Think twice before you vape!

Current medical knowledge on the health effects of e-cigarettes

Take home points

- Vaping is not safe and poses health risks for people of all ages, and unique risks for adolescents.
- Vaping exposes users to multiple toxins that have been shown to cause asthma and other lung diseases, heart disease, brain problems, and cancer.
- Nicotine exposure in teens has been shown to cause numerous problems in adulthood, including drug seeking behavior, deficits in attention and cognition, and mood disorders.
- As of August 2016, the FDA has started to regulate e-cigarettes, making sales to minors illegal. Ingredient and toxin reporting are still under the process of being regulated.
- The CDC recognizes that e-cigarettes may contain less toxins than regular cigarettes, but they are not harmless and are not approved by the FDA as a quit smoking aid.
- Current studies on the negative health effects of e-cigarettes is limited and more research needs to be done.

Abbreviated References (see attachment for full)

6. Choi et al. 2010
7. Manigrasso et al. 2015
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11. Harber et al. 2006
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25. Hanna 2006
28. Belluzzi et al. 2004
32. Portugal et al. 2012
33. Slawecki et al. 2003
34. Smith et al. 2006
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What is vaping?

- Vaping is a term describing the use of an e-cigarette
- E-cigarettes are made to look like regular cigarettes or cigars, but some are disguised as pens and USB sticks
- E-cigarettes work by heating a fluid reservoir of nicotine (e-liquid) to create an aerosol that can be inhaled by users and bystanders
- Nicotine refills can be purchased in vials as a liquid freebase or in “pods” (cartridges) of nicotine salts

Vaping costs ~$720/year for e-liquid and ~$50 for a starter kit

What is the vapor?

- Nicotine
- Minor tobacco alkaloids
- Flavorants: Over 7,700 unique chemicals, but diacetyl and acetyl propionyl most common
- Solvents: propylene glycol (in plastics) and glycerin (in sweeteners and soaps)
- Submicron particles and free radicals
- Cancer causing chemicals like Tobacco-specific nitrosamines (TSNAs)
- Carbonyls: formaldehyde (in embalming fluid), acetaldehyde (in perfumes and dyes), acrolein (in herbicides)
- Benzoic acid (plastic and food preservative)
- Metals: Tin, nickel, cadmium, lead, mercury

What are the toxic effects?

- Inhaling propylene glycol can increase the risk of developing asthma
- After a single 2 second puff, ~30% of your daily dose of particles is deposited in your lungs, a potential toxicologic risk
- Some flavorants recognized as being “generally safe” when ingested are harmful when inhaled: diacetyl has been associated with a decline in lung function, can cause COPD, and can lead to bronchiolitis obliterans
- Inhaled acetyl propionyl causes similar airway damage
- TSNAs are cancer causing chemicals created by the process used to extract nicotine from tobacco leaves

Heating the e-liquid can increase the concentration of toxic carbonyl compounds in the aerosol, sometimes at higher concentrations than regular cigarettes

- Acrolein has been linked to increased risk of lung cancer, asthma, COPD, and heart disease
- Formaldehyde has been linked to causing cancer in humans
- Acetaldehyde is an irritant and probable cancer causing chemical
- Lead, cadmium, and nickel are known to cause respiratory distress and disease, and mercury can cause brain damage

What are the risks of nicotine exposure in adolescents?

- There is a biologic link between nicotine and negative heart effects, including heart disease

One Juul “pod” contains 59mg/mL of nicotine, equal to the nicotine content of an entire pack of real cigarettes

- The developing adolescent brain has an increased sensitivity to the rewarding effects of nicotine
- Nicotine induced brain changes can increase the addictive effects of abusive drugs in teens, causing them to become addicted later in life
- Adolescent nicotine exposure may result in brain problems as an adult, such as diminished attention span and enhanced impulsivity, memory problems, and increased anxiety and fear

A study in adolescent rats showed that even a single day’s exposure to nicotine could result in depression as adults

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