

# Electronic Cigarettes & Drug Use



Alexandria City Public Schools (ACPS)  
Department of Student Services  
Alternative Programs & Equity

Fredy L. Martinez, MS. Ed. CSAC. QMHP

ACPS K-12 Substance Abuse Prevention & Intervention Services Coordinator



**EVERY STUDENT SUCCEEDS**

# Essential Questions

- What's the problem about vaping?
- What's the difference between smoking e-cigarettes and smoking tobacco?
- What's the difference between smoke, aerosol and vapor?
- Are VAPING and JUULING the same?
- Is VAPING harmful? how?
- Is nicotine is addictive? how?



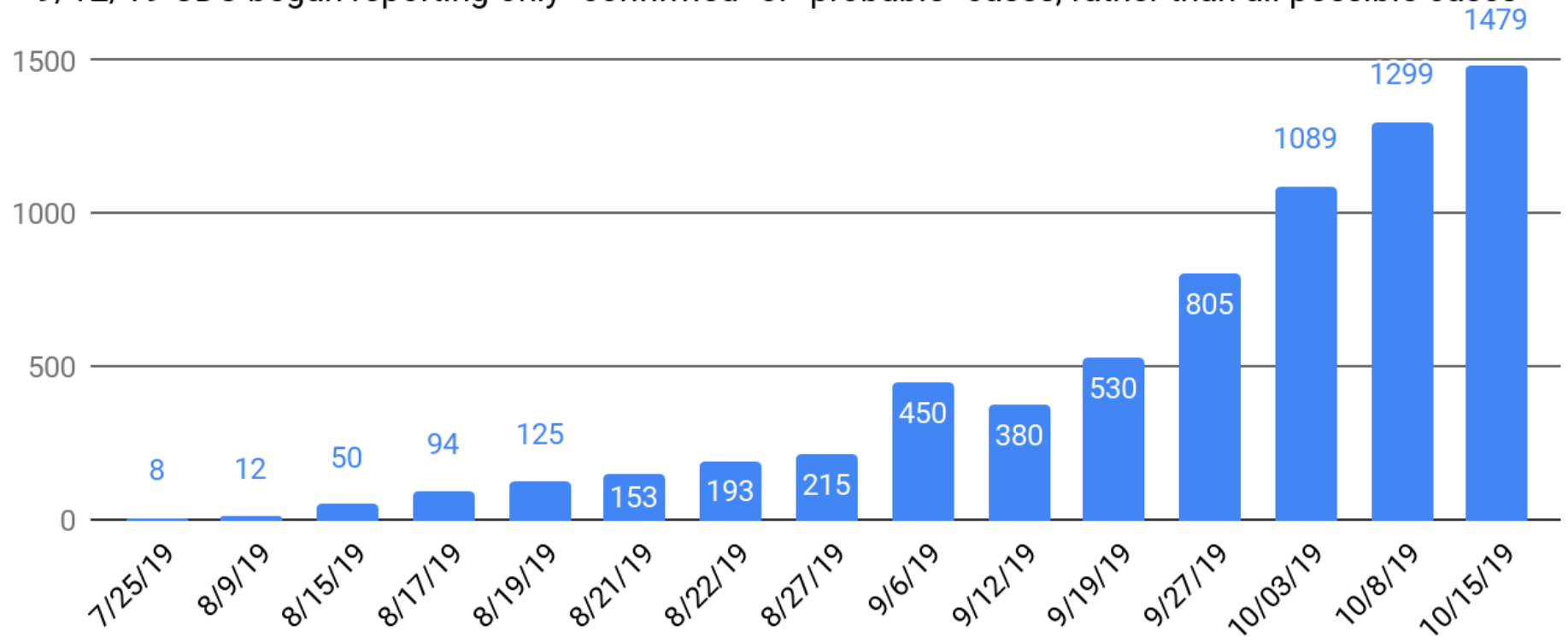
7 out of 10 middle and high school students who currently use tobacco have used FLAVORED products. (Source: Mobility & Mortality Weekly Report (MMWR), CDC)

Source: <https://www.flavorshookkids.org/#do-something>

# 1479 lung injury cases/49 states : October 15,

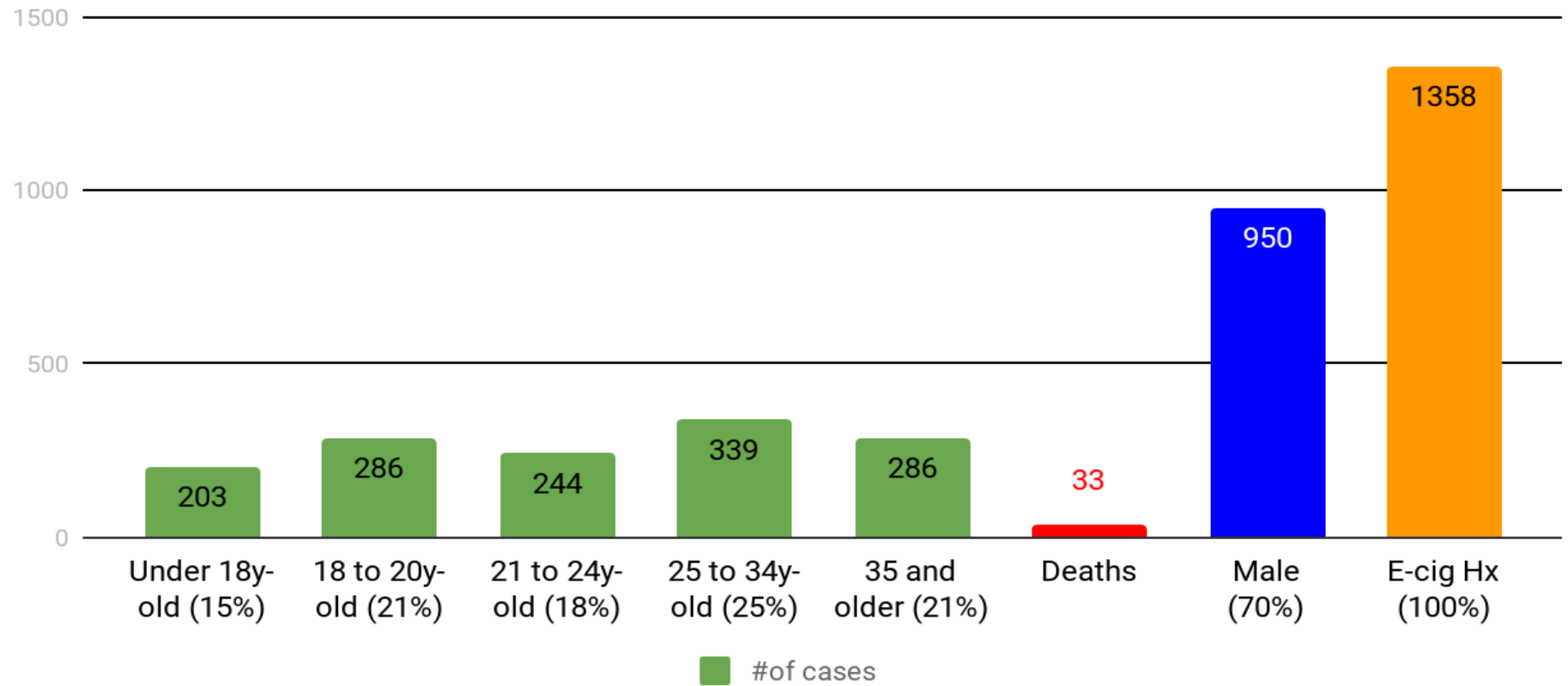
## US Vaping-Related Lung Illnesses Cases. Date 10/15/19

