

# What Teens are Smoking Today

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July 17, 2017

## Disclosures

- I have no commercial relationships to disclose
- I will not be discussing any unapproved uses of pharmaceuticals or devices

## Outline

- Vaping
  - Basics
  - Epidemiology
  - Risks
- Cannabinoids
  - Basics
  - Epidemiology
  - Policies

## What Do You Ask Your Patients?



## Questions to Ask Youth

- **What vaping device are you using?**
  - Does it contain nicotine? What concentration?
  - Have you modified your e-cigarette? How?
  - What are you vaping? Any THC-containing liquids?
- **How do you obtain your e-cigarettes and cartridges?**
  - Who's buying? Online? Who's accepting the delivery?
- **Have you tried K2, spice, synthetic marijuana?**
  - Where and how are you buying it? Who are you using it with? How are you using it?

## Vaping Objectives

1. Describe 'vaping' with regard to engineering and pharmacology
2. Highlight recent epidemiologic trends in vaping
3. Review the potential risks of vaping

## Introduction: Vaping / E-Cigarettes

- Electronic cigarettes introduced to US in 2007
- Researched by Philip Morris since 1990s
- Engineered to deliver nicotine through *non-combustible* means



Image from NIEHS/NIH

Collaco JM, Drummond MB, McGrath-Morrow SA. *JAMA Pediatr.* 2015;169(2):177-82

## E-Cigarette Anatomy: 3 Components

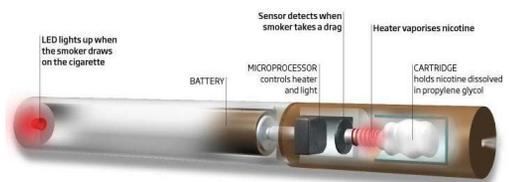


Image adapted from <http://eastcoastvapor.com>

Wollscheid KA, Kremzner ME. *Am J Health Syst Pharm.* 2009;66(19):1740-2

## Types of E-Cigarettes



E-cigarettes      Mid-sized ("Ego")      APV ("Mods")

Grana R, Benowitz N, Glantz SA. *Circulation*. 2014; 129(19):1972-86

## Carcinogen Exposure

Table 1. Levels of Toxicants in E-Cigarette Aerosol Compared With Nicotine Inhaler and Cigarette Smoke

Toxicant	Range in Content in Aerosol From 12 E-Cigarette Samples per 15 Puffs*	Range in Content in Conventional Cigarette Micrograms in Mainstream Smoke From 1 Cigarette	Content in Nicotine Inhaler Mist per 15 Puffs*
Formaldehyde, µg	0.2-5.61	1.6-52	0.2
Acetaldehyde, µg	0.11-1.36	52-140	0.11
Acrolein, µg	0.07-4.19	2.4-62	ND
o-Methylbenzaldehyde, µg	0.13-0.71	...	0.07
Toluene, µg	ND-0.63	8.3-70	ND
p,m-xylene, µg	ND-0.2	...	ND
NaN, ng	ND-0.00043	0.0005-0.19	ND
NaN, ng	ND-0.00293	0.012-0.11	ND
Cadmium, ng	ND-0.022	...	0.003
Nickel, ng	0.011-0.029	...	0.019
Lead, ng	0.003-0.057	...	0.004

10 to 100x

Goniewicz ML, Klysak J, Gawron M, et al. *Tob Control*. 2014;23(2):133-9  
Grana R, Benowitz N, Glantz SA. *Circulation*. 2014; 129(19):1972-86

## Prevalence of Traditional Cig Use

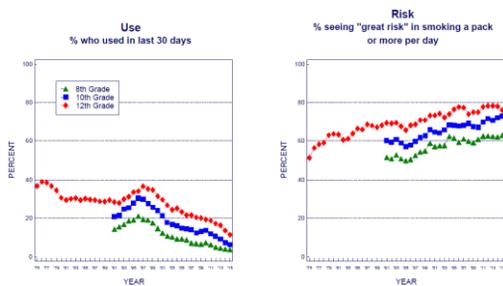


Figure from: *Monitoring the Future Survey*, University of Michigan, 2015

## Prevalence of E-Cigarette Use, 2014

Estimated share of high school students who used tobacco in the preceding 30 days, by product

