



E-CIGARETTES AND VAPING: What We Know and What We Don't

Judith S. Gordon, PhD

Professor and Associate Dean for Research, College of Nursing

Professor, Family & Community Medicine

University of Arizona



FINANCIAL DISCLOSURE

I have no financial conflicts of interest to disclose.



PREVALENCE OF E-CIGARETTE USE IN THE UNITED STATES - ADULTS

Prevalence Adults (%)	2016	2017	2018
Current Use E-Cig	3.2	2.8	3.2
Ever Use E-Cig	15.4	-	-

<https://www.cdc.gov/mmwr/volumes/66/wr/mm6633a6.htm>

PREVALENCE OF E-CIGARETTE USE IN THE UNITED STATES - YOUTH

Vaping 12 th Grade (%)	2017	2018	2019
Nicotine Last 30 Days	11.7	20.9	25.4
Nicotine Ever Use	25.0	34.0	40.5
Daily Use	-	-	11.7
Any Vaping	-	37.3	-
Marijuana Vaping	9.5	13.1	-

<https://www.nih.gov/news-events/news-releases/teens-using-vaping-devices-record-numbers>

PATTERNS OF USE AMONG CURRENT E-CIGARETTE USERS - 2015

Age	Regular Smokers (%)	Former Smokers (%)	Never Smoker (%)
Overall	60	29	11
45+	69	30	1
25-44	60	32	8
18-24	42	18	40

QuickStats: Cigarette Smoking Status Among Current Adult E-cigarette Users, by Age Group — National Health Interview Survey, United States, 2015. MMWR Morb Mortal Wkly Rep 2016;65:1177. DOI: <http://dx.doi.org/10.15585/mmwr.mm6542a7>

THE JUUL PHENOMENON

- Sleek high-tech design
- Better nicotine delivery
- Savvy marketing



JUUL @JUULvapor · 4 Jun 2015

Having way too much fun at the #JUUL launch party #LightsCameraVapor #NYC

Twitter



Instagram



Promotional
Event



Magazine
ad



E-CIGARETTES

- Electronic nicotine delivery system (ENDS)
- Produces aerosol (vapor)
- Known as “vaping” or “juuling”
- Contains many chemicals
- Most contain nicotine
- Little is known about contents and short-term health consequences
- Nothing is known about long-term health consequences
- “Big Tobacco” now major players