\* 9/12/19 CDC began reporting only "confirmed" or "probable" cases, rather than all possible cases



Centers for Disease Control&Prevention (CDC)reporting dates (Via cdc.gov)

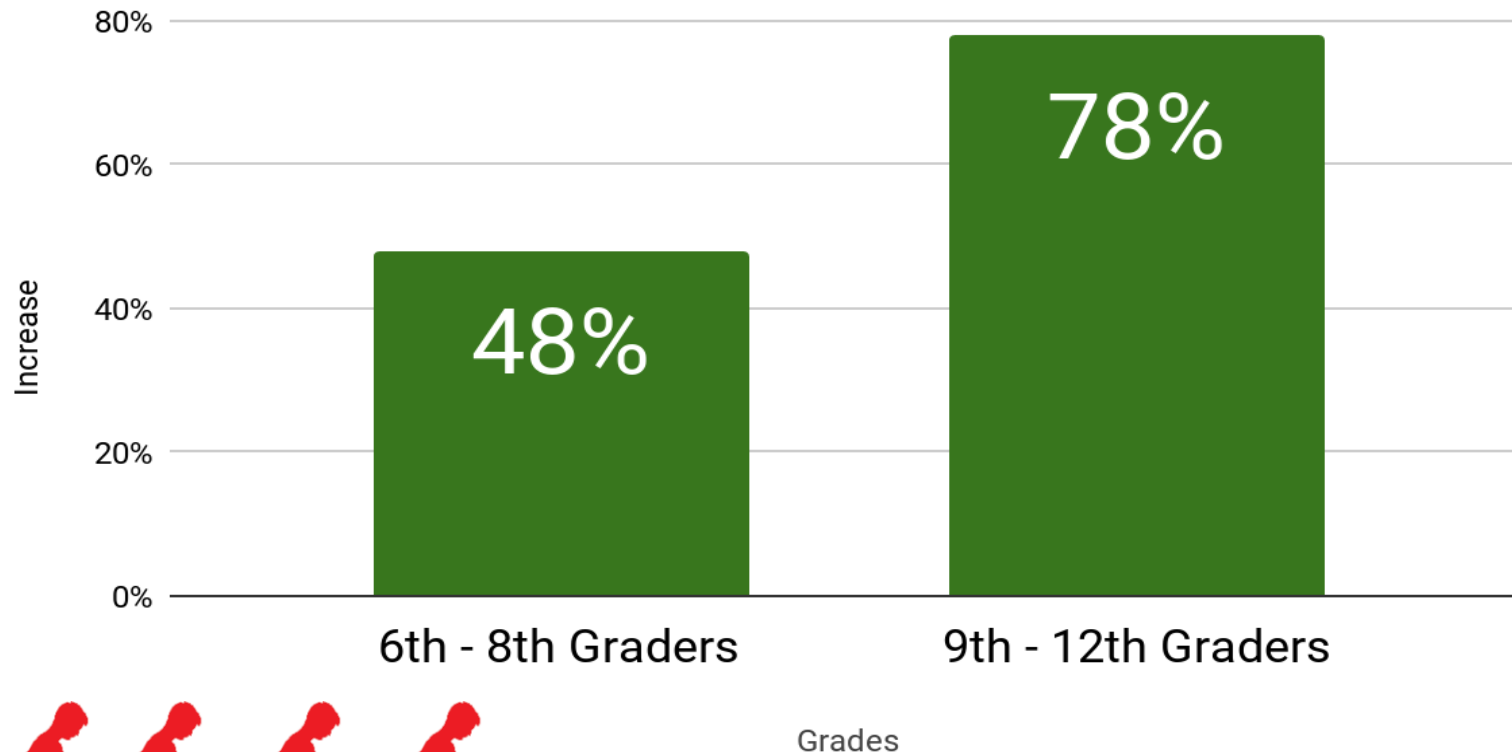
# Outbreak of Lung Injury : As of Oct 15, 2019. (1358 of 1479 cases analyzed)



[Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion](#)

# National Youth Tobacco 2018 Survey

2017- 2018 - Increase vs. Grades



4 out of 5 kids tobacco users started with a flavored product ([American Journal of Preventive Medicine](#) )

Surge in current e-cig use = 1.5 million more students 2017-2018

# Combustion -> Smoke

Combustion of Tobacco: The tobacco in a cigarette burns at temperatures in excess of 600 °C...



...generating smoke that contains high levels of harmful chemicals.

**Solid state (tobacco/fuel)+oxygen+energy= Combustion/Oxidation/heat = Smoke**

# Cigarette Chemicals

<ul style="list-style-type: none"> <li>• Propylene glycol</li> <li>• Glycerin</li> <li>• Flavorings (many)</li> <li>• Nicotine</li> <li>• NNN</li> <li>• NNK</li> <li>• NAB</li> <li>• NAT</li> <li>• Ethylbenzene</li> <li>• Benzene</li> <li>• Xylene</li> <li>• Toluene</li> <li>• Acetaldehyde</li> <li>• Formaldehyde</li> <li>• Naphthalene</li> <li>• Styrene</li> <li>• Benzo(b)fluoranthene</li> </ul>	<ul style="list-style-type: none"> <li>• Chlorobenzene</li> <li>• Crotonaldehyde</li> <li>• Propionaldehyde</li> <li>• Benzaldehyde</li> <li>• Valeric acid</li> <li>• Hexanal</li> <li>• Fluorine</li> <li>• Anthracene</li> <li>• Pyrene</li> <li>• Acenaphthylene</li> <li>• Acenaphthene</li> <li>• Fluoranthene</li> <li>• Benz(a)anthracene</li> <li>• Chrysene</li> <li>• Retene</li> <li>• Benzo(a)pyrene</li> <li>• Indeno(1,2,3-cd)pyrene</li> </ul>	<ul style="list-style-type: none"> <li>• Benzo(ghi)perylene</li> <li>• Acetone</li> <li>• Acrolein</li> <li>• Silver</li> <li>• Nickel</li> <li>• Tin</li> <li>• Sodium</li> <li>• Strontium</li> <li>• Barium</li> <li>• Aluminum</li> <li>• Chromium</li> <li>• Boron</li> <li>• Copper</li> <li>• Selenium</li> <li>• Arsenic</li> <li>• Nitrosamines</li> <li>• Polycyclic aromatic hydrocarbons</li> </ul>	<ul style="list-style-type: none"> <li>• Cadmium</li> <li>• Silicon</li> <li>• Lithium</li> <li>• Lead</li> <li>• Magnesium</li> <li>• Manganese</li> <li>• Potassium</li> <li>• Titanium</li> <li>• Zinc</li> <li>• Zirconium</li> <li>• Calcium</li> <li>• Iron</li> <li>• Sulfur</li> <li>• Vanadium</li> <li>• Cobalt</li> <li>• Rubidium</li> </ul>
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Source: Cancer.org



