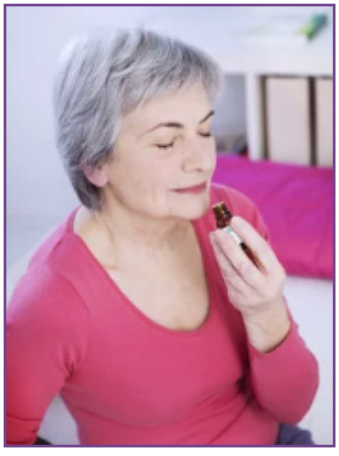
The Covid-19 pandemic is associated with a significant number of people losing their sense of smell. As olfactory training has been recommended for improvement of anosmia and hyposmia, many have turned to this simple intervention for help.

A French initiative launched a web-based application that is assisting people in their smell training with visual cues as well as guidelines on self-assessment. Participants have the option to order an essential oil kit to use - it includes Rose, Lemon, Eucalyptus, Clove and Birch.

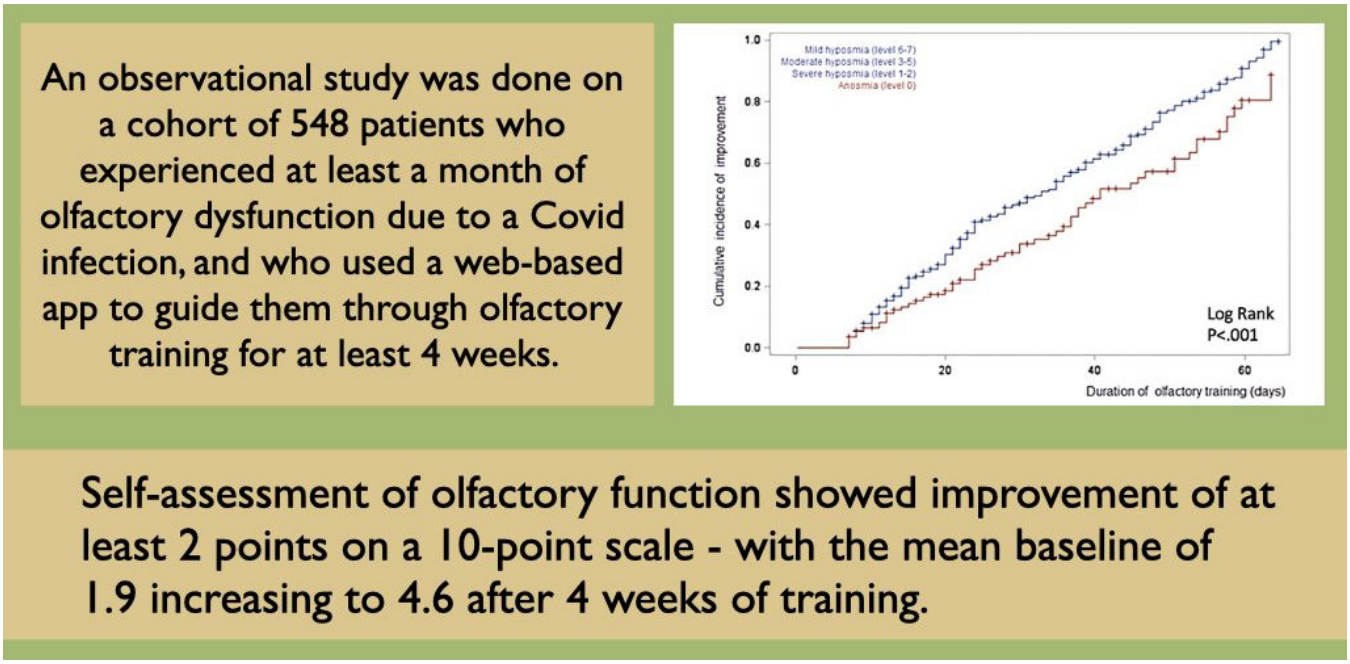
Interestingly, most of the previous clinical research uses single aroma chemicals - phenyl ethanol, 1,8-cineole, eugenol and citronellal. While citronellal is noted to represent a "Lemon" odor, it is more typical of Citronella essential oil. However, most protocols that use essential oils use Lemon.

