Hookah Smoking: Known Health Effects and Associated Substances

The Triangulum: Tobacco, Marijuana, and E-Cigarettes

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Tobacco-Related Disease Research Program
Hookah Smoking

- > 500 year-old form of tobacco use

- Unsubstantiated belief “smoke should be first passed through water so that it would be rendered harmless.”

- i.e. waterpipe, gouza, narghile, or shisha
Schematic showing the major components of a Hookah

Head
Body
Bowl

Charcoal
Foil
Tobacco

Hose
From Cultural to Social

Then

Now
HIGH SCHOOL STUDENTS REPORTING CIGARETTE SMOKING

(Past 30 days)

Prevalence (%)

Source: University of Michigan, 2015 Monitoring the Future Study
HIGH SCHOOL STUDENTS REPORTING ALTERNATIVE TOBACCO PRODUCT USE

(Past 30 days)

Prevalence (%)

Smokeless/dip/chewing tobacco: 2.2%
Cigars/cigarillos/little cigars: 3.6%
Cigarettes: 5.7%
E-cigarettes: 9.6%
Hookah: 10.7%

YOUNG ADULTS REPORTING HOOKAH SMOKING

(Ever use)

Global Epidemiology


Jawad M¹, Lee JT², Millett C².

Prevalence (%)
Global Epidemiology
Prevalence (%)

Hookah smoking is associated with polysubstance use especially marijuana, cigarettes and alcohol.

Polysubstance Use


- In 3,418 college students, Hookah/marijuana/ LCC co-users:
  - Past 4 months: 11.3%
  - Past 30 days: 9.1%
  (Haardorfer et al. 2016. Addict Behav; 64)
Hookah Smoking Epidemic

- Flavored tobacco product

- Unregulated (May 5\textsuperscript{th}, 2016)
  - Accessibility/ affordability
  - Aggressive media and marketing

- Understudied
  - Reduced harm perception
  - Little is known
FDA RULES FOR HOOKAH AND PIPE TOBACCO SALES

Are you taking the necessary steps to prevent underage tobacco use?

- Check photo ID of everyone under age 27 who attempts to purchase hookah tobacco or pipe tobacco.

- Only sell hookah tobacco or pipe tobacco to customers age 18 and older.*

- Do NOT give away free samples of hookah or pipe tobacco, including any of their components or parts.

- Do NOT sell hookah or pipe tobacco in a vending machine unless in an adult-only facility.**

PROVIDED BY THE CENTER FOR TOBACCO PRODUCTS

This flyer provides a snapshot of some of the new requirements for hookah and pipe tobacco, effective 08/08/2016. See our website www.FDA.gov/Tobacco for a full list of requirements that may apply to you.

*Residents must also follow state or local tobacco laws, even if they are more restrictive. For example, in some states the minimum age is 19.
**An adult-only facility is one in which minors are neither present nor permitted to enter at any time.
Hookah Flavored Tobacco
Media & Marketing

HYDRO HERBAL MOLOSES
19 FLAVORS
TOBACCO FREE

E-HOOKAH
Share the Satisfaction

STOP SMOKING, START STEAMING

the only thing you’ll get addicted to is the social thing

THE HOOKAH HOUSE

hours
mon-thur 5p-12a
fri & sat 5p-3a
Media & Marketing

One big happy family.

#1 Disposable Electronic Hookah
- Industry leading 700 puffs
- 6 second shut-off protection
- Regulated voltage to ensure consistent taste
- Flat button design prevents accidental usage in pocket

texashookah.com
...we’ll just be passing it [ehookah] around & enjoying the smell that the vapor leaves in the air because it smells all fruity & candyish & delicious."

“ehookah just sounds like it’s better because if you have an ecig, it’s still a cigarette in a way. Then you have a hookah pen. It’s like hookah, it’s kind of cool. It’s better”

Wagoner et al. Nicotine Tob Res. 2016 Mar 30. [Epub ahead of print]
Reduced Harm Perception

“Hookah will never be addicting because it does not contain nicotine”

“I hate smoking cigarettes because it has a bad taste to it compared to Hookah which is very flavorful”

“Hookah is harmless because all the smoke passes through the water filter first and then through fruits”

Hookah Smoke Exposure

Figure Adapted from: St Helen et al. *Cancer Epidemiol Biomarkers Prev.* 2014;23:1055-66
Hookah Smoke Exposure

Particulate Matter Size and Concentration of Mainstream Smoke

Figure Adapted from: Monn et al. *Tob Control.* 2007;16:390-3.
Hookah Smoke Exposure

Particulate matter exposure: modifiable risk factor that contributes to cardiovascular morbidity and mortality

<table>
<thead>
<tr>
<th>Fine Particulate Matter &lt;2.5µm (PM$_{2.5}$)</th>
<th>Ultrafine Particulate Matter &lt;0.1µm (UFP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Diagram of PM$_{2.5}$ composition]</td>
<td>![Diagram of UFP composition]</td>
</tr>
<tr>
<td>Organic Carbon 25%</td>
<td>Unknown 9%</td>
</tr>
<tr>
<td>Elemental Carbon 3%</td>
<td>Metals 17%</td>
</tr>
<tr>
<td>Sulfates 19%</td>
<td>Metals 25%</td>
</tr>
<tr>
<td>Nitrates 23%</td>
<td>Unknown 5%</td>
</tr>
</tbody>
</table>