[www.acps.k12.va.us](http://www.acps.k12.va.us)

[Stanford Medicine. Tobacco Prevention Toolkit. Stanford University, 2018](#)





-“Numbers of E-cigs droplets deposited in pulmonary and **tracheobronchial** regions were approximately 2x (two-fold) higher than the numbers of deposited cigarette particles in these regions”.  
[Manigrasso et al. (2015), Pichelstorfer et al. (2016)]”

# Electronic Nicotine Delivery Systems (ENDS)

Electronic cigarettes, also known as e-cigarettes, e-cigs or Electronic Nicotine Delivery Systems (ENDS), are typically cigarette-shaped battery-powered electronic devices that produce an aerosol that users inhale.

## Vaporizing -> Aerosol

**Solid state/Liquid/Oil + Heat + Vaporization = Aerosol**



Time - sec 27 - 1.33 sec.

# Types



JUUL



E-cigar

E-CIGARETTE: No maintenance, needs recharge, smaller and disposable. Atomizer has a limited use life.

1-Dry ingredients  
(herbs, oil, wax)

2-Wet Ingredients  
(liquids)

3-Direct Heat

4-Indirect Heat  
(circulating heat air)



MOD

BOX-MOD:  
maintenance,  
refilling and  
changing  
parts: produce  
large amount  
of smoke



E-pipes



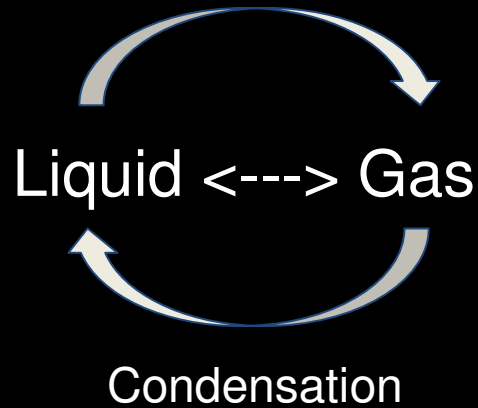
OIL-VAPES: Used  
for wax, oil, or  
concentrates. Has  
a chamber.

E-cigarettes

# Gas

A substance in the gas phase

Vaporization



# Aerosol

Suspension system of solid or liquid particles in a gas

WATER  
VAPORIZED



PARTICLES AEROSOLIZED

Micro-particles suspended



**smoke is an aerosol, not all aerosols are smoke.**



**TOBACCO  
FREE CA**



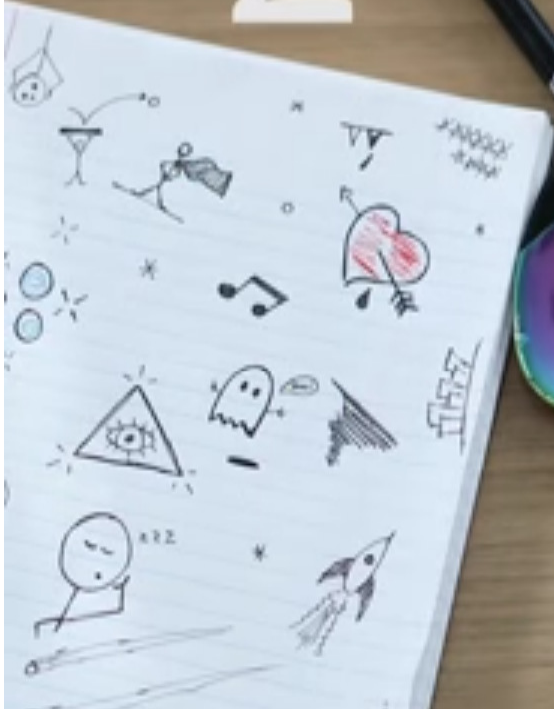
Identify which products teens are vaping.



