Electronic Cigarettes

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Disclosure

• I have no relevant financial relationships with the manufacturer(s) of any commercial products(s) and/or provider of commercial services discussed in this CME activity

• I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.

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Objectives

- Provide background information on the evolution of e-cigarettes
- Describe various types of Electronic Nicotine Delivery Systems
- Review the prevalence and trends of e-cigarettes use among youth in the US and in Kansas
- Describe why e-cigarettes are gaining popularity among youth
- Review what is currently known about their contents and health risks
- Review current e-cigarettes control policies in the US and Kansas

From Whence Cometh E-Cigarettes

- 2003: Chinese pharmacist, Hon Lik, is credited with conceptualizing and producing the first modern Electronic Cigarette

Types of Electronic Nicotine Delivery System (ENDS)

- 1st Generation:
  » Cig-a-likes
  » Most Toxins Emitted in the Aerosol Lower than Regular Cigarettes
  » Aerosolizing Temperature 104 – 149 degrees Fahrenheit

- 2nd Generation
  » Tank Systems; refillables
  » Some Toxins Emitted Approaching Levels found in Regular Cigarettes
  » Aerosolizing Temperatures >149 degrees Fahrenheit
Component Parts Cig-a-Likes

- Cartridge
- Atomizer
- Battery and electronics

Modifications: Tank Systems

E-Pens/E-Hookah Pens

- Flavors: Cherry, Chocolate, Vanilla, Bubblegum
Electronic Nicotine Delivery Systems (ENDS)

Varieties of ENDS

Bluetooth E-Cigarette: “Vape” and Receive Calls or Listen to Music
Prevalence of Tobacco Use among U.S. Youth, 2013/2014

<table>
<thead>
<tr>
<th>Category</th>
<th>Any Tobacco</th>
<th>Cigarettes</th>
<th>E-Cigarettes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Youth Ever</td>
<td>21.8</td>
<td>13.4</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>(20.8-22.8)</td>
<td>(12.6-14.3)</td>
<td>(10.0-11.4)</td>
</tr>
<tr>
<td>Youth Last 30 days</td>
<td>8.9</td>
<td>4.6</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>(8.3-9.6)</td>
<td>(4.2-5.0)</td>
<td>(2.8-3.5)</td>
</tr>
</tbody>
</table>

E-Cigarette Use Among Kansas Youth*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Ever (%)</th>
<th>Currently (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle School</td>
<td>14.9</td>
<td>4.3</td>
</tr>
<tr>
<td>High School</td>
<td>13.2</td>
<td>4.7</td>
</tr>
</tbody>
</table>

*Unweighted 2013/2014 Kansas Youth Tobacco Survey
Christensen, Welsh and Faseru, 2014

Trends in Youth: E-Cigarettes vs. Conventional Cigarettes

Vaping Up, Smoking Down
This high-school student who used electronic cigarettes once a week in the last 30 days
Youth & E-Cigarettes

16% in 2015

- More than 3 million middle and high school students were current users of e-cigarettes in 2015, up from an estimated 2.46 million in 2014.

(NYTS, 2015)

Why the Appeal?

- No bans on marketing
  » Thousands of flavors
  » Appealing to youth
- Conflicting messages about safety
  » Headline from KC Star
  » Everyone’s doing it
- Lack of policy
  » Not covered by KS Clean Indoor Air Act
  » Majority of municipalities, workplaces, and schools don’t have policies that encompass e-cigs
  » Enforcement difficult

E-Cigarette Advertising

- Overall, e-cigarette advertising expenditures across media channels have increased from $6.4 million in 2011, to $18.3 million in 2012, to $59.3 million in 2013.
  » 80 unique brands
  » blu e-cigarettes (most popular among youth) dominated ad spending, comprising about 75% of all e-cigarette advertising.
  » Highest in Magazines and TV; Lowest in Newspapers

(Kim et al., 2014)
Flavorful and Fun

Local Messaging
"I can tell you that it is 99 percent better for you than smoking." FORMER HARD-CORE SMOKER RANDI MCCANN, WHO NOW VAPES

Freedom and A ‘Safer’ Alternative
Past cigarette and present e-cigarette advertising

Cigarettes, 1958
E-Cigarettes, 2013

Renormalization

Cigarettes, 1930
E-Cigarettes, 2012

Renormalization

Cigarettes, 1964
E-Cigarettes, 2013
E-Cigarettes: A Cause for Concern?