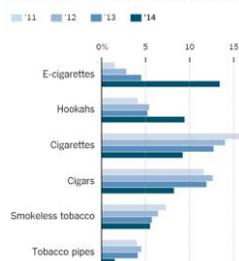
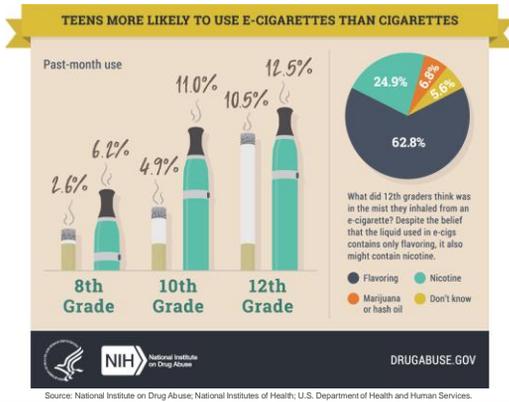


Figure from: <http://www.nytimes.com>; 2014 National Youth Tobacco Survey, CDC, 2015



## Transition to Combustible Cigs



- National longitudinal sample of 16 to 26 year-old never-smokers
- Recruited between 2012 and 2014, one-year follow-up
- Baseline e-cigarette use associated with risk for subsequent smoking:
  - **Adjusted OR 8.3** (95% CI, 1.2–58.6)

BA Primack, et al. *JAMA Pediatr.* 2015;169(11):1018-23.

## Use As a Cessation Tool...?



- No randomized trials have yet been conducted; mostly anecdotal evidence
- Cross-sectional survey in UK among 5,000 attempted quitters of conventional cigarettes:
  - **OR 1.63** (95% CI, 1.17–2.27) vs. NRT
  - **OR 1.61** (95% CI, 1.19–2.18) vs. no aid

NRT = nicotine replacement therapy  
Brown J, Beard E, Kotz D, et al. *Addiction.* 2014;109(9):1531-40.

## FDA Regulation

- **US Food & Drug Administration (FDA) regulates:**
  - Cigarettes
  - Smokeless tobacco (snuff, dipping, snus)
- **Until May 6, 2016, did not regulate:**
  - E-cigarettes
  - Hookahs
  - Pipe tobacco
  - Cigars

### FDA Regulation:

- Product labeling (warnings)
- Face-to-face purchases
- Proximity of advertising to schools
- Limits on advertising in media
- Limits on advertising to youth

US Food & Drug Administration, 2015 and 2016

## E-Cigarette Advertisements



<http://www.tobaccofreekids.org/>

## E-Cigarette Related Injuries



EG Brownson, et al. *N Engl J Med*, 2016; 375:1400-1402.

## Vaping Conclusions

1. E-cigarette use is common among youth (17% of high school seniors in 2014) and increasing in prevalence
2. Carcinogen exposure is lower, but not non-existent
3. Vaping may be a risk factor for use of traditional cigarettes



<http://herb.co>

## Marijuana & Cannabinoids Objectives

1. Define marijuana, cannabinoids and synthetic cannabinoids
2. Highlight recent epidemiologic trends in use of these substances
3. Discuss impact of cannabinoid policies on adolescents

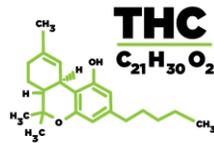
## Definitions: Marijuana

- The cannabis plant (contains a large number of biologically active cannabinoids)
  - Cannabis sativa – Causes alert, energetic high
  - Cannabis indica – Causes relaxed, lethargic high
  - Both have been hybridized repeatedly



## Definitions: THC

- Tetrahydrocannabinol (aka delta-9-tetrahydrocannabinol)
- Primary psychoactive cannabinoid in the marijuana plant
- Amount of THC in a given plant varies widely (~15% is common)