Watch later



Share



2

3

1

4

5

TOBACCO FREE CA VIDEOS



0:13 / 1:18

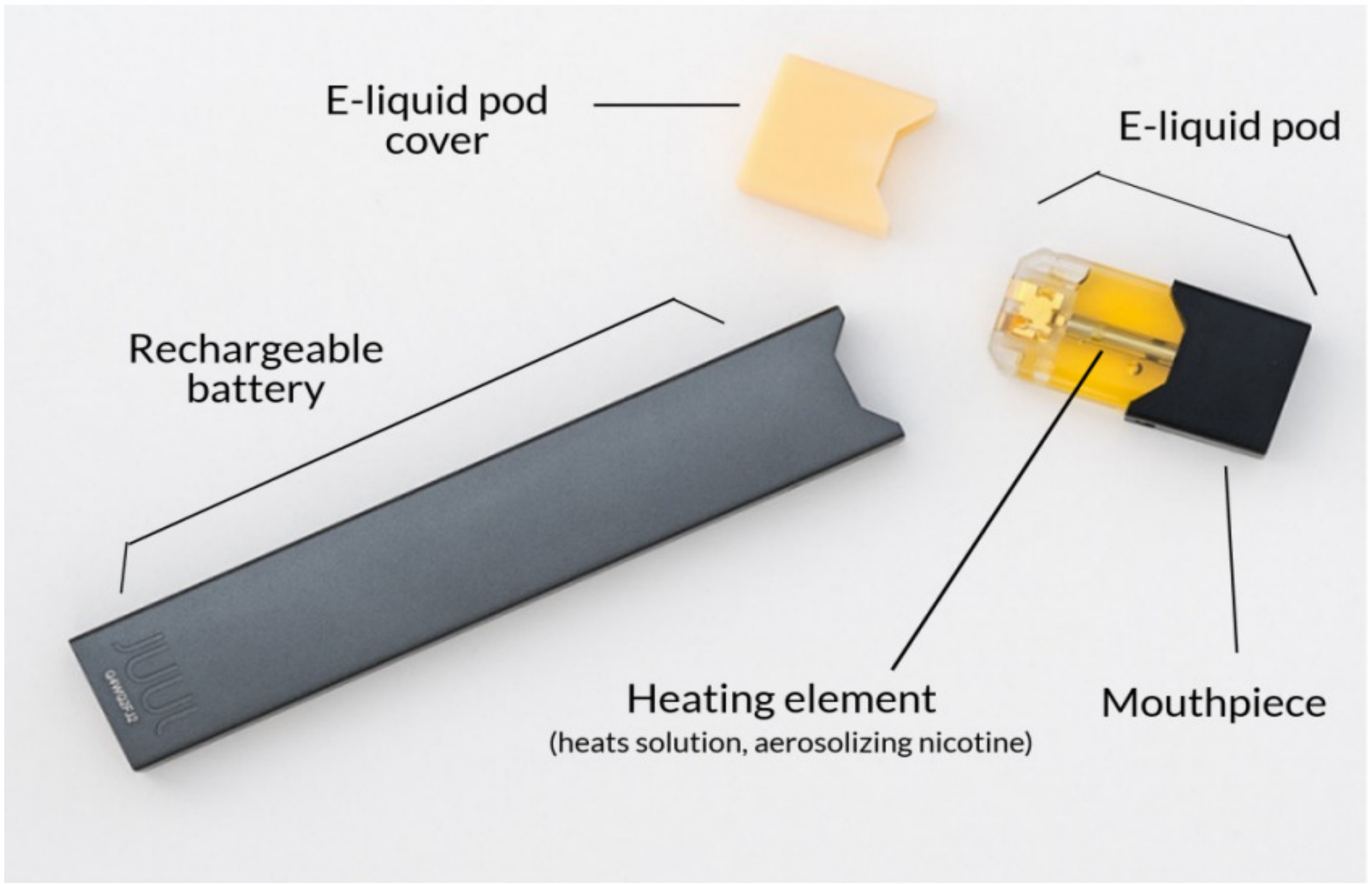


YouTube









E-liquid pod cover

E-liquid pod

Rechargeable battery

Heating element  
(heats solution, aerosolizing nicotine)

Mouthpiece

# Juuling



Vaping is the process...  
Aerosol is the result

**AEROSOL:**

Has solid particles

**GAS:**

Does not have solid particles

Condensation  
+  
sedimentation

Solid state/Liquid/Oil + Heat + Vaporization = Aerosol

“A study of high school students found that 1 in 4 teens reported using e-cigarettes for *dripping*..”

## Dripping



Teens reported the following reasons for dripping: **to create thicker vapor** (63.5 percent), to **improve flavors** (38.7 percent), and to produce a **stronger throat hit**—a pleasurable feeling that the vapor creates when it causes the throat to contract (27.7 percent)”

Teens say:

"JUUL has multiple flavors."

"It's definitely more discreet."

"JUULs are simple and easy to use."

"This is not vaping, it is Juuling."

The JUUL device, with its sleek design that resembles a flash drive, is a special hit with teens.

# E-LIQUID

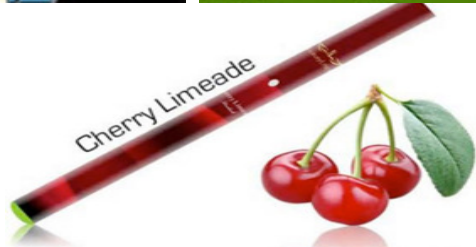
7,000 unique e-liquid flavors available to e-cigarette users (Zhu et al., 2014),

*“[Kucharska and colleagues \(2016\)](#) have identified 113 chemicals in 50 brands of liquids”*



**Would You Breath Food?**

# The flavorings used in e-juices can trigger an inflammatory response



## Marketing e-Liquids

*Diacetyl, cinnamaldehyde, acetoin, pentanedione, o-vanillin, maltol & coumarin*





Exhibit A



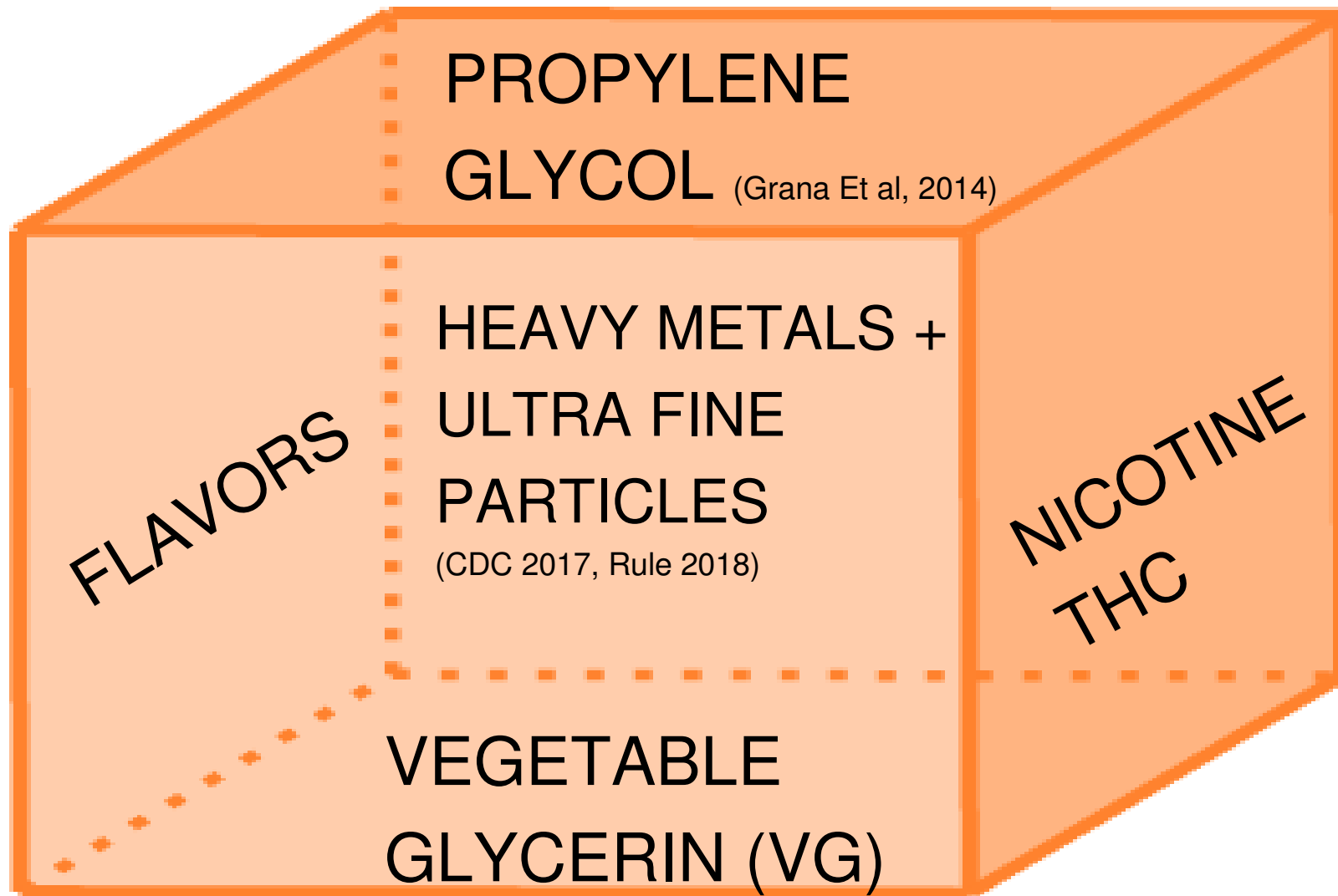
Exhibit B

“...One Mad Hit Juice Box,” which resembles children’s apple juice boxes, such as Tree Top-brand juice boxes...”

