E-Cigarette Flavors: An Overview of the Evidence of Their Impact on Use and Health

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Next Generation Tobacco: The Impact of E-Cigarettes on Kentucky’s Future Health – December 10, 2018
Overview

• Most e-cigarettes are flavored*
  • More than 7,000 e-liquid flavors (Zhu et al., 2014)
  • Distinguish traditional tobacco flavors from others flavors

• Flavored e-cigarettes have come under intense national scrutiny
  
  07.30.18

  Durbin To E-Cigarette Industry: Gummy Bear-Flavored Liquid Nicotine Helps Adults Quit Smoking? Prove It

  Bipartisan Bill Addresses Sharp Increase In Number Of Kids Using E-Cigarettes

• Why?
  • Flavors linked to appeal, experimentation, initiation, and maintenance of youth tobacco use (incl. e-cigarettes)
  • Flavor additives in e-cigarettes may have health consequences
  • Currently, FDA enforcement discretion allows flavored e-cigarettes
E-cigarette Flavors and Youth

- E-cigarettes are marketed with youth-appealing flavors (SGR, 2016)

- Appealing flavors are a strong attraction to e-cigarettes (Ambrose et al., 2015; Harrell et al., 2017; Pepper et al., 2016; Shang et al., 2017; Tsai et al., 2018)
  - Menthol, candy, or fruit flavors → greater interest
  - >98% use flavored e-cigarettes; 82% used because of flavors
  - Most: Fruit (76%) & Candy/Dessert (57%); Least: Tobacco (13%)

- Flavor descriptors may affect perceptions of e-cigarettes (Pepper et al., 2016; Czoli et al., 2015)
E-cigarette Flavors and Adults

• Flavors make e-cigarettes appealing also to adults (Nonnemaker et al. 2016; Harrell et al., 2017; Czoli et al. 2016; Pesko et al., 2016; Buckell et al., 2018)

• Smokers equally or more likely to initiate e-cigarette use with tobacco flavor as with non-tobacco flavors
  • but tend to switch to non-tobacco flavors (Farsalinos et al., 2013; Harrell et al., 2017); Former smokers more likely to initiate with fruit flavors
  • Fruit most popular flavor category among adults, but varies by age:
    • Younger adults: Fruit (74%); Candy/Dessert (50%); … Tobacco (1%)
    • Older adults: Fruit (47%); Menthol (32%);… Tobacco (13%)

• Preference for flavors linked to perceptions of lower harm (Czoli et al.)

• May affect smoking reduction and quitting in smokers using e-cigarettes to quit (Weaver et al., 2018; Smith et al., 2016; Chen, 2018)
E-cigarette Flavors and Health

- Many flavors are Generally Recognized As Safe (GRAS), but
  - in food products at levels of intended use.
  - When aerosolized and inhaled, may have adverse health effects

- More than 140 volatile flavoring components identified (Hutzler et al., 2014)
  - Cinnamaldehyde (cinnamon-, tobacco-, sweet-, and fruit-flavored e-liquids) (Behar, 2016)
    - “even at low concentrations, cinnamaldehyde in e-cigarette products is cytotoxic and genotoxic and adversely affects cell processes and survival… may impair homeostasis in the respiratory system.” (NASEM, 2018)
  - Benzaldehyde, diacetyl, acetylpropionyl, acetoin…
E-cigarette Flavors and Health (2)

• May affect nicotine absorption (Walele et al. 2016, Helen et al. 2017)

• May increase the reinforcing effects of nicotine & increase dependence (Ahijevych & Garrett, 2010; Garten & Falkner, 2004)
  • Sweet-flavored e-liquids → more rewarding (Audrain-McGovern et al., 2016) and higher abuse liability rating vs. non-sweet and flavorless (Goldstein et al., 2016)

• Challenges
  • Many flavoring additives have not been evaluated for toxicity in e-cigarettes
  • Issues of generalization to humans and across devices and use patterns
  • Effects on long-term disease and mortality risk unknown
Policy Landscape & E-cigarette Flavors

• Federal
  • *March 2018* – FDA issued an ANPRM on role of flavors in:
    • Youth experimentation and use
    • Helping smokers switch to potentially less harmful tobacco
  • *May - Nov 2018* – FDA sent warning letters to 18 companies for selling e-liquids resembling kid-friendly food products (cereal, candy, PB&J, juice, etc.)
  • *July 2018* – Sen. Durbin & Murkowski introduced SAFE Kids act
  • *November 2018* – FDA announced revisiting compliance policy for flavored e-cigarettes (other than tobacco, mint, menthol) if not
    • Sold in age-restricted, in-person locations, or
    • Online outlets with heightened age-verification practices

• Local
  • Several localities have prohibited sale of flavored tobacco, including e-cigarettes
E-cigarette Flavors & Regulatory Challenges

• Balancing concerns of youth use with harm reduction for adult smokers

• Complexity of flavors
  • 7000+ flavors – but theoretically limitless
  • Chemical compounds vs. sensory experience vs. marketing/packaging

• Avoiding unintended consequences

• Policy Resource:
  • Tips & Tools Regulating Flavored Tobacco – Public Health Law Center