Cardiovascular effects of secondhand smoke from marijuana

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5/12/17

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The Bad Ol’ Days
Typical day in 2017
Back to the Future: CA, 2017?

“Partygoers dance and smoke pot April 19, the first of two days of the annual 4/20 marijuana festival in Denver. The 4/20 event was the first one since Colorado legalized recreational marijuana in January.”
Today (well, actually on 4/20):
...1/2 mile from UCSF!
Smoking attributable mortality

- Cancer: 37.5%
- Cardiovascular: 36.6%
- Respiratory: 25.9%
Annual SHS-attributable mortality in USA:

- **Heart Disease**: 69%
- **Stroke**: 16%
- **Lung Cancer**: 15%
Tobacco secondhand smoke exposure impairs ability of arteries to *vasodilate* when they need to pass more blood

(Vasodilation: Arteries grow in diameter when necessary)

Important: Impairment is temporary, but repeated exposures lead to **long-term** impairment
Measuring Endothelial Function
“Flow-Mediated Dilation” (FMD)

before

after

4.0 mm

4.4 mm

FMD = 10%

Celermajer NEJM 1992
Experimental design: FMD before and after exposure
1 minute of secondhand smoke (tobacco) exposure was enough to impair vascular endothelial function

Pinnamaneni et al., 2014, Nicotine Tob. Res. 16:584-590
Problem: General public avoids tobacco SHS but many think marijuana SHS is ok.

“No one said it ISN’T ok”
## Dried plant smoke: similar chemicals in varied proportions

<table>
<thead>
<tr>
<th>Health Effects</th>
<th>Tobacco</th>
<th>Marijuana</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight (mg)</td>
<td>788</td>
<td>769</td>
</tr>
<tr>
<td>puffs</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>tar (mg)</td>
<td>Multiple</td>
<td>24</td>
</tr>
<tr>
<td>CO (mg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia (mg)</td>
<td></td>
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<tr>
<td>Nicotine (mg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOx (mg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formaldehyde (μg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acrolein (μg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCN (μg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzo (a) pyrene (ng)</td>
<td></td>
<td></td>
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<tr>
<td>NNK (ng)</td>
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</tbody>
</table>

Moir et al., 2008
Marijuana SHS for 30 minutes impaired FMD (American Heart Association, Chicago, Nov. 2014)

low dose = ~200 µg/m³ particles; high dose = ~670 µg/m³ particles (starting concentrations)
Marijuana SHS 1 minute exposure lowered FMD

“30 minutes is kind of long, how about shorter times?”

marijuana 1 min

59% drop in FMD

Marijuana SHS 1 minute exposure lowered FMD
“Could the impairment in FMD be caused by smoke from the burning paper, rather than tobacco and marijuana?”

SHS from marijuana without paper still impairs FMD
“They totally smoke out the rats”

The smoke was invisible in the exposure chamber
Marijuana SHS exposure for 1 minute lowered FMD for at least 90 minutes.
“How do marijuana and tobacco compare in impairment of FMD?”

Impairment from one minute of marijuana SHS persists longer than impairment from tobacco SHS.
Summary of marijuana results
Wang et al., 2016, J Am Heart Assoc 5:e003858

Marijuana SHS for one minute substantially impairs vascular endothelial function in rats.

Neither THC nor paper smoke are required for marijuana SHS to impair vascular function.

...nicotine is not required for impairment of vascular function by smoke.

One minute of marijuana SHS exposure impairs vascular function for at least 90 minutes, longer than impairment from tobacco SHS.
Implications

2015: California State Assembly bill AB 2300 (Jim Woods)

- Clarifies that landlords can prohibit smoking of marijuana even with medicinal ID card in properties where tobacco smoking is banned
  - Our 2014 report cited as a major reason for the bill

2016- Proposition 64

- Bans Consuming marijuana in any public place
- Bans smoking or vaporizing marijuana in any non-smoking area
Policy Goals:

Public exposure to secondhand smoke should be avoided whether the source is tobacco or marijuana.
Policy Goals:

Change the perception and the dialogue
Policy Goals:
Change the perception and the dialogue

“No one said ‘It ISN’T ok’

“There’s tar and chemicals”

“‘It’s gross’!”

“It’s bad for you”

“No one said ‘It ISN’T ok’”