Federal Trade Commission (FTC) and the U.S. Food and Drug Administration (FDA) May 1 , 2018



NIGHTLY  
 NEWS



E-cigarettes and Other Emerging Tobacco Products. DMV Regional Tobacco Use Control and Prevention Meeting Navigating the Challenges, Barriers, and Solutions Together. Jim D. Martin, MS Director of Policy and Programs. NC. Tobacco Prevention and Control, Division of Public Health. May 15 2018.



**DIETHYLENE  
GLYCOL**



**PROPYLENE GLYCOL**



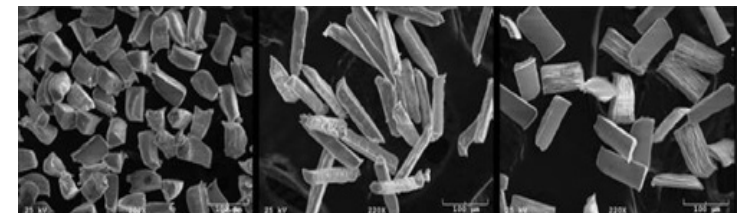
**NITROSAMINES(nitrate/nitrites)**



**FORMALDEHYDE**



**ACROLEIN**



**METAL AND FIBER PARTICLES**



**DIACETYL**

## E-liquids contains:

### Micro solid, or oil particles:

- **Concentrated Nicotine:** addiction
- **Artificial flavors:** Irritation
- **Acetaldehyde:** cancer
- **Diacetyl :** inflammatory condition
- **Propylene Glycol:** dry mouth & throat
- **Formaldehyde:** cancer
- **Glycerol:** irritation
- **Heavy metals:** Poisoning.



Silver, iron, nickel aluminum, sodium, chromium, copper, magnesium, manganese, lead, potassium, silicate and more.

# Which Chemicals Are Found in E-Cig/Vape Pen Aerosol?

<ul style="list-style-type: none"> <li>• Propylene glycol</li> <li>• Glycerin</li> <li>• Flavorings (many)</li> <li>• <b>Nicotine</b></li> <li>• <b>NNN</b></li> <li>• <b>NNK</b></li> <li>• NAB</li> <li>• NAT</li> <li>• <b>Ethylbenzene</b></li> <li>• <b>Benzene</b></li> <li>• <b>Xylene</b></li> <li>• <b>Toluene</b></li> <li>• <b>Acetaldehyde</b></li> <li>• <b>Formaldehyde</b></li> <li>• <b>Naphthalene</b></li> <li>• <b>Styrene</b></li> <li>• <b>Benzo(b)fluoranthene</b></li> </ul>	<ul style="list-style-type: none"> <li>• Chlorobenzene</li> <li>• <b>Crotonaldehyde</b></li> <li>• <b>Propionaldehyde</b></li> <li>• Benzaldehyde</li> <li>• Valeric acid</li> <li>• Hexanal</li> <li>• Fluorine</li> <li>• Anthracene</li> <li>• Pyrene</li> <li>• Acenaphthylene</li> <li>• Acenaphthene</li> <li>• Fluoranthene</li> <li>• <b>Benz(a)anthracene</b></li> <li>• <b>Chrysene</b></li> <li>• Retene</li> <li>• <b>Benzo(a)pyrene</b></li> <li>• <b>Indeno(1,2,3-cd)pyrene</b></li> </ul>	<ul style="list-style-type: none"> <li>• Benzo(ghi)perylene</li> <li>• <b>Acetone</b></li> <li>• <b>Acrolein</b></li> <li>• Silver</li> <li>• <b>Nickel</b></li> <li>• Tin</li> <li>• Sodium</li> <li>• Strontium</li> <li>• Barium</li> <li>• Aluminum</li> <li>• <b>Chromium</b></li> <li>• Boron</li> <li>• Copper</li> <li>• <b>Selenium</b></li> <li>• <b>Arsenic</b></li> <li>• <b>Nitrosamines</b></li> <li>• <b>Polycyclic aromatic hydrocarbons</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Cadmium</b></li> <li>• Silicon</li> <li>• Lithium</li> <li>• <b>Lead</b></li> <li>• Magnesium</li> <li>• Manganese</li> <li>• Potassium</li> <li>• Titanium</li> <li>• Zinc</li> <li>• Zirconium</li> <li>• Calcium</li> <li>• Iron</li> <li>• Sulfur</li> <li>• Vanadium</li> <li>• <b>Cobalt</b></li> <li>• Rubidium</li> </ul> <p>All of <b>these</b> have been found in e-cigarette/vape pen aerosol</p>
<p>Compounds in <b>yellow</b> are from FDA 2012, Harmful and Potentially Harmful Substances – Established List</p>			

For example, one patient of a general dental practice had a caries-free history for 35 years. He ceased smoking traditional cigarettes and decided to vape as he thought this was a healthier alternative. Within a year, cervical enamel demineralization and interproximal lesions were present on the mandibular anterior sextant, consistent with the primary point of contact of the e-liquid aerosol (figure 2).

“those who used e-cigarettes (aka vaporizers) experienced significant tooth decay.”



**Figure 2:** Effects of e-cigarette usage





Image source: <https://www.sciencesource.com>

### Propylene glycol (PG):

- Absorbs water** = dry mouth : cavities, gum disease.
- Streptococcus thrive breaking down toxins :
- Acetic acid + Lactic acid + Propionaldehyde** toxic to enamel and gums

### Vegetable glycerin (VG):

- Sucrose + flavoring = more **Streptococcus mutans bacteria, more colonies** of bacteria, enamel eroded.

### Flavors:

- 27% flavorings **decrease in enamel** hardness .
- The liquid viscosity (**Streptococcus** mutans to **adhere** to pits and fissures).