Hookah$^a$ PM$_{2.5}$: 1,180 µg/m$^3$ (real time)
Air pollution$^b$: 150 µg/m$^3$

Hookah UFP$^c$: 74.4x10$^9$ µg/m$^3$ (mainstream)
Cigarette smoke$^c$: 9.24x10$^9$ µg/m$^3$

Hookah Smoke Exposure

Carbon monoxide (CO)

Charcoal is responsible for \sim 90\% of the CO produced in mainstream hookah smoke.\(^2\)

Objective: To determine the net acute effect of hookah smoking on myocardial blood flow, central aorta, and peripheral circulation.
Hookah Smoking Chamber

Cedars-Sinai Medical Center
Hypertension & Vascular Biology Clinical Research Center
## Subject Characteristics (n=28)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N or mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female/Male</td>
<td>8/20</td>
</tr>
<tr>
<td>Age, years</td>
<td>27 ± 5</td>
</tr>
<tr>
<td>Body Mass Index, kg·m²</td>
<td>25.0 ± 4.0</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>9</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>14</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
</tr>
<tr>
<td>Native Hawaiian/ Pacific Islander</td>
<td>1</td>
</tr>
<tr>
<td><strong>Middle-Eastern Origin</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Level of Education Attained</strong></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>6</td>
</tr>
<tr>
<td>College</td>
<td>20</td>
</tr>
<tr>
<td>Graduate</td>
<td>2</td>
</tr>
<tr>
<td><strong>Hookah Smoking History</strong></td>
<td></td>
</tr>
<tr>
<td>Number of Hookah Sessions per week</td>
<td>2 ± 2</td>
</tr>
<tr>
<td>Session Duration, minutes</td>
<td>102 ± 60</td>
</tr>
<tr>
<td>Age of Hookah Smoking Onset, years</td>
<td></td>
</tr>
<tr>
<td>&lt; 17</td>
<td>5</td>
</tr>
<tr>
<td>18-24</td>
<td>19</td>
</tr>
<tr>
<td>25-29</td>
<td>3</td>
</tr>
<tr>
<td>30-39</td>
<td>1</td>
</tr>
</tbody>
</table>
Hookah Smoking and Myocardial Oxygen Demand (MVO$_2$)

**Heart Rate**

- Pre: 50 beats.min$^{-1}$
- Post: 125 beats.min$^{-1}$

**Systolic BP**

- Pre: 115 mmHg
- Post: 130 mmHg

**MVO$_2$**

- Pre: 6 mmHg.beats.min$^{-1}.10^{-4}$
- Post: 8 mmHg.beats.min$^{-1}.10^{-4}$

* Indicates $P < 0.05$
Hookah Smoking and Myocardial Blood Flow

Myocardial Blood Flow

Rate-Pressure Product

Nelson et al. Am J Cardiol. 2016;inpress
Hookah Smoking and Central Aorta

PWV = D/T

* Indicates P < 0.05
Hookah Smoking and Peripheral Circulation

**Skin Blood Flow**
- **Baseline**: SBF 17.5, SVR 5.2
- **Hookah**: SBF 9.8, SVR 9.9
- **30 Minutes Recovery**: SBF 8.3, SVR 11.5
- **60 Minutes Recovery**: SBF 7.9, SVR 12.3

**Calf Blood Flow**
- **Baseline**: CBF 2.4, CVR 37.1
- **Hookah**: CBF 3.2, CVR 30.5
- **30 Minutes Recovery**: CBF 2.5, CVR 38.5
- **60 Minutes Recovery**: CBF 2.7, CVR 35.2

**Skin Vascular Resistance**
- Baseline: 13 mmHg/u
- Hookah: 12 mmHg/u
- 30 Minutes Recovery: 10 mmHg/u
- 60 Minutes Recovery: 9 mmHg/u

**Calf Muscle Vascular Resistance**
- Baseline: 45 mmHg%/min
- Hookah: 43 mmHg%/min
- 30 Minutes Recovery: 42 mmHg%/min
- 60 Minutes Recovery: 38 mmHg%/min

Heart Rate
- **Baseline**: 68
- **Hookah**: 93
- **30 Minutes Recovery**: 89
- **60 Minutes Recovery**: 83

MAP
- **Baseline**: 92
- **Hookah**: 99
- **30 Minutes Recovery**: 97
- **60 Minutes Recovery**: 98

P-values:
- Skin Blood Flow: P=0.11
- Skin Vascular Resistance: P=0.10
- Calf Muscle Vascular Resistance: P=0.003
### Acute Effects

- **Cardiovascular:**
  - Increased heart rate
  - Increased blood pressure

- **Respiratory:**
  - Impaired pulmonary function
  - Decreased exercise capacity
  - Larynx and voice changes

- **Carbon monoxide intoxication**

### Chronic Effects

- **Cardiovascular:**
  - Ischemic heart disease

- **Respiratory:**
  - Impaired pulmonary function
  - Chronic obstructive lung disease
  - Larynx and voice changes

- **Cancer:**
  - Lung
  - Esophageal
  - Gastric

- **Low birth weight**
- **Periodontal disease**
- **Lower bone density, high fracture risk**

Figure Adapted from: El-Zaatari et al., Tob Control, 2015
Conclusion

• Advocate for more research: extent to which Hookah smoking negatively affects human health is not well known

• Policy regulation: flavored hookah tobacco, charcoal and water

• Dissemination of findings to the public, particularly to adolescents and young adults
Thank you

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