The authors then recruited participants that met certain criteria for an observational study. The criteria included:

- Covid-related olfactory dysfunction lasting for at least one month
- Have done olfactory training with the help of the web-based application for at least 7 days



Patients smelled the training odorants twice daily, each time for 15 seconds with their eyes closed, and repeated the process for another 15 seconds while knowing which odorant they were smelling. They were asked to keep a diary, and the results were analyzed after at least four weeks of records were available, including regular self-assessment of olfactory function.



The report shows the results for the 548 patients who met the criteria and completed the study. The mean baseline score of olfactory function was 1.9 on a visual 10 point scale, and after 28 days the mean score rose to 4.6. Olfactory training was associated with at least a 1-point increase on the olfactory scale in 82.1% of patients, and 64.2% reported improvement of at least 2 points.

Both the length of training and the severity of olfactory dysfunction played a role in the improvement rate. A longer training period was associated with better results, and people with a lower olfactory score took longer to recover.

Although this study relied on self-assessment and there was no control group, it's still a reasonable indicator that consistent olfactory training can help in the recovery of Covid patients suffering from smell loss.

Denis F, Septans A, Periers L, Maillard J, Legoff F, Gurden H, Moriniere S
Olfactory Training and Visual Stimulation Assisted by a Web Application for Patients With Persistent Olfactory Dysfunction After SARS-CoV-2 Infection: Observational Study
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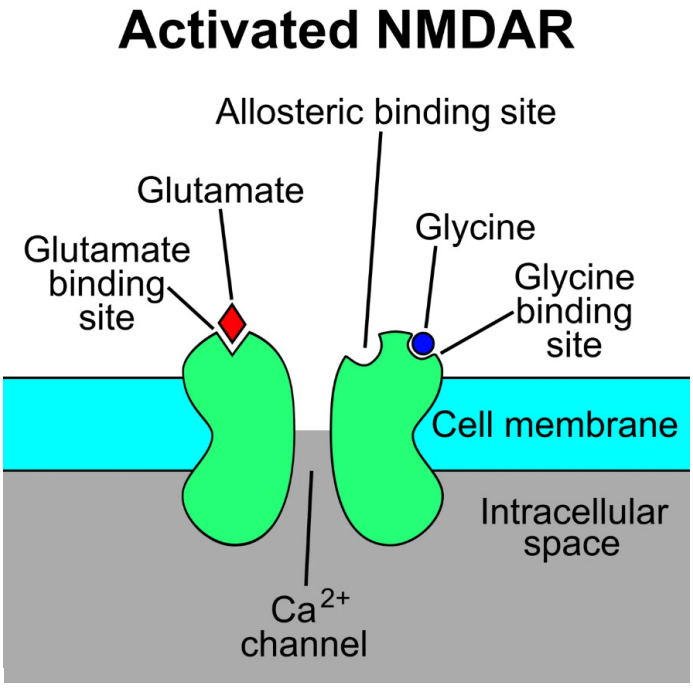
Research Highlight #12

Exploring Pharmacological Mechanisms of Lavender (Lavandula angustifolia) Essential Oil on Central Nervous System Targets

López et al., 2017

Lavender essential oil (LEO) has traditionally been used as an aromatherapy treatment for its calming effect, and is commercially available as a standardized formulation (Silexan, sold as either Lasea® or Calm Aid®) to treat anxiety and stress. However, the molecular interactions of cells in the body with LEO is not well understood. This study examines the interaction of LEO, linalool, and linalyl acetate with specific molecular and cellular targets in the central nervous system (CNS), and also explores their neuroprotective properties. These results help explain the anxiolytic and sedative effects seen in clinical studies with LEO.