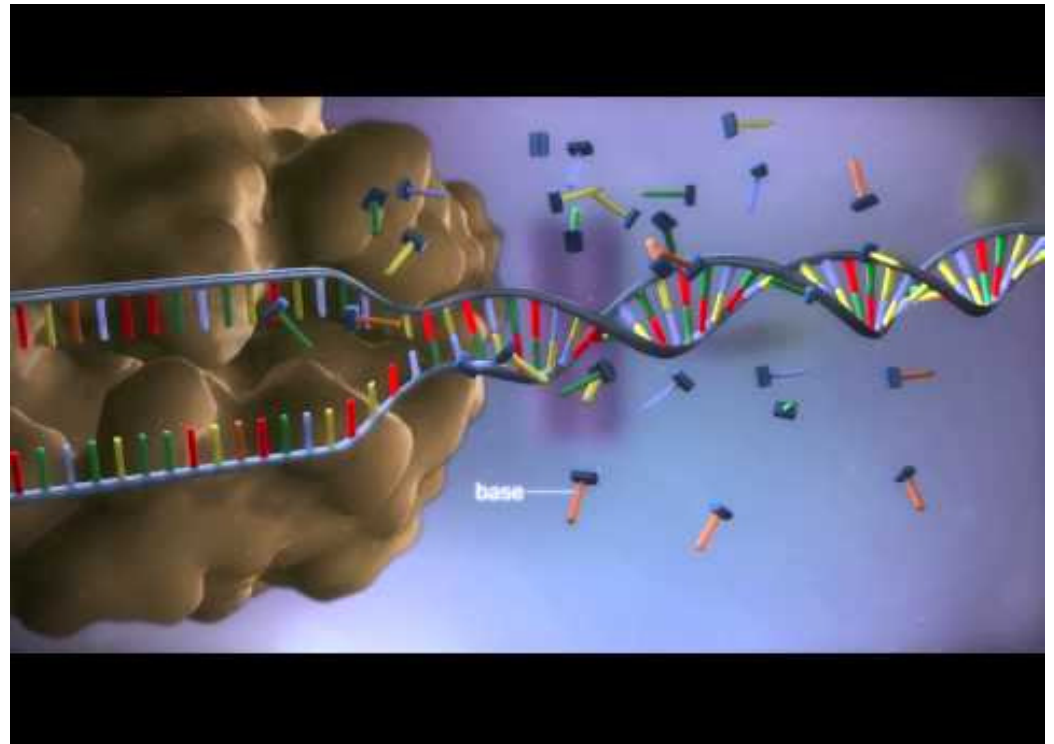
### Nicotine:

- Vasoconstriction** (gums blood flow)
- Altered proteins production (inflammation, immunity)
- Affects **white blood cells** (infections)



# Oral cells of (e-cigs) users & cigarette smokers affected

- Oral cells development are affected by Vaping
- Vaping triggers abnormal expressions of miRNA in oral cells
- “cancer” was the top disease associated with the deregulated genes in both e-cig users and smokers

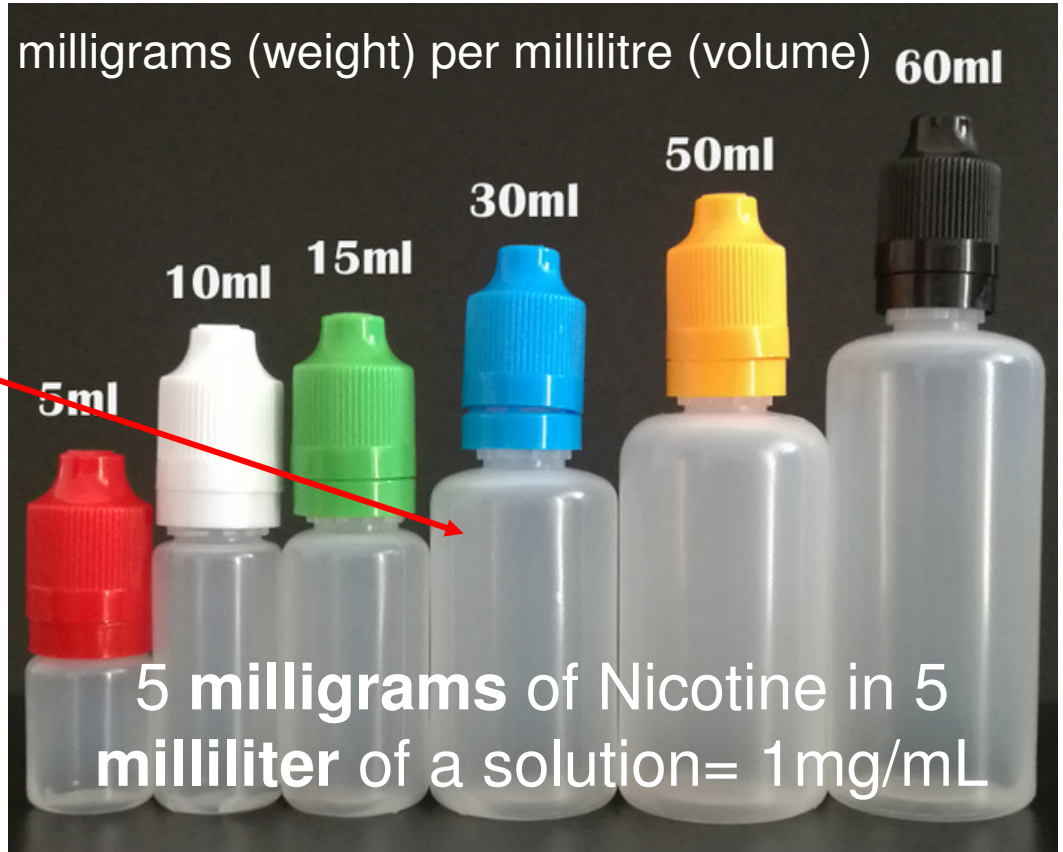


Stella Tommasi, Andrew W. Caliri, Amanda Caceres, Debra E. Moreno, Meng Li, Yibu Chen, Kimberly D. Siegmund, ... Ahmad Besaratinia. (January 01, 2019). Deregulation of Biologically Significant Genes and Associated Molecular Pathways in the Oral Epithelium of Electronic Cigarette Users. *International Journal of Molecular Sciences*, 20, 3.)

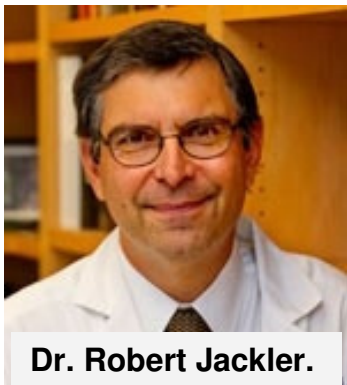
The typical 30 milliliter bottle has 6 teaspoons

Nicotine: 3%      5%

1 spoon: 5 millilitres (mL)



5 milligrams of Nicotine in 5 milliliter of a solution = 1 mg/mL



Dr. Robert Jackler.

