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Impact of Electronic Smoking Devices and Marijuana on Air Quality Fact Sheet

Overview: *The emergence of electronic smoking devices (ESD) and the growing social acceptance of marijuana have created new challenges for protecting the public from exposure to toxic chemicals in indoor and outdoor settings. Some local jurisdictions do not include marijuana smoke and ESD aerosol in their secondhand smoke protection policies. This fact sheet provides information on the impact of ESDs and marijuana on air quality.*

The Problem: Secondhand Smoke/Aerosol Exposure and Public Opinion

- In 2016, 15.0 percent of California adults reported exposure to secondhand cigarette smoke in the workplace in the past two weeks; 6.1 percent of California adults reported exposure to ESD vapor/aerosol in the workplace in the past two weeks. This includes both indoor and outdoor workplaces.¹
- In 2016, a significant majority of California adults reported that smoking is completely prohibited inside their home, with higher proportions prohibiting tobacco (88.6%) than ESDs (84.6%) or marijuana (85.8%).¹
 - Current cigarette smokers are less likely to have a home policy that completely prohibits all types of smoking inside their home compared to non-current cigarette smokers (tobacco 67.5% vs. 92.3%; ESDs: 59.4% vs. 88.8%; marijuana: 73.6% vs. 87.5%).¹
 - A lower percentage of young adults aged 18-29 reported completely prohibiting vaping (77.7%) inside their home than adults aged 30-64 (86.7%).¹
- Four-out-of-five California adults reported that cigarette smoking (80.5%) and vaping (80.8%) is completely prohibited in their work areas (indoor and outdoor) in 2015.¹
 - Current cigarette smokers were less likely to report working in smoke-free workplaces (indoor and outdoor) compared to non-current cigarette smokers (cigarettes: 57.1% vs. 84.9%; ESDs: 58.6% vs. 85.2%).¹



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- Low income Californians (<185% Federal Poverty Level (FPL)) were less likely to report working in a 100 percent smoke-free workplace (indoor and outdoor) compared to higher income Californians (>=185% FPL) (cigarettes: 70.1% vs 83.6%; ESDs: 73.1% vs 83.1%).¹
- Young adults and low income individuals expressed less support for statements in favor of restrictions on ESDs use and marijuana smoking in indoor worksites and wherever smoking restrictions are in place.¹

Marijuana Smoke Facts

- Secondhand marijuana smoke contains many of the same chemicals and carcinogens as secondhand tobacco smoke. Results from laboratory testing under standard conditions found that secondhand marijuana smoke contained more than twice as much tar and ammonia as tobacco smoke, and more than eight times as much hydrogen cyanide.²
- Exposure to tobacco secondhand smoke adversely affects cardiovascular health and impairs blood vessel function in humans and in rats. A study using a rat model showed that, similar to tobacco, marijuana secondhand smoke exposure impairs the ability of arteries to vasodilate (regulation of diameter based on conditions). The exposure to marijuana secondhand smoke impaired vessel function for much longer than the exposure to tobacco smoke. Although impairment is temporary, repeated exposure leads to long-term impairment.³
- Animal research suggests that exposure to tetrahydrocannabinol (THC) in late pregnancy could have profound and long lasting health impacts for both the brain and the behavior of the offspring. In addition, studies have shown that THC can be transferred from mother to infant in breast milk and that children exposed to marijuana in utero perform worse in problem solving skills, memory, and the ability to remain attentive.⁴
- ESDs can be modified to efficiently vape marijuana in the form of highly concentrated liquid hash oil and waxy forms of THC, or dried cannabis buds or leaves. THC concentrations of vaporized hash oil and waxes can exceed that of dried cannabis by four to 30 times.^{2,5}

ESD Aerosol Facts

- A 2013 study on e-cigarette aerosol concluded that ESDs are a source of volatile organic compounds and ultrafine/fine particles in the indoor environment and that they contribute to “passive vaping.”⁶
- A 2016 systematic review of research on secondhand exposure to ESD aerosol concluded that passive exposure to ESD aerosol shows the potential for health impacts. It concluded

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that individuals passively exposed to the aerosol of ESD users are exposed to numerous pollutants at concentrations that are associated with potential adverse health effects.⁷

- A 2015 study by the Harvard School of Public Health found diacetyl in 75 percent of flavored ESDs liquids and refill liquids tested, and at least one of the three flavoring chemicals diacetyl, 2,3-pentanedione, or acetoin, was detected in 92 percent of the tested e-liquid solutions.⁸
- Certain chemicals used to flavor liquid nicotine, such as diacetyl, 2,3-pentanedione, and acetoin, are present in many e-liquids at levels which are unsafe for inhalation.⁹
- 2,3-pentanedione was shown to cause proliferation of fibrosis connective lung tissue and airway fibrosis in an inhalation study performed on rats.¹⁰
- Diacetyl, when inhaled, is associated with the development of the severe lung condition, bronchiolitis obliterans, also known as “popcorn lung,” which causes an irreversible loss of pulmonary function and damage to cell lining and airways.¹¹

