california work-related asthma prevention program

CDPH California Department of PublicHealth

INVESTIGATION INTO POTENTIAL FOR EMPLOYEE EXPOSURES TO ESSENTIAL OILS USED TO TREAT PATIENTS AT A CALIFORNIA SURGERY CENTER

SEPTEMBER 29, 2019

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BACKGROUND

The California Department of Public Health (CDPH), Occupational Health Branch, is mandated to evaluate the public health effects of workplace hazards, and to make recommendations to prevent occupational illness and injury. The Work-Related Asthma Prevention Program (WRAPP) within CDPH has an ongoing project to learn about fragrance exposures at workplaces. We are not a regulatory agency and do not issue citations. We function as a research and health promotion program, and key aspects of our work include conducting workplace evaluations of conditions that may contribute to work-related illness and injury and making recommendations for prevention following our site visits.

WRAPP has tracked hundreds of asthma cases associated with fragrances at work (Weinberg et al. 2017). These worker illnesses have occurred in many indoor work settings like schools, hospitals, offices, and manufacturing. WRAPP found that perfume was the ninth most common exposure reported by people with asthma related to their work. Nearly a quarter of the cases associated with fragrances were new-onset asthma, meaning the workers developed new asthma from their conditions at work. Our data led us to develop educational fact sheets (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/WRAPP/Pages/Fragrances.aspx) for workers and employers and to publish our surveillance data about work-related asthma due to fragrances. We also promote fragrance-free workplace policies. (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/WRAPP/CDPH%20Document%20Library/model_fragrance_free_policy.docx)

When CDPH staff was made aware of the practice of using essential oils (EOs) to treat patients at a California surgery center, we wanted to better understand how and when EOs are used and what means are used to prevent employee exposures. Because EOs contain a complex mix of fragrance chemicals, it is important to consider potentially harmful exposures to both workers and patients. CDPH staff members visited this facility on March 13, 2019, interviewed personnel who are responsible for implementing the EO policy and staff members who administer the EOs, reviewed training and policy documentation and injury and illness recordkeeping, and observed storage of the EOs and the mixing/dispensing process and location.

FACILITY DETAILS

The surgery center is an acute care facility which offers surgery and labor and delivery care. There are approximately 300 staff members, including about 150 registered nurses. There is not a union at this workplace.

The facility has a committee which meets regularly and addresses safety issues. There is a daily brief safety meeting to which anyone can come. Employees can express concerns by calling an anonymous complaint line, emailing a local leadership team, or filing a patient safety report. There is an onsite safety officer.

WORKSITE POLICIES AND PROCEDURES RELEVANT TO FRAGRANCE EXPOSURES AND ESSENTIAL OIL USE

The facility's policy for their workforce contains this statement regarding wearing fragrance at work: "No heavily scented lotions or perfumes." The Dress Code policy contains this statement regarding wearing fragrance at work: "If a supervisor determines that a Workforce member's appearance or odor detracts from Legal Entity's professional image, reduces or negatively impacts safety at Legal Entity, and/or violates the applicable regulations, the supervisor has the right to request that the Workforce member adjust his/her appearance to ensure compliance with this policy, including by, among other things, removing piercings, covering up tattoos, adjusting clothing, and removing offending colognes/perfumes." In addition, it was stated during our meeting that patients are asked to avoid fragrances and not bring in scent diffusers or EOs and surgical patients are asked to shower and use no products before coming in. There is no specific fragrance policy for visitors.

The procedure for dispensing EOs for patient care is found in two internal policy documents—a policy that outlines the different kinds of complementary care offered and instructions for EO use. The policy states that "Essential oils can be used for a variety of conditions, such as pain, nausea, anxiety, sleep, headache, rest/relaxation, and/or spiritual well-being." It also states that a physician order is not needed to initiate integrative interventions such as EO use. There is no discussion of the adverse effects of EOs or the chemicals found in them other than a brief statement that phenols can be caustic to the skin and an assertion that "Allergies to essential oils are rare." There are statements made about the classes of chemicals such as "Terpenes—inhibit the accumulation of toxins and help discharge existing toxins from the liver and kidneys." There are detailed procedures for keeping the EOs contained during mixing/dispensing, staff precautions against skin exposure, and steps to take in the event of a spill.