“The lethal dose for a toddler, if ingested, is a bit over 1 milliliter of e-liquid with a 5 percent nicotine content” [1 mg/mL]

“A single teaspoon is toxic enough to kill five toddlers”



1 pod per day

One JUUL pod is reported to contain **59 mg/mL**, but one JUUL pod is only **0.7mL** per pod.

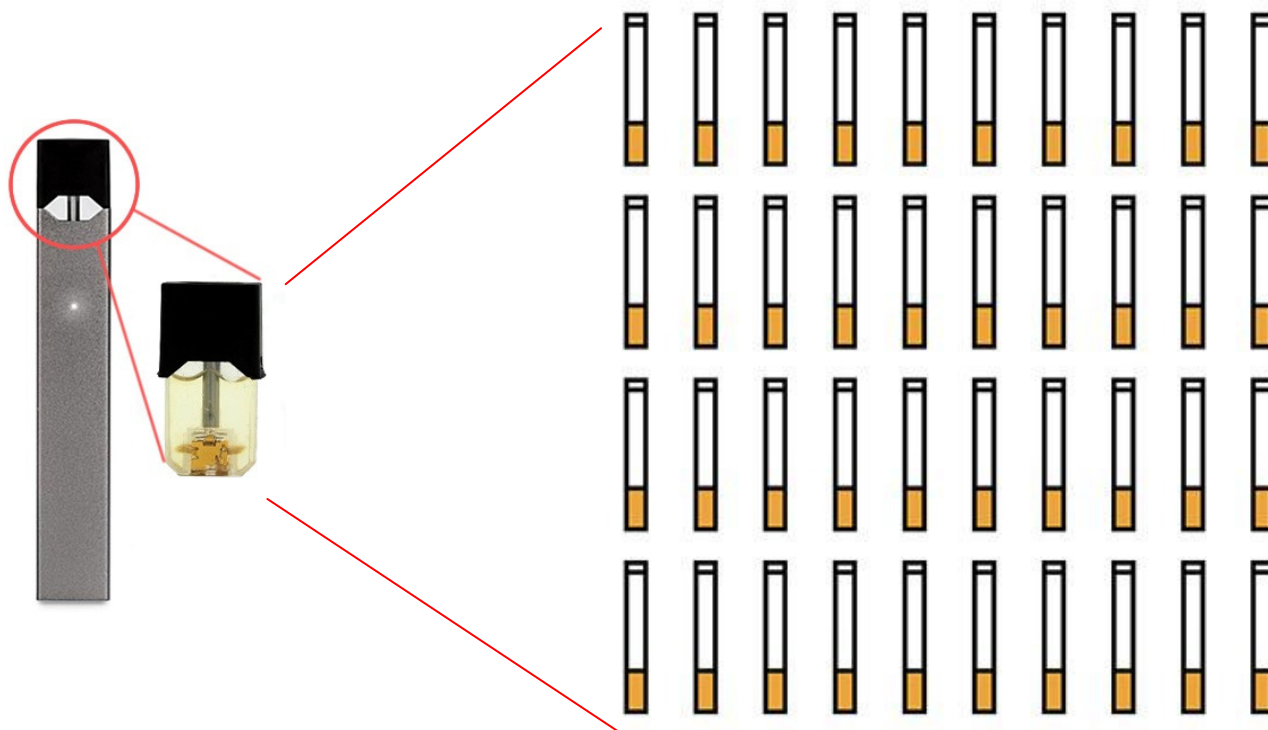
[59 mg/mL] x [0.7mL] equals **41.3mg** (NOTE: milliliter units cancel out)

1 mg of Nicotine per cigarette

1 JUUL pod: Approx.40 cigarettes

5 % or 3% Concentrated

The **lethal** dose for adults is **60 mg** or less.



**1-2**  
packs of  
cigarettes, or

**20-40**  
cigarettes  
are equal to

**1**  
juul pod

Source Vox.com



abc NEWS

<https://youtu.be/TzxfC7CqbO>

[Q](#)

ABC News August 2010

9:54

**Tweet**

**The Epoch Times** @EpochTimes

Nearly 9 of 10 cases where #Vaping led to people developing a severe lung disease in #Wisconsin involved the use of #THC products, such as waxes or oils, Wisconsin's Department of Health Services said.



Tweet your reply

12:27



Done amp.cnn.com


**CNN** Live TV

### Cases of lung disease possibly linked to vaping continue to rise. This teen was given a 'second chance'

By Michael Nedelman, CNN

Updated 12:56 PM EDT, Fri August 30, 2019



(CNN) — US health officials announced Friday that as of August 27, there are at least 215

8:16

Safari

**The Washington Post**  
*Democracy Dies in Darkness*

**Health**

### Mystery lung illness linked to vaping. Health officials investigating nearly 100 possible cases.

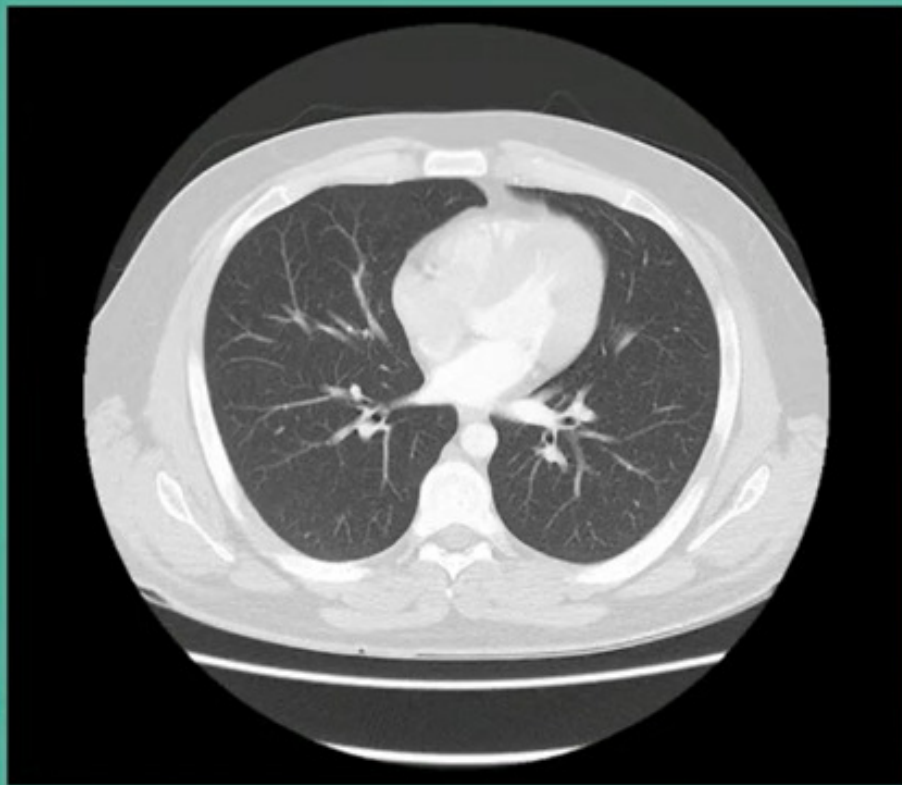


A high school student uses a vaping device in 2018 in Cambridge, Mass.