Clean Air and Occupational Safety Association Positions

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Position

- In 2015, ASHRAE released addenda to its *Standard for Ventilation for Acceptable Indoor Air Quality* in order to revise ASHRAE’s definition of environmental tobacco smoke (ETS) in response to the increasing popularity of ESDs and the legalization of the smoking of cannabis in some jurisdictions.¹² ASHRAE’s ventilation standards are widely adopted into building codes throughout the world.
- ASHRAE’s new definition of ETS includes emissions from ESDs and marijuana smoke. In addition, ASHRAE reiterated that the requirement for separation of ETS-free spaces from ETS spaces applies to the emissions of ESDs and marijuana smoke.¹²
- ASHRAE holds the position that acceptable indoor air quality is incompatible with the presence of ETS, including cannabis smoke and ESD emissions.¹²

National Institute for Occupational Safety and Health (NIOSH) Position

- In 2015, NIOSH released a statement indicating that, at a minimum, employers should establish and maintain smoke-free workplaces that protect those in workplaces from involuntary, secondhand exposures to tobacco smoke and airborne emissions from ESDs. NIOSH stated that smoke-free zones should encompass (1) all indoor areas without exceptions (i.e., no indoor smoking areas of any kind, even if separately enclosed and/ or ventilated); (2) all areas immediately outside building entrances and air intakes; and, (3) all work vehicles.¹³

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- NIOSH believes that individuals who use ESDs in the workplace could exacerbate their risk from other hazardous toxicants already present in the workplace.¹³
- NIOSH is also concerned that ESDs may serve as a potential ignition source in workplaces where explosive atmospheres are present, and can result in secondhand exposure of coworkers.¹³
- In a 2016 report, NIOSH concluded that workers should not be exposed to more than a time-weighted average of five parts per billion of diacetyl during an 8-hour day, over a 40-hour work week. Researchers calculated the exposure rate to allow no more than one worker per 1,000 to become ill in the course of a 45-year work life.¹⁴

American Industrial Hygiene Association (AIHA) Position

- In 2014, AIHA stated that existing research does not appear to warrant the conclusion that ESDs are “safe” in absolute terms and that ESDs emit airborne contaminants that may be inhaled by both the user and those in the vicinity of vaping. AIHA concluded that ESDs should be considered a source of volatile organic compounds and particulates in the indoor environment that have not been thoroughly characterized or evaluated for safety.¹⁵

Tobacco Control Network

- The Tobacco Control Network (TCN), comprised of the tobacco control program managers and staff from all U.S. states and territories, has as its primary function to facilitate information sharing between tobacco control partners across the country. The Tobacco Control Network 2016 Policy Recommendations included several secondhand aerosol policy recommendations, including:
 - enacting 100 percent clean air laws, inclusive of ESDs, in all enclosed workplaces and public places, and
 - adopting smoke-free multi-unit housing policies that prohibit smoking and ESD use in all units and attached balconies and patios.¹⁶

World Health Organization (WHO) Position

- In August 2016, the WHO Framework Convention on Tobacco Control (FCTC) released a report that encouraged the 180 parties (countries) to FCTC that allow sale of ESDs to minimize health risks to non-users by prohibiting the use of ESD in indoor spaces.¹⁷

Policy Environment

- As of January 2016, 155 cities and counties in California had regulated the use of ESDs through secondhand smoke laws in the strongest possible way. These policies define ESDs as “tobacco products” or include them within the “smoke” or “smoking” definitions.¹⁸

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- As of September 2016, no organization or agency tracks local California jurisdictions that include marijuana smoke in their smoke-free policies.
- California law prohibits the smoking of medical marijuana by a qualified patient in any place where tobacco smoking is prohibited by law.¹⁹
- California clean indoor air laws prohibit smoking all tobacco products (including ESDs) in enclosed spaces including, but not limited to:
 - multi-unit housing common areas; covered parking lots; public and private offices; government buildings; hotel/motel lobbies, banquet and meeting rooms, and 80 percent of guestrooms.²⁰
- California law prohibits smoking all tobacco products (including ESDs) in the following indoor and outdoor youth-sensitive areas:
 - group homes, foster family agencies, small family homes, transitional housing placement providers and crisis nurseries (including the outdoor grounds of the facility when a child is present)²¹
 - licensed family day care centers and family day care homes^{22,23}
 - cars with minors²⁴⁻²⁶
 - tot lots and playgrounds²⁷
 - youth sports events (effective January 1, 2017)²⁷
 - public K-12 schools, including charter schools²⁸
- California law authorizes a landlord of a residential dwelling unit to prohibit smoking tobacco products and/or medical marijuana on the property or in any building on which it is located.^{4,29}

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