A brief description of the dispensing procedure was described by personnel: Drops of EOs are placed on a cotton ball inside a "snap-top" plastic vial, the vial is closed and labeled with which EOs are included, the date, and the name and room number of the patient. Gloves are the only personal protective equipment required, but surgical masks are offered for use by staff on a voluntary basis. Disposable nitrile gloves are provided. The vial is taken to the patient's bedside and the patient is instructed to open the cap and slowly inhale as needed. Since there is no control of how often or how long the patient keeps the vial open, there is relatively little control of how much vapor is emitted into the room. There is currently no sign or indication for staff required on the outside of rooms where EOs are being used. The oils currently offered are bergamot, frankincense, lavender, lemon, geranium, mandarin or wild orange, peppermint, and Roman chamomile.

Because of spill/release incidents and staff complaints, several changes have been made to the methods used to store EOs. They are now triple-contained: the small bottles of EOs are individually bagged in small plastic zipper-sealed bags which are individually stored upright in small plastic boxes. These boxes are in turn stored in a large plastic bin. The bin is kept in a closed cabinet.

During our site visit it was stated that the written complementary care policy has been in place for three years. This policy covers several modalities in addition to EO use: breathing techniques, gentle touch/acupressure, and imagery. A two-hour training is given to cover all modalities, and the time spent on EO use is about 40 minutes. Staff who can administer the EOs are nurses. Some support staff can also do the mixing and preparation of EOs. Training is provided by an on-staff educator who has taken a botanical healing arts certification class. Nurses can opt out of offering and administering EOs and do not have to go to training, and some nurses have chosen to opt out. Patient assignments can be changed so that nurses do not have to work with patients who are using EOs.

Some nurses offer EOs to patients more than others. Patients are asked if they have allergy or sensitivity before they are offered EOs. No other information about potential adverse effects is shared with patients. According to the personnel we interviewed, approximately ten percent of patients choose to use EOs, with a higher proportion of perinatal patients than surgery patients opting to use them. Employees are also allowed and encouraged to use EO products at work as self-care.

The Hazard Communication training curriculum is general and does not include specific information regarding adverse health effects of EOs.

RECORDS REVIEW

A review of the Cal/OSHA 300 log from the last three years showed that one employee had a respiratory reaction (allergy) to essential oils and that another had severe bronchospasm in reaction to fragrance worn by a coworker.

Safety Data Sheets (SDSs) for the eight currently used EOs were provided. No detailed chemical ingredient information was found on the SDSs. The SDSs contained no information about recommended glove types. Listed health effects and hazards included, but were not limited to the information summarized in Table 1.

TABLE 1.
SUMMARY OF HEALTH EFFECTS AND HAZARDS LISTED ON PRODUCT SAFETY DATA SHEETS

PRODUCT TRADE NAME	LISTED HEALTH EFFECTS	OTHER HAZARD	SIGNAL WORD
Bergamot Oil	Skin irritation, serious eye irritation, and allergic skin reaction. Sensitization possible through skin contact.	Flammable liquid	Warning
Frankincense	None given	Flammable liquid	Warning
Geranium Oil	Serious eye damage, skin irritation, allergic skin reaction. Sensitization possible through skin contact. Corrosive.	Combustible liquid	Danger
Lavender Oil	Skin irritation, serious eye irritation, allergic skin reaction. Sensitization possible through skin contact.	Combustible liquid	Danger
Lemon	Skin irritation, allergic skin reaction. Sensitization possible through skin contact.	Flammable liquid	Danger
Peppermint	Skin irritation, serious eye irritation, allergic skin reaction. Sensitization possible through skin contact.	Combustible liquid	Danger
Roman Chamomile	None given		None given
Wild Orange	Skin irritation, allergic skin reaction. Sensitization possible through skin contact.	Flammable liquid	Danger

Product information pages were accessed online for the EOs. The pages list "main chemical ingredients," but no percentages are given and no indication is given about how many other chemicals are in each product. All products carry this precaution: "Possible skin sensitivity. Keep out of reach of children. If you are pregnant, nursing, or under a doctor's care, consult your physician. Avoid contact with eyes, inner ears, and sensitive areas." The disclosed ingredients from the Product Information Pages are summarized in Table 2 below.