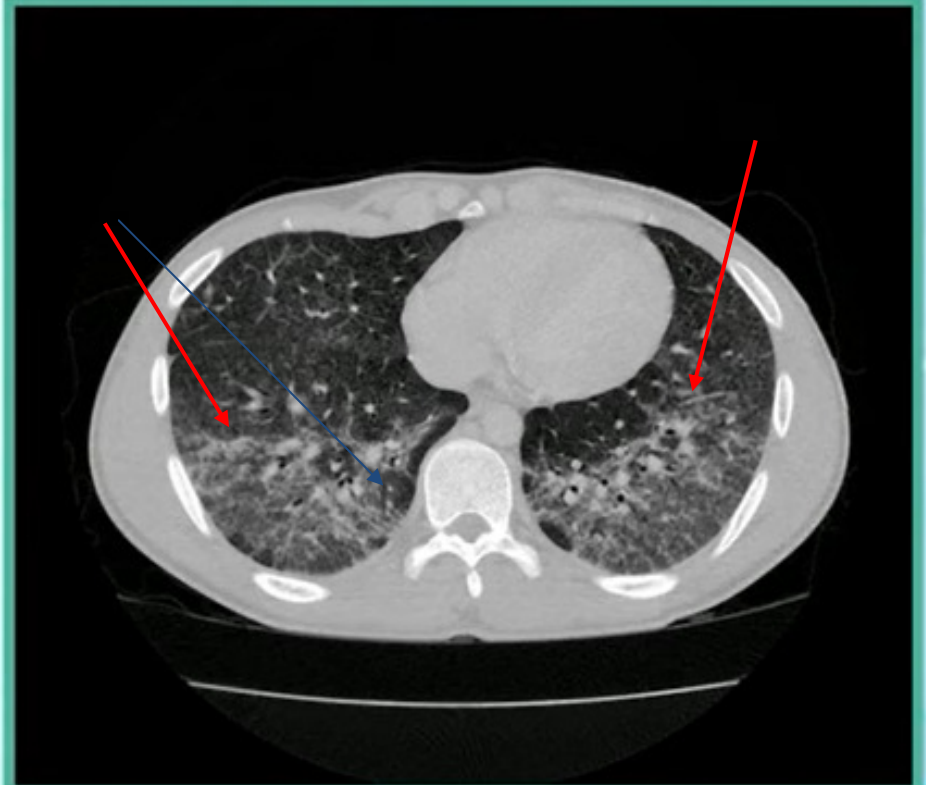
By **Lena H. Sun** and **Lindsey Bever**

August 16, 2019 at 6:26 PM EDT

## Hawaii Case



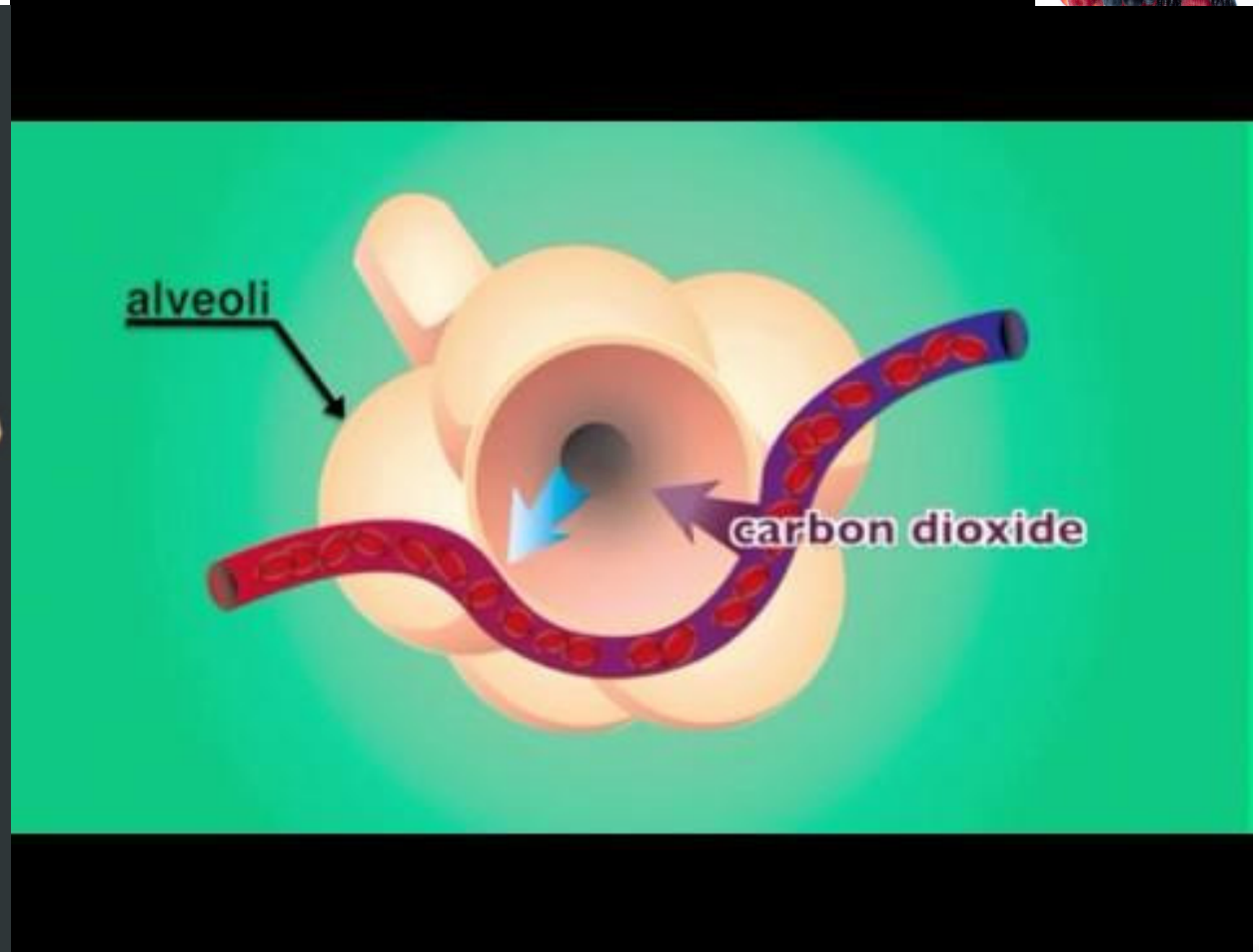