VAPING HARDWARE 1.0



VAPING HARDWARE 2.0



VAPING HARDWARE 2.0

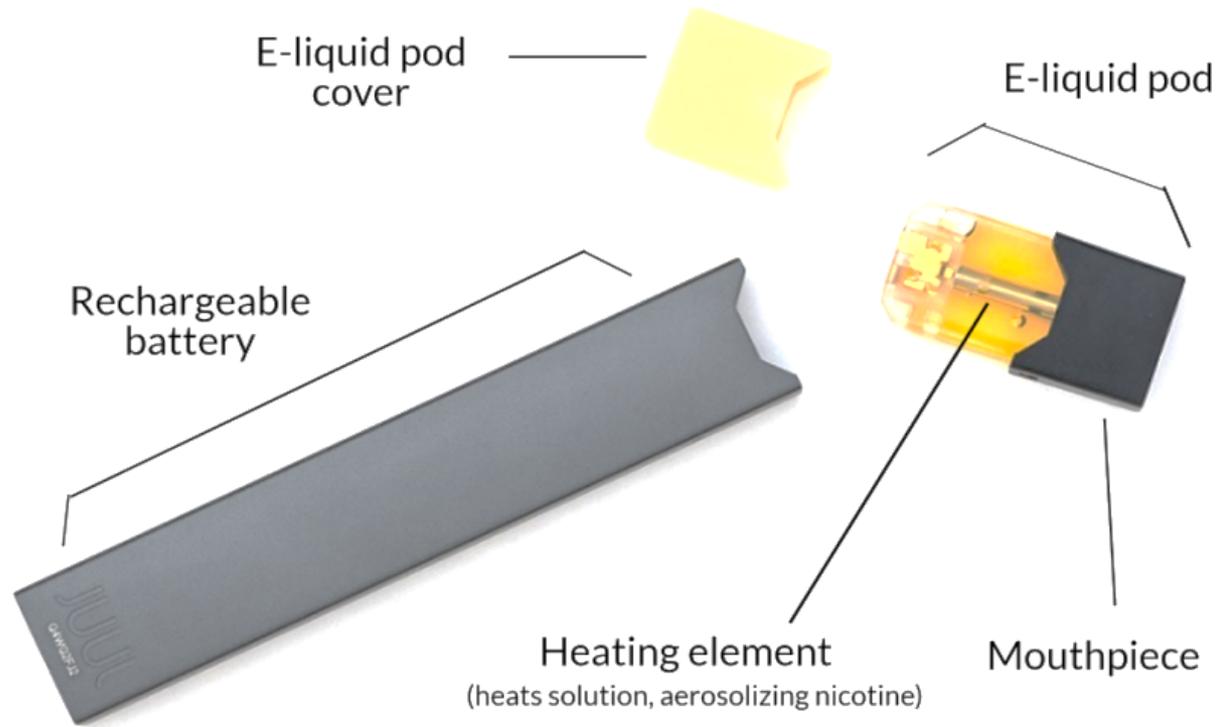
DISPOSABLES



COMPONENTS OF VAPE SYSTEMS 1.0



COMPONENTS OF VAPE SYSTEMS 2.0



E-LIQUIDS



E-LIQUID CARTRIDGES



FLAVORS



BLUE
RAZ



BLUEBERRY



COOL
MINT



CUCUMBER



GRAPE



LUSH ICE



LYCHEE
ICE



PINK
LEMONADE



PINEAPPLE
LEMONADE



O.M.G.



POMEGRANATE



SOUR APPLE



STRAWBERRY



WATERMELON

FLAVORS



CONSTITUENTS OF E-LIQUIDS

- Nicotine salts
 - Highly addictive
- THC/CBD
 - **Vitamin E acetate**
 - Oils build up in lungs
- Ultrafine particles
 - Can be inhaled deeply
- Propylene glycol
 - Propylene oxide
- Volatile Organic Compounds (VOCs)
 - Benzene, Acrylamide, Formaldehyde, Acetone, Acetylaldehyde
 - Carcinogens
- Microbial Contaminants
 - Glucan (fungi), Endotoxin (microbial agent)
 - Asthma, reduced lung function, inflammation



CONSTITUENTS OF E-LIQUIDS

- Flavor additives
 - Diacetyl – all flavors
 - Ethyl maltol – mint/menthol
 - Cinnamaldehyde – cinnamon
 - Ethylvanillin – vanilla
 - Benzaldehyde – cherry
 - Toxins/Mutagens/Carcinogens
 - Tobacco specific nitrosamines
 - Carcinogens found in tobacco
 - Heavy metals
 - Nickel, tin, chromium, lead
 - All toxins
 - Plastics
 - Myclobutanil
 - Fungicide that transforms into hydrogen cyanide when burned
- 

NICOTINE IN E-CIGARETTES

Product Type	# of Puffs	Avg. Nicotine
Cigarettes	10	1.0 mg
E-cigarettes	10	0.3 mg
Pod mods	10	0.8 – 2.0 mg

Product Type	Average Nicotine Concentration
E-Cigarettes	24 mg/ml
Juul	56 mg/ml



HOW SAFE ARE E-CIGARETTES?

- FDA has not approved electronic cigarettes as an effective and safe smoking cessation treatment due to lack of evidence
- Considered an “alternative smoking device”
- They do not include any health warnings
- E-liquid products not consistent in labeling/content
- Misperception that flavored e-liquids are safer



HEALTH EFFECTS

- Emerging evidence on short-term health effects
 - No research yet on long-term health effects
 - Vaping has contributed to ~2,700 illnesses in the US alone
 - >50 deaths in the US
 - Possible carcinogen in mouse models
- 

SHORT-TERM HEALTH CONSEQUENCES OF E-CIGARETTE/VAPING

- **Nicotine addiction**
 - Mouth and throat irritation
 - Dry cough
 - Increased respiratory infections
 - Exacerbation of asthma symptoms
 - Pneumonia
 - Alveolar hemorrhage
 - Respiratory failure
 - Seizures
 - Changes in neuroanatomy
 - Increased heart rate
 - Decreased O2 saturation
 - Increased airway resistance
 - Increased inflammation
 - Cell damage
 - Acute pulmonary damage
 - E-cig/Vaping Assoc Lung Injury (EVALI)
- 

Healthy Lungs



“EVALI” Lungs



CDC EXPANDED CLINICAL GUIDANCE - EVALI

- **Ask all pts about use of e-cigarettes or vaping, especially if presenting with respiratory or gastrointestinal symptoms**
 - EVALI is considered a diagnosis of exclusion; no specific test or marker exists for its diagnosis
 - Measure O₂ saturation and vital signs, a respiratory viral panel, and complete blood count and urine toxicology testing, including tests for THC
 - Along with a chest x-ray looking for infiltrates for all patients with a hx of vaping and respiratory or GI symptoms, consider a chest CT for evaluation of severe or worsening disease
 - Some patients can be managed on an outpatient basis if they have >95% O₂ saturation, are clinically stable, and can assure f/up w/in 24-48 hrs
 - For tx, consider corticosteroids and influenza antivirals, and strongly consider early initiation of antimicrobial drugs for community-acquired pneumonia
 - **Strongly advise patients to stop vaping and get the flu shot and pneumococcal vaccine**
- 