TABLE 2. SUMMARY OF MAIN CHEMICAL COMPONENTS AND CAUTION INFORMATION FROM PRODUCT INFORMATION PAGES

PRODUCT NAME	MAIN CHEMICAL COMPONENTS
Bergamot Oil	Limonene*, linalyl acetate, linalool*, terpinene, β-pinene
Frankincense	α-pinene, limonene*, α-thujene
Geranium Oil	Citronellol*, citronellyl formate, geraniol*, guaiadene, menthone
Lavender Oil	Linalool*, linalyl acetate, ocimene
Lemon	Limonene*, β-pinene, γ-terpinene
Peppermint	Menthol, menthone, eucalyptol
Roman Chamomile	4-methyl amyl angelate, isobutyl angelate, isoamyl tiglate
Wild Orange	Limonene*

** Regulated by the European Union as a fragrance allergen (Regulation (EC) No. 1223/2009)*

No information was provided or found that indicates that there are United States Food and Drug Administration (FDA) approvals for any of the essential oil products being used. The FDA web page (https://www.fda.gov/cosmetics/cosmetic-products/aromatherapy) that covers aromatherapy states that "drugs must meet requirements such as FDA approval for safety and effectiveness before they go on the market." According to the FDA, claims that a product has a therapeutic use, such as "ease pain, relax muscles, treat depression or anxiety, or help (a person) sleep" are drug claims.

DISCUSSION AND FINDINGS

EOs are concentrated and complex mixtures of volatile chemicals, most of which are typically not identified on labels, SDSs, or online product information. Each EO can contain dozens or as many as a hundred different chemicals (Hui et al. 2010, Nematollahi et al. 2018). Generally, these chemicals are volatile hydrocarbon compounds such as terpenes, aldehydes, ketones, and alcohols, similar to those found in other fragrance blends (Nematollahi et al. 2018, Su et al. 2007).

A recent peer-reviewed journal article analyzed the chemicals that off-gassed from EO products similar, if not identical to, the EO products used by the surgery center, and found that all 12 EOs marketed as "natural" off-gassed acetaldehyde, a Proposition 65 carcinogen. The authors also found 3-carene, a known asthmagen (a chemical that can cause asthma in individuals who have never had asthma before [Association of Environmental and Occupational Clinics]) in 11 of 12 of the EOs marketed as "natural." Several other hazardous chemicals including other Proposition 65 carcinogens and developmental and reproductive toxicants were found as well (Nematollahi et al. 2018).

The chemicals found in EOs can degrade indoor air quality (Su et al. 2007) and can further react with gases in ambient air to form secondary pollutants such as formaldehyde and ultrafine particles (Huang et al. 2012). Formaldehyde is a known asthmagen and carcinogen, and ultrafine

particles are irritants.

Although the SDSs list as ingredients items such as "Lavender Oil Lavandula angustifolia," this does not reveal the actual chemical composition of the product. For example, three typical major ingredients of lavender oil are linalool (a terpene), linalyl acetate (a monoterpene ester), and ocimene (a terpene) (Diaz et al. 2016; and online product information page), but more detailed analysis has identified 47 compounds (Hui et al. 2010) in a lavender EO the researchers produced using steam distillation with water. One of the compounds found was 3-carene, an asthmagen. In addition, linalool is one of 26 chemicals regulated by the European Union as a fragrance allergen (Regulation (EC) No 1223/2009).

The National Center for Complementary and Integrative Health at the National Institutes of Health (NCCIH) Clearinghouse provides information on NCCIH and complementary and integrative health approaches, including publications and searches of Federal databases of scientific and medical literature. They provide some information regarding EOs, and this site can be consulted for more information. For example, the NCCIH states that there is little scientific evidence of lavender's effectiveness for most health uses and that there is not enough evidence to determine its safety when inhaled as aromatherapy. Indeed, a number of adverse effects to patients have been reported in the literature (Posadzki et al. 2012).

