THE ALLURE AND REALITY OF ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS/ELECTRONIC CIGARETTES)

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LEARNING OBJECTIVES

- What is Nicotine what does it do
- List 3 characteristics of nicotine
- The allure of ENDS
- How nicotine effects the body
  - Heart
  - Blood vessels
  - Liver
NICOTINE

- Imitates the action of acetylcholine
- Dependency occurs because of increased dopamine the “pleasure molecule”
- Addictive due to desensitization
THE ALLURE OF ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS)

- Multifavored
- Conveniently rechargeable
- Not currently subject to the California 2016 proposition #56 tax increase
- Smooth design (simulates elegance)
THE REALITY OF ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS)

- Acetaldehyde – when accumulated in the body contributes to hangover phenomenon
- Nitrosamines – Carcinogen, contained in latex products like balloons and condoms
- Formaldehyde – Carcinogen, engine transmission chemical, tissue preservative
HOW NICOTINE EFFECTS THE BLOOD VESSELS

- Causes narrowing of the blood vessels
- Increased cardiac work with elevated BP and heart rate
- Blood supply deficiencies arise due to narrowed and or clotted blood vessels
- Elevated bad cholesterol
ENDS DELIVERY TANK E-CIG CHAMBER
Tobacco causes over 2 MILLION deaths from cardiovascular diseases every year

#NoTobacco
Echocardiographic data: Left Ventricle left ventricle fractional shortening percentage; velocity of circumferential fiber shortening; LVEF, left ventricle ejection fraction; (N=5 per group, Saline vs ENDS *P < 0.05, Non-Nic vs ENDS #P < 0.05)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment</th>
<th>12 weeks</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Saline</td>
<td>ENDS (0%)</td>
</tr>
<tr>
<td>VST (mm)</td>
<td>0.50 ±0.3</td>
<td>0.49 ±0.4</td>
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<tr>
<td>EDD (mm)</td>
<td>4.16 ±0.24</td>
<td>4.42 ±0.50</td>
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<tr>
<td>PWT (mm)</td>
<td>0.53 ±0.03</td>
<td>0.49 ±0.02</td>
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<tr>
<td>ESD (mm)</td>
<td>2.72 ±0.26</td>
<td>2.92 ±0.42</td>
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<tr>
<td>Ao-ET (ms)</td>
<td>50 ±5</td>
<td>48 ±2</td>
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<tr>
<td>HR</td>
<td>535 ±45</td>
<td>479 ±99</td>
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<tr>
<td>LV % FS</td>
<td>35 ±3</td>
<td>34 ±4</td>
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<tr>
<td>Vcf</td>
<td>7.1 ±1.2</td>
<td>7.05 ±0.9</td>
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<tr>
<td>LvEF</td>
<td>69 ±4</td>
<td>70 ±7</td>
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<tr>
<td>LV mass</td>
<td>72 ±8</td>
<td>76 ±16</td>
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<tr>
<td>E</td>
<td>0.71 ±0.1</td>
<td>0.82 ±0.2</td>
</tr>
<tr>
<td>A</td>
<td>0.36 ±0.1</td>
<td>0.49 ±0.1</td>
</tr>
<tr>
<td>E/A</td>
<td>2.0 ±0.1</td>
<td>1.65 ±0.2</td>
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<tr>
<td>H/B ratio</td>
<td>2.27 ±0.45</td>
<td>2.40 ±0.42</td>
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</table>
(A-F). Representative left ventricle heart tissue from ApoE-KO mice on a western diet exposed to ENDS. (A) Mice exposed to saline showing normal tissue architecture and sarcomeric pattern. (G) Normal mitochondrial ultrastructure observed in mice exposed to saline.
ENDS PROMOTES PLAQUE BUILD UP IN THE BLOOD VESSELS

(A) Oil Red O counterstained with hematoxylin and fast green for visualization.
(B) Atherosclerotic lesions quantified with Image-Pro Plus. **P < 0.01.
Preventable Causes of LIVER CANCER

Obesity
Type 2 diabetes
Smoking
Alcohol abuse
Anabolic steroid use

Know the facts. Protect the organ you can't live without.
ENDS HAVE A SECONDARY EFFECT OF HEPATIC STEATOSIS

Liver # 2 – WD and saline 40x

Liver # 2 – WD and nicotine 40x
Nicotine exacerbates HFD-induced hepatic steatosis in obese mice

FIGURE 1 | Representative H&E-stained liver sections from mice fed with normal chow diet (NCD) without (A) or with (B) nicotine exhibit normal histological appearance. Compared with a mouse on a high-fat diet (HFD), where a modest increase in lipid accumulation (arrow) is detected (C), combined treatment with nicotine and HFD causes a marked increase in lipid accumulation in the liver (D). (E–H) Representative light microscopic images of glutaraldehyde-fixed, osmium tetroxide post-fixed, epoxy-embedded, and toluidine-blue-stained liver sections from different treatment groups show nicotine plus a HFD (H) causes a striking increase in lipid accumulation of varying sizes in hepatocytes compared to those from mice on a HFD alone [(G), arrow]. Mice fed with NCD with (F) or without nicotine (E) have normal liver morphology. Scale bar = 25 μm [reproduced with permission from Friedman et al. (42)].
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QUESTIONS?

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REFERENCES