NICOTINE EXPOSURE IN YOUTH MAY:
1. Promote addiction
2. Lead to sustained tobacco use
3. Cause lasting harm to brain development

Nicotine interferes with maturation of the prefrontal cortex

- Neuroplasticity
  - Intracellular signaling
  - Gene expression
  - Structural changes
- Nicotine acutely activates but chronically desensitizes the areas in the brain responsible for attention and memory
  - Long-term impairment in impulse control, memory, and attention
  - Adolescent smoking associated with later life behavioral disturbances, including substance abuse and mental health problems


E-Cigs as Gateway to Regular Tobacco

  - 263,000 youth who had never smoked used e-cigarettes
  - 44% of youth who had ever used e-cigarettes said they intended to smoke conventional cigarettes within the year
Polytobacco use Among Youth, 2013/2014

Kasza et al, 2017, 32,320 adult participants (≥18 years of age) and 13,651 youth participants (12 to 17 years of age).

Aerosol: It’s not just Water “Vapor”

- Concentrations of pollutants less than in cigarettes
- Carcinogens, less than in cigarettes
- Wide variation in contents across products, no product standards
- Intermediate and long-term health effects unknown.
- Maybe safer than cigarettes, but this doesn’t mean safe

Composition of Aerosol

Components in red are from FDA 2012, Harmful and Potentially Harmful Substances – Established List
* = Carcinogenic to humans (IARC). N = 9.
Toxic Chemicals in E-Cigs

- Tobacco-specific nitrosamines
- Aldehydes
  - Formaldehyde, acetaldehyde, acrolein, acetone
- Metals
  - Nickel, lead, chromium
- Polycyclic aromatics
  - Cresol, anthracene, pyrene
- Volatile organics
  - Propylene glycol, glycerin

Health Effects

Lead: impaired mental development in young children

Nickel: lung and nasal cancer

Propylene Glycol: eye, throat, and airway irritation, and asthma

Flavoring

Common flavors: menthol, candy, bubblegum, strawberry, fruit, tobacco, mix your own, etc.

Health effects: facilitates usage, cinnamon and several other flavors have been found to have detrimental effects on the lungs of laboratory animals
Secondhand “Vaping”

Concentrations of both biomarkers among non-smokers exposed to conventional cigarettes and e-cigarettes’ “vapor” were statistically similar (only 2 and 1.4 times higher, respectively). The levels of airborne nicotine and cotinine concentrations in the homes with e-cigarette users were higher than control homes (differences statistically significant). “Our results show that non-smokers passively exposed to e-cigarettes absorb nicotine.”

(Fernandez et al, 2014)

Secondhand “Vaping” (Con’t.)

“Overall, the e-cigarette is a new source of Volatile Organic Compounds (VOCs) and ultrafine/fine particles in the indoor environment. Therefore, the question of “passive vaping” can be answered in the affirmative. However, with regard to a health-related evaluation of e-cigarette consumption, the impact of vapor inhalation into the human lung should be of primary concern.”

(Schripp, et al., 2012)

Other Concerns

- E-cigarette explodes in man’s pant
- E-cigarette explodes inside man’s mouth
- E-cigarette explodes in Man’s pocket on bus
Other Concerns (con’t.)

Current U.S. State Policies Regarding Minors

Current U.S. State Policies – Clean Indoor Air Laws
Current Kansas Policies

- Illegal for KS youth to purchase or possess (KS statute: 79-3321)
- E-cigarettes are NOT covered by the Kansas Indoor Clean Air Act.
  - KS Attorney General ruling (2011)
- E-cigarettes are NOT covered by most city ordinances.
  - Smoking regulations depend on specific definitions of smoking and/or tobacco. Neither smoking nor tobacco applies to e-cigarettes which is why they are not covered.

Existing E-Cigarette Indoor Air Policies in Kansas

- Existing State policy: Kansas correction facilities.
- Other targeted cities without policies: Lawrence, Manhattan, Salina, Shawnee, Wichita.

Summary and Conclusions

- Variety of products.
- Appeals to youth. Rapid increase in use.
- Increase in use among non-smokers.
  - Nicotine addiction
  - Transition to cigarette smoking
  - Anxiety disorders
  - Susceptibility to other drugs of abuse
  - Nicotine exposure to the developing fetus
- Health impacts (short and long-term) not currently understood.
Summary and Conclusions (Con’t.)

• Some flavors exhibit greater lung toxicity (e.g., menthol, tobacco, cinnamon, and coffee)
• Carcinogens present (e.g., formaldehyde)
• Second hand exposure (not free of emissions)
• Additional concerns include acute nicotine poisoning, and explosion and fire from batteries
• U.S. and Kansas control policies are inadequate

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