As stated earlier, according to the FDA, claims that a product has a therapeutic use, such as "ease pain, relax muscles, treat depression or anxiety, or help (a person) sleep" are drug claims. The FDA web page (https://www.fda.gov/cosmetics/cosmetic-products/aromatherapy) that addresses the regulations for aromatherapy states that "drugs must meet requirements such as FDA approval for safety and effectiveness before they go on the market."

It is clear that the surgery center and its parent entity have recognized in their policies that fragrances can be an issue in the workplace. This is prudent since fragrances have been recognized to cause and trigger asthma and cause other respiratory effects (Weinberg et al. 2017, Caress and Steinemann 2009, Anderson and Anderson 1998, Lessenger 2001, Steinemann 2018). Fragrance-free policies are extremely important because they prevent workers and the public from developing new onset asthma and prevent the triggering of asthma symptoms in people who already have asthma. The use of EOs in a hospital setting appears to be inconsistent with the surgery center's current policy regarding fragrances.

Employees and patients at the surgery center are not given detailed information about the EO components and possible adverse health effects from the chemicals found in EOs. Although in the self-care section of the "Instructions for Use" there is some recognition that those in the vicinity of EO users can be affected, there does not appear to be a detailed review of or training about these effects. Patients and employees may get the impression that exposures to EO chemicals are without risk and continue to use them on their own or to dispense them for their job. It would seem that there is a duty of care (for patients) and requirement (for employees, under the Illness and Injury Prevention Program [IIPP] and Hazard Communication standards) that more information be given to them so that they are proceeding with full knowledge of potential risks of these chemical exposures.

The complementary care policy contains this statement: "Aromatherapy is rooted in herbal medicine from which many orthodox medicines are derived: aspirin, atropine, codeine, curare, digitalis, theophylline, vinblastine." While these examples all have therapeutic benefit, they can also be toxic and are never dispensed or sold without extensive adverse effects information, dosaging information, and in some cases a prescription or physician's orders. These medications have undergone FDA assessment and approval to show safety and effectiveness. If the comparison is to be made with aromatherapy chemicals, then similar precautions should follow—only FDA-approved products should be used and employees and patients should also be

given full disclosure of ingredients and potential adverse effects.

Health care workers, including nurses, are already exposed to several types of asthmagens and asthma triggers at work: cleaning products and surface disinfectants are typical exposures in a hospital setting, along with sterilants, and instrument processing detergents and disinfectants (enzymes, glutaraldehyde) (Pechter et al. 2005, Dumas et al. 2017). California work-related asthma surveillance data collected from 1993-2015 show that hospitals are the industry with the second highest rate (14.3 cases per 100,000 workers, compared to 2.7 cases/100,000 workers for all industries combined). Health care workers have a rate of work-related asthma twice as high as the rate of all occupations combined. Adding EOs to these already problematic exposures should be done with extreme care and with added measures to control exposures.

RECOMMENDATIONS

Staff and patient education

We commend the policy of allowing staff to opt out of handling EOs or administering EOs to patients. Continue this policy for employees who find them harmful or irritating or who otherwise have concerns. However, more employee education is warranted. Since EO ingredients have been implicated in a number of adverse health effects, and since employees may not be aware of these health effects, conduct a review using information provided by the SDSs, scientific literature, and toxicity studies, rather than that provided by aromatherapy proponents.

