E-Cigarettes + Marijuana

Brian Tiep, M.D.
Pulmonary Rehabilitation
Smoking Cessation
City of Hope

Disclosures
Consultant: CHAD Therapeutics, Drive Medical
Nonin Medical

History of Cigarettes

- 5000 BC Babylonians, Chinese, Indians
- James Buchanan Duke: Mass produced/Marketed
- Cigarettes to soldiers WWI: Free and addicting
- Lung Cancer 20th Century
- Surgeon Generals: 1963-4
- Medications for withdrawal: NRT, Varenicline, Bupropion
- E-Cigarettes: 2003...

James Duke Licensed James Bonsack
1881
What is Tobacco Dependency

- Tobacco dependency is nicotine addiction
- A disease of the brain that causes its victim to inject 7000 **TOXIC** chemicals into its body over 200 times a day
- And find it a pleasurable experience.

What is Tobacco Dependency

- **Chronic Disease**
- Chronic Disease of **the brain**
- Chronic **Relapsing** Disease of the Brain
- A very strong **addiction**
- Changes way the **victim thinks** and **acts**.

What is Tobacco Dependency

- Like any addiction, the brain focuses energy on obtaining its drug
- After it obtains its drug: Rush and Pleasure
- Minimum nicotine level to maintain addiction
- Deprived: Physiological + Mental disturbances set in.
When you smoke nicotine reaches the brain in 7 Seconds

Nicotine Fix

- I Feel Good
- I feel Centered
- I feel Reassured

Dopamine Reward Pathway
Brain Links Habits to Procure Nicotine
Habits = Autopilot

Withdrawal Symptoms > 2 Hours
- Depressed mood
- Insomnia
- Irritability, frustration, anger, anxiety
- Difficulty concentrating, Restlessness
- Decreased heart rate
- Increased appetite – Weight gain
- Craving for NICOTINE!

Reversible by nicotine = dose dependent

Rat Studies on Nicotine Addiction
Rat Studies

- Normal behavior when receiving nicotine
- Slows when deprived of nicotine or receives nicotine blocker
  - Stops sniffing
  - Teeth chatter, shakes
  - Eyes half closed
- Dose of nicotine:
  - Normal behavior: Within seconds

Quit Smoking Tools

Medications
- NRT
  - Long acting: Patch
  - Rapid Acting: Inhalers, lozenges, gum
- Varenicline
- Bupropion
- Combinations of above

Behavior Therapy
- Dose dependent.

Successful Smoking Cessation
E-Cigarettes

- Neat invention by Herbert Gilbert 1963
- Modern E-cigarette re-invented by Hon Lik 2003
- Probably safer than tobacco cigarettes – no combustion
- Patients take to it – Vibrant vape support systems
- Considered "harm reduction" for those who will not quit via NRT or Varenicline
- Tends to the tactile and psychosocial part of addiction
- Some evidence that patients can quit via E-cigarettes
- Inexpensive and accessible.

E-Cigarette Herbert Gilbert 1963
Hon Lik 2003

After his father died of lung cancer – deliver smoke free nicotine vapor

ENDS (electronic Nicotine Delivery Systems)

Electronic Nicotine Delivery System
ENDS

- Personal vaporizer
- Handheld often looks like cigarettes
- E-liquid or E juice
- forms an aerosol when E-liquid heated boiling point
  - Pushing a button heats the battery-powered device
- This is called vaping
- Use:
  - Recreational: less harm, more socially acceptable places
  - Smoking Cessation
466 brands of E-cigarettes
2014 = 7 Billion Dollars

E-cigarette Build it yourself

E-Cigarettes
- E-Cigarettes
  vaporized nicotine solution
- Liquid Solution Composition (variable)
  - Propylene glycol (90%)
  - Nicotine (2%)
  - Tobacco Essence (4.5%)
  - Vegetable glycerin
  - Essence (1%)
  - Organic acid (2%) + Nitrosamines

En. wikipedia.org
E-cigarette Support System

- On-line
- E-cigarette Forum:
- Response to threatening regulations
- Positive direction rather than quit something
- Vibrant and Vocal

American Vaping Association
Greg Conley - President

FDA to Regulate E-Cigarettes
Will chronic e-cigarette use cause lung disease?

- throat burning
- mucus secretion
- cough reflex
- wound healing
- heavy lung

Toxicology

- Propylene Glycol – Long term exposure
- Flavorings Cinnamaldehyde, Cherry - Benzaldehyde
- Diacetyl Popcorn lung BOS
- Acrolein (aldehyde) from heated glycerin
- Nitrosamines Potent carcinogens
- Ethylene glycol, coumarin and acetamide, formaldehyde, acetaldehyde, propionaldehyde
- Less free radicals
- Metals chromium and Nickel (not in tobacco).