## Definitions: Cannabidiol (CBD)

- Non-psychoactive cannabinoid
- Currently being studied for:
  - Improved control of certain chronic neurological conditions, including intractable seizures
  - Immune enhancement
  - Cancer treatment
- Little known about dose-response of CBD use
  - Too little may be ineffective and too much may cause adverse effects

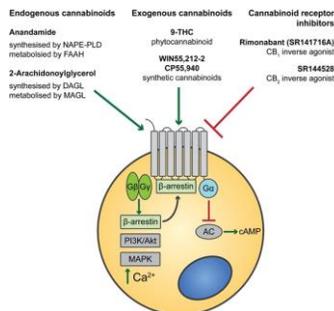
## Definitions: Hemp

- A low-THC (<0.3%) strain of *Cannabis sativa*
- NOT utilized for psychoactive effects
- Used to make a variety of consumer products including paper, textiles, clothing, health food, and bio-fuel
- Legally grown in a number of countries including Spain, China, Japan, Korea, France, and Ireland

## Cannabinoids: Basics

- Biologically active molecules
- Number of regulatory functions in human body
- Humans have endocannabinoid receptors known as CB1 and CB2
  - CB1 is found in the brain and nervous system
  - CB2 is found in certain immune system cells
- Humans produce “endocannabinoids” (e.g., anandamide, 2-arachidonoylglycerol)
- THC & synthetic cannabinoid molecules can bind the human endocannabinoid receptors

## Cannabinoids: Basics



## “Medical Marijuana”

- A misnomer
- Compounds that may have therapeutic benefit are the *cannabinoids*
  - THC (psychoactive cannabinoid)
  - CBD (non-psychoactive cannabinoid)
- Buds and leaves of the plant are smoked, vaporized, and/or cooked
- Cannabinoid extractions may also produce therapeutic benefits
  - “Charlotte’s Web”: CBD-based product with low (<0.3%) THC



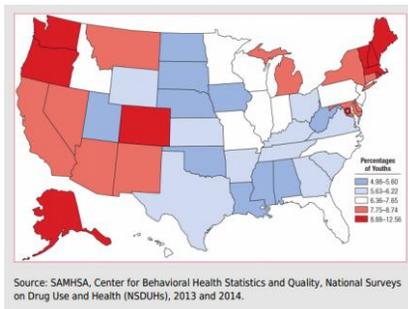
## Legal Synthetic Forms of Marijuana for Medical Use

- **Dronabinol (Marinol)**
  - Schedule III oral medication
  - Approved by FDA for treatment of AIDS-related wasting and chemotherapy-induced nausea/vomiting
  - Oral capsule must be taken whole
- **Nabilone (Cesamet)**
  - Oral capsule with similar properties to dronabinol
  - Schedule II due to possible higher abuse potential
- **Sativex**
  - Cannabinoid-based oral mucosal spray (faster onset)
  - Canada & UK for neuropathic pain in MS, cancer

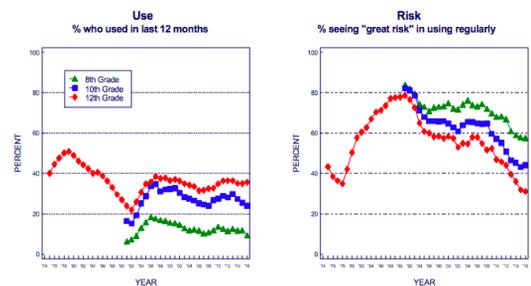
## Evidence-based Indications for Marijuana