- Provide specific information to staff about potential adverse health effects of EOs as part of Hazard Communication and/or IIPP training. Examples include:
  - Fragrance ingredients can cause and trigger asthma and cause allergy.
  - Geranium oil can cause eye damage and most of the EOs can cause dermatitis and allergy.
  - Lavender oil has been linked to gynecomastia in boys (Henley et al. 2007, Diaz et al. 2016) and pregnant women may want to avoid exposure.
  - What an employee should do if she/he experiences rash, wheeze, difficulty breathing, etc., due to exposure to EOs or any other chemicals
- Ensure that staff knows they should report symptoms related to any chemical exposure to supervisors and that they should be sent by the employer for medical evaluation.
- Keep a binder or folder with SDSs where the EO bins are stored and ensure it is available to any employee.
- Contact the EO supplier(s) to get more specific and detailed EO component information and/or have an independent analysis conducted by a laboratory to get component information. Share results with employees.
- Contact the CDPH Food and Drug Branch, Drug Safety Program (https://www.cdph.ca.gov/Programs/CEH/DFDCS/Pages/FDBPrograms/DrugSafetyProgram.aspx) for regulatory guidance about the products, since these products are being used as unapproved drugs based on health claims made, and appear to be have no FDA approval. Pharmaceuticals typically come with dosage levels, adverse effects information, and instructions for use; as found on packaging labels and product inserts. This information would include what to do if a person experiences side effects such as rash, wheezing, difficulty breathing, etc. Since patients may not know if they have been sensitized to a substance until they have a reaction, this will help them seek medical assistance in a timely manner.

Engineering and administrative controls

- The surgery center has employed steps to decrease employee exposure and ambient airborne levels of EO ingredients. But these steps illustrate the difficulty in containing these volatile chemicals. Fragrance ingredients, including those found in EOs, are by design and necessity volatile. To better

contain fugitive vapors during mixing and dispensing, and in case of spill, install and properly maintain a benchtop ventilated hood equipped with organic vapor filters. Facility safety personnel should be consulted about equipment parameters and placement.

- A color-coded or pictographic warning card placed outside patient rooms where EOs are being used, along with employee training, can help staff avoid exposure. Once the patients who have used the EOs have been discharged and the vials properly disposed of, allow for an adequate number of air changes before the warning card is removed. The period of time necessary for this is dependent on the room ventilation characteristics and should be determined by facility safety personnel.

Personal protective equipment

- Contact the EO manufacturer or supplier for a more specific glove recommendation.
- Several EOs list eye damage or serious eye irritation as a hazard. Require eye protection (chemical splash goggles) for the dispensing of EOs.
- Surgical masks and N95 filtering facepiece respirators will not protect employees from volatile organic compounds. If respirators are offered, implement a Respiratory Protection Program per Cal/OSHA regulations and offer respirators that can be fitted with organic vapor cartridges.

Emergency response

- Keep a spill kit either in the bin or in the room where the EOs are dispensed. Train employees in proper use of spill kits. Ensure that disposal containers are airtight.
- Devise some method of ensuring that the room or area where there has been a spill or release is not entered until the area has been cleaned and there have been an adequate number of room air changes.

Safer alternatives for other asthmagenic exposures

While this report focuses on EO use, other recommendations for reducing exposures to asthmagens in the hospital setting include:

- To decrease overall exposures to asthmagens we encourage every entity to use only third-party certified (Green Seal, UL EcoLogo) cleaning products. Hard-surface cleaning product standards (GS-37 and UL Ecologo 2759) prohibit asthmagens. GS-El Standards (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/WRAPP/CDPH%20 Document%20Library/GS-ELStandards.pdf)
- Disinfectants should be used with all relevant precautions such as proper dilution, personal protective equipment, adequate ventilation, and measures to prevent bystander exposures. Where possible, use disinfectants with the Environmental Protection Agency's Design for the Environment seal. Design for the Environment Page for Antimicrobial Pesticide Products (https://www.epa.gov/pesticide-labels/design-environment-logo-antimicrobial-pesticide-products)

More information about fragrances and work-related asthma can be found here: Fragrances and Work-Related Asthma (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/WRAPP/Pages/Fragrances.aspx)

More information about work-related asthma and cleaning products and disinfectants can be found here: Cleaning Products and Disinfectants (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/WRAPP/Pages/Topics.aspx#cleaning)

For more information, call the Work-Related Asthma Prevention Program in California: 1-800-970-6680 (toll-free to California callers) or go to Work-Related Asthma Prevention Program (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/WRAPP/Pages/WRAPP.aspx). California Relay Service: 711. To get a copy of this fact sheet in another format, please call (510) 620-5757. Allow at least 10 days.

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