E-Cigarettes

- Inhale heated, vaporized chemicals of unknown composition
- Manufactured by unknown and unregulated manufacturers
  - Including 3 tobacco companies
- Heating tip is nichrom/Kanthal heating element with a wick
  - The tip temps between 300° and 700° C.
- Boils very rapidly – upon inhalation. 3 watts 1-3 ohms 3-6 V
- Boiling point of propylene glycol = 188.2° C (370.8 F)
- Studies underway on temperature and formaldehyde.

Temperature of Atomizer

- Information not available
- Estimated between 130 C° and 700° C
  - Depends on Voltage and resistance of atomizer
- Some brands allow control of watts / volts.
- Higher temperatures can create toxic chemicals
  - Formaldehyde
  - Acetaldehyde
  - Ethylene Glycol.
Temperature of Atomizer

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling point</td>
<td></td>
</tr>
<tr>
<td>Propylene Glycol</td>
<td>350.8°F</td>
</tr>
<tr>
<td>Glycerin</td>
<td>544.8°F</td>
</tr>
<tr>
<td>Water</td>
<td>212°F</td>
</tr>
</tbody>
</table>

Vaping Power Chart

Resistance vs Volts

Children

- Vape Shops everywhere:
  - Near Schools
  - E-cigarettes at school
- Increased use increased x 3
  - Includes never smokers
- E-cigarettes delivering
  - Vaping drugs at school
  - Does not smell
  - Overdose – ER’s
Children

- Looks cool
- Flavors are fruity – candy
- Vaping can be hidden
- Can be used for drugs.

Kids

E-cigarette ads reach nearly 7 in 10 U.S. youth.

Youth

<table>
<thead>
<tr>
<th>Youth Age</th>
<th>E-cigarettes</th>
<th>Cigarettes</th>
<th>All Tobacco Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle School</td>
<td>5.3%</td>
<td>2.3%</td>
<td>7.4%</td>
</tr>
<tr>
<td>High School</td>
<td>16.0%</td>
<td>9.3%</td>
<td>25.3%</td>
</tr>
</tbody>
</table>

UAB Study
E-cigarette Nicotine Poisoning Compared to Tobacco Cigarettes

- Kids <5y/o poisoning up 15X in 3 years
- 44% poison control calls for kids < 2y/o
- Hospitalizations 5X more likely
- Most due to E-Juice.

National Institute on Drug Abuse

- Study teens using E-Cigarettes more likely to start smoking tobacco cigarettes
- Nicotine exposure causes neuroplastic changes in brain
  - Prime the brain for rewarding by other chemicals
- Or combustible tobacco
Gateway To Cigarette

Adolescents who had ever used e-cigarettes at baseline compared with nonusers are 3X more likely to smoke combustible tobacco use over the next year.


Reduction in Nicotine Withdrawal

Comparison Nicotine Levels between Tobacco Cigarettes and E-Cigarettes

Van Sicot et al, Konstantinos 2014
E-Cigarette Summit – Hajek 2012

**Randomised trials**

- Caponetto et al 2013 - 300 smokers not intending to quit, EC with and without nicotine (one arm reduced EC nicotine after 6w), 12M f-u
- Bullen et al. 2013 – 657 smokers wanting to quit, EC with and without nicotine or 21mg/24 patches, 6M f-u

Hajek. Adding E-Cigarettes to Specialist Stop-Smoking Treatment: City of London Pilot Project. J Addict Res Ther. 2015

Recommended combining with Varenicline

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E-cigarettes and smoking cessation in real-world and clinical settings: a systematic review and meta-analysis

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E-Cigarettes for smoking cessation

- Less harmful than tobacco cigarettes?
- Get patients started on a track to quit
- Better tactile – behavioral substitute?
- Harm reduction
- Efficacy not yet determined
- Unsafe substances
- May end up smoking AND vaping
- We have proven methods to quit
- Nicotine Replacement; Varenicline
International Forum of Respiratory Societies Oslo

- Weigh benefits vs potential harm: Ban until more information is available
  - Safety
  - Benefits / Harm
    - Individual
    - Society
  - If allowed: Regulate as medicine or tobacco product.

Summary

- E-Cigarettes increase in popularity
  - Safer, cheaper, versatile, available

- Smoking Cessation
  - Some able to quit combustible
  - Some use both
  - Most not helped

- More safe than cigarettes? – but not safe!

Thank You