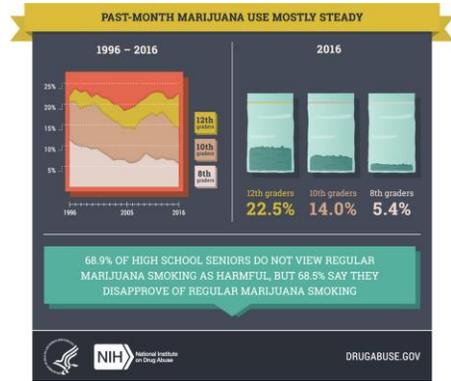
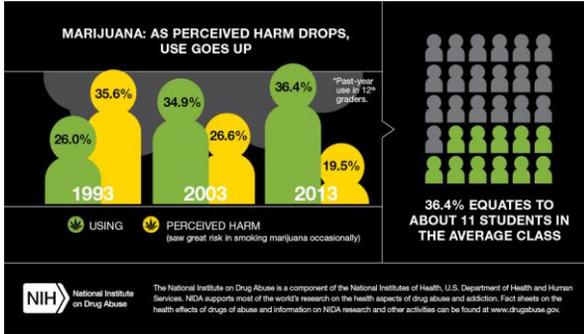
- No published clinical trials on the use of medical marijuana/cannabinoids in the pediatric and adolescent populations
- Potential therapeutic areas
  - Analgesia in chronic neuropathic pain.
  - Appetite stimulation in debilitating disease.
  - Spasticity in multiple sclerosis.
  - Cachexia

## Marijuana Use by Youth (12-17 yrs old in the past month)



## Prevalence of Marijuana Use





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## Vaping THC

- Anonymous survey of 3,847 high school students in CT in 2014
- More than 1 in 6 e-cigarette users had used an e-cigarette to vape hash oil
- Most likely: male, younger



ME Morean, et al. *Pediatrics*, 2015;136(4):611-6.

Duke Children's | Duke | Robert J. Margolis, MD Center for Health Policy | Duke Clinical Research Institute

## Synthetic Cannabinoids



Image from: *The New York Times Magazine*, July 2015. Quote from [www.nytimes.com](http://www.nytimes.com), 2015.

Duke Children's | Duke | Robert J. Margolis, MD Center for Health Policy | Duke Clinical Research Institute

## Synthetic Cannabinoids

- **Past year use: 1 in 20 high school seniors**
  - Compare to more than 1 in 3 for marijuana
  - Prevalence is declining (was 11% in 2012)
- Sold under brand names
  - Spice, K2, herbal incense, Cloud 9, mojo, 'legal' marijuana
  - Sold online, in stores

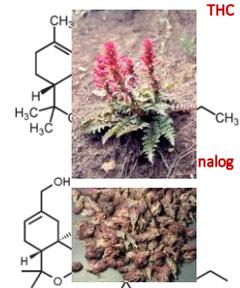


Data from: *Monitoring the Future Survey*, University of Michigan, 2015; [www.drugabuse.gov](http://www.drugabuse.gov), 2016



## Synthetic Cannabinoids: Structure, Preparation

- Synthetic cannabinoids are *full* agonists of cannabinoid receptor
  - THC only a *partial* agonist
- Synthesized in lab
  - Dissolved in acetone/ethanol
  - Mixed with an inert plant ("wild dagga" or "Indian warrior")
  - Gives impression of being 'natural'
- Smoked, snorted, or ingested



BM Mills, et al. *Am J Med Sci*, 2015;350(1):59-62.



## Synthetic Cannabinoids: Use and Toxicity

- Produces similar psychoactive effects to THC
  - Positive: relaxation, euphoria, sensation of time slowing
  - Negative: anxiety, paranoia, poor memory, attention)
- Batch-to-batch differences result in great variation (e.g., stimulant-like effects)
- Reported effects:
  - Tachycardia (37%), agitation (19%), drowsiness (18%), hallucinations (11%), hypertension (10%), nausea (9%)



BM Mills, et al. *Am J Med Sci*, 2015;350(1):59-62.



## Synthetic Cannabinoids: Detection and Legal Issues

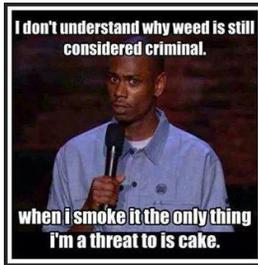
- Standard urine drug screens *cannot* detect synthetic cannabinoids
- Requires send out to special lab; even then, newer chemicals not yet detectable
- Since 2011, US Drug Enforcement Agency (DEA) has actively been designating synthetic cannabinoids as Schedule 1 controlled substances



BM Mills, et al. *Am J Med Sci*, 2015;350(1):59-62.