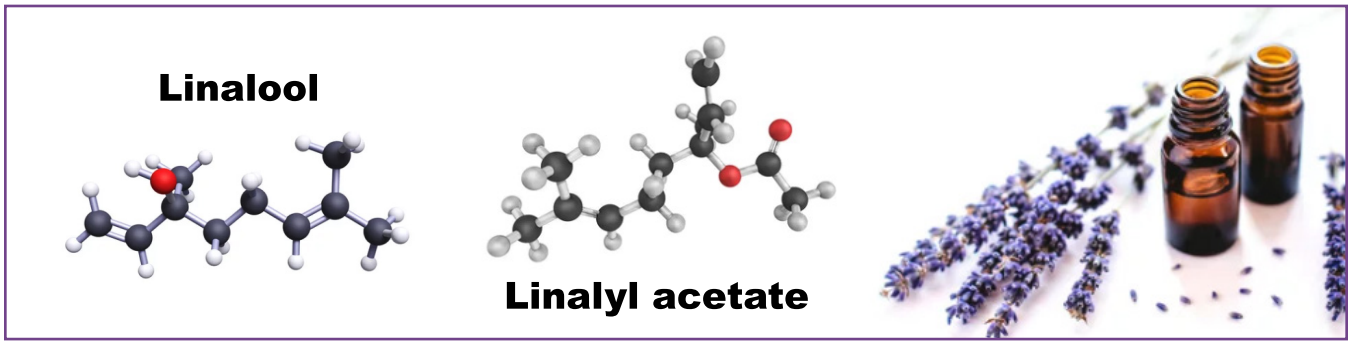
The interactions of LEO, linalool, and linalyl acetate with monoamine oxidase (MAO), w(SERT), gamma aminobutyric acid-A form (GABAA), and glutamate N-methyl-D-aspartate receptor (NMDA) were examined using established experimental protocols.



MAO is an enzyme that breaks down amines, including the neurotransmitters dopamine, norepinephrine, and serotonin, and also those found in some medications and foods. MAO is important for normal brain activity and development, and MAO deficiencies have been linked to aggressive, violent behavior. While MAO targets several neurotransmitters, SERT affects only serotonin by terminating its activity, and transporting serotonin back to the neurons. SSRIs and tricyclic antidepressants target SERT and block its activity, to result in increased serotonin levels.

The GABAA receptor inhibits neurotransmitter release in the CNS when active. Excessive GABAergic signaling can result in sedation, amnesia, and ataxia (lack of muscle coordination and control). The glutamate-NMDA receptor-ion channel complex can produce anesthetic and hallucinatory effects when inhibited. NMDA receptors are involved in disorders such as epilepsy and Parkinson's disease, and are pharmaceutical targets in current drug research and development.

MAO activity was not detected with various dilutions of LEO, but this test was inconclusive due to experimental errors. LEO and linalool, but not linalyl acetate, bound to SERT, indicating both compounds likely interact with serotonin recycling and cause an antidepressant-like effect. GABAA and NMDA receptors were tested using cells harvested from the cerebral cortexes of adult male rats. LEO, linalool, and linalyl acetate did not bind to GABAA receptors, but all three compounds dose-dependently bound to NMDA receptors.



This interaction with NMDA receptors has not been reported previously and is likely to be a major reason for LEO's anxiolytic effects and neuroprotective activity. NMDA antagonist drugs work by blocking different parts of the NMDA receptor, which results in different effects. Ketamine, for example, is an anesthetic, which blocks the calcium channel, and LEO and constituents work by blocking glutamate.

The authors conclude that the anxiolytic and antidepressant activity of LEO may be due to NMDA receptor modulation and inhibition of SERT. They note that the free hydroxyl group present in linalool (but not linalyl acetate) may be the reason for its SERT interaction. They also believe the acetate group present in linalyl acetate increases NMDA activity compared to linalool.

Neuroprotective activity was measured by exposure of undifferentiated cells from a neuroblastoma cell line to one of three cell toxins, in conjunction with LEO in various concentrations over multiple time points. LEO protected against hydrogen peroxide injury when applied at the same time as the hydrogen peroxide, and at 2 hours and 24 hours prior to hydrogen peroxide application. LEO offered no protection from malonate injury. To simulate Parkinson's disease, amyloid plaque causing peptides were introduced to cultured cells. LEO introduced two hours before amyloid injury did show protection, but overall this test was inconclusive. The implications of protection from hydrogen peroxide injury were not discussed.

This study establishes the interactions of LEO, linalool, and linalyl acetate in the CNS. While clinical studies have established the anxiolytic and sedative properties of LEO, the reason for this action has not been established on the molecular and cellular level. This study shows that these compounds interact directly with SERT and NMDA receptors, although linalyl acetate did not interact with SERT. These findings are a significant addition to evidence-based aromatherapy practices. The significance of neuroprotection from hydrogen peroxide by LEO is less clear, and likely needs to be further explored.

López V, Nielsen B, Solas M, Ramírez MJ, Jäger AK. (2017). Frontiers in Pharmacology, May 19;8:280. doi: 10.3389/fphar.2017.00280.
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