ORAL HEALTH EFFECTS OF VAPING

- E-liquids cause cavities, gum disease & other oral health issues
- Lithium batteries can explode causing oral/craniofacial injury



Perio-ImplantAdvisory.com, January 10, 2019



Perio-ImplantAdvisory.com, January 10, 2019

EXPOSURE TO AEROSOL (VAPOR)

- Secondhand aerosol contains the same chemicals as those inhaled/exhaled by the person vaping
- >33% of middle and high school students report being exposed to secondhand aerosol
- Thirdhand aerosol is deposited on surfaces
- Aerosol is heavier than smoke and settles quickly
- E-liquids containing nicotine can be toxic if absorbed through the skin or ingested
 - Refillable cartridges pose a risk for dermal exposure and toxicity
 - In US 2013-2017, 115 children under 5 visited the ER for nicotine poisoning from e-liquids



WHAT SHOULD AN E-CIGARETTE USER KNOW?

- They are not harmless
- The contents vary widely and are not regulated
- Products safe for eating may not be safe when heated and inhaled
- Many questions remain about e-cigarettes' safety
- Don't use black market or "home-made" products
- Encourage users to quit e-cigarettes
- Use same effective (approved) treatments for cessation as you would for smoking
- Stop vaping of all products (THC, CBD, etc.) and use other (non-combustible) forms for medical use

WHAT SHOULD A SMOKER KNOW ABOUT E-CIGARETTES?

- Not a safe alternative to smoking
- Not approved for smoking cessation
- Recommend using approved treatments first
- If smoker insists and has failed with other methods
 - Express concern regarding safety of e-cigarettes
 - Recommend only temporary, short-term use of e-cigs
 - Switch completely to e-cigarettes (no dual use)
 - Don't vape THC/CBD or buy black market products
 - Make a plan to stop e-cigarettes (taper off) as you would with approved treatments
 - Create a quit plan and follow up on progress
 - Switch to approved treatments if still vaping

MOST E-CIGARETTE USERS WANT TO QUIT

- Recent survey of 1800 people who used e-cigarettes regularly
- Over half were also smoking conventional cigarettes
- Almost 67% said they had plans to quit e-cigarettes someday
- About 50% planned to quit in the next year
- 25% had tried to quit in the past year
- Few used social support and FDA-approved cessation aids

Rosen RL & Steinberg ML, Interest in Quitting E-cigarettes Among Adults in the United States, *Nicotine & Tobacco Research*, ntz062, <https://doi.org/10.1093/ntr/ntz062>

FDA-APPROVED CESSATION PHARMACOTHERAPY OPTIONS

- Over-The-Counter (OTC) Nicotine Products
 - Nicotine Patch
 - Nicotine Gum
 - Nicotine Lozenge
- Prescription Medications
 - Nicotrol Inhaler
 - Nicotine Nasal Spray
 - Zyban/Wellbutrin (Bupropion)
 - Chantix (Varenicline)
- Age restrictions (18+) on purchase of OTC
- Physician can prescribe for <18



BEHAVIORAL TREATMENT

- Tobacco Quitlines
 - ASHLine (800-556-6222)
 - 1-800-QUIT-NOW (800-784-8669)
 - Trained quit coaches
 - Spanish-speaking
 - Special protocols
 - Free or low-cost NRT
- Smokefree.gov
 - Web-based
 - Text-based
 - Chat-based
 - Mobile apps
 - Social media

PREVENTION AMONG YOUTH

- Prevention efforts must focus on youth before exposure to tobacco products
- Large jumps in use each year starting in 6th grade
- Start talking about e-cigarettes at age 12
- Focus on:
 - Similarities to cigarettes
 - Vaping is very addictive and not safe
 - Kids who vape 4 x more likely to use cigarettes
 - E-cigarettes are owned by tobacco companies
 - Looking for new customers through vaping
 - Manipulating youth
 - Marketing products as “safe” and “cool”
 - Using social media and banned tactics
- Click City[®]: Tobacco prevention program



FEDERAL & STATE REGULATION

- CDC warning not to vape, particularly THC
- Some states have imposed bans on e-cigarette sales & stores no longer selling e-cigarettes
- Partial ban on flavored e-cigarette liquids
- Increased age to 21 to buy tobacco products
- Federal probes of deceptive marketing practices at Juul and other manufacturers



THANK YOU!



Contact Info:

Judith Gordon, PhD

judithg@email.arizona.edu

520-626-4970