## Marijuana Policies



## AAP Marijuana Position Statement (2015)

- Given the data supporting the **negative health and brain development effects** of marijuana in children and adolescents, ages 0 through 21 years, **the AAP is opposed to marijuana use in this population**
- Evidence summary
  - >10 uses/month can significantly impair adolescent cognitive development
  - Can also adversely affect mental health and social outcomes

## AAP Marijuana Position Statement (2015)

- Opposes “medical marijuana” outside regulatory process of FDA
- Notwithstanding this opposition to use, the AAP **recognizes that marijuana may currently be an option for cannabinoid administration for children with life-limiting or severely debilitating conditions and for whom current therapies are inadequate**
- Evidence summary
  - Unlike FDA-regulated medications, the current system of medical marijuana does not routinely include standardization of purity, indications, dosing, effects, or side effects

## AAP Marijuana Position Statement (2015)

- **Opposes legalization of marijuana** because of the potential harms to children and adolescents
- **Strongly supports research and development** of pharmaceutical cannabinoids and supports a review of policies promoting research on the medical use of these compounds
- Recommends changing marijuana from **DEA schedule I → schedule II** drug to facilitate research

## AAP Marijuana Position Statement (2015)

- Strongly supports the **decriminalization of marijuana use for both minors and young adults**
  - Encourages pediatricians to advocate for laws that prevent harsh criminal penalties for possession or use of marijuana



## AAP Marijuana Position Statement (2015)

- Discourages the use of **marijuana by adults in the presence of minors** because of the important influence of role modeling by adults on child and adolescent behavior



## Medical Marijuana Policies

- The U.S. Food and Drug Administration (FDA) has not recognized or approved the marijuana plant as medicine
- Not enough large-scale clinical trials for FDA to approve medical uses of marijuana
- This is because the DEA has to approve trials
- The FDA has approved two medications that contain cannabinoid chemicals in pill form

## Marijuana Policies for Adolescents

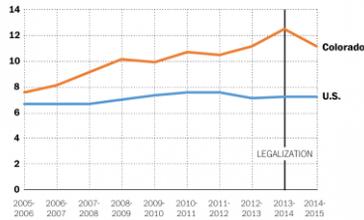
- In almost all states where medical marijuana has been legalized, marijuana use by minors has been **stable or decreased**
- Some states require doctors to prescribe medical marijuana rather than recommend, which is illegal under federal law



## Marijuana Policies for Adolescents

### Teen pot use drops sharply in Colorado

% of 12-to-17 year olds using marijuana in the past month



WFOU/ST/WORKBLOG

Source: National Survey on Drug Use and Health



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## Marijuana Resources

- American Academy of Pediatrics: [www.aap.org/marijuana](http://www.aap.org/marijuana)
- National Institute on Drug Abuse: [www.drugabuse.gov](http://www.drugabuse.gov)
- Office of National Drug Control Policy: [www.whitehouse.gov/ondcp](http://www.whitehouse.gov/ondcp)
- Smart Approaches to Marijuana: <http://learnaboutsam.com>
- Substance Abuse and Mental Health Services Administration: [www.samhsa.gov](http://www.samhsa.gov)
- US Department of Health & Human Services, Office of Adolescent Health: [www.hhs.gov/ash/oah/resources-and-publications/publications/substance-abuse.html](http://www.hhs.gov/ash/oah/resources-and-publications/publications/substance-abuse.html)

## Marijuana Summary

- Cannabinoids, both for recreational and medical purposes, come in many forms
- Synthetic cannabinoids produce similar effects to THC, but are unpredictable and dangerous
- Many outstanding questions about the impact of the legalization of marijuana and adolescent health



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Center for Health Policy



## Questions to Ask Youth

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  - Does it contain nicotine? What concentration?
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## Questions? And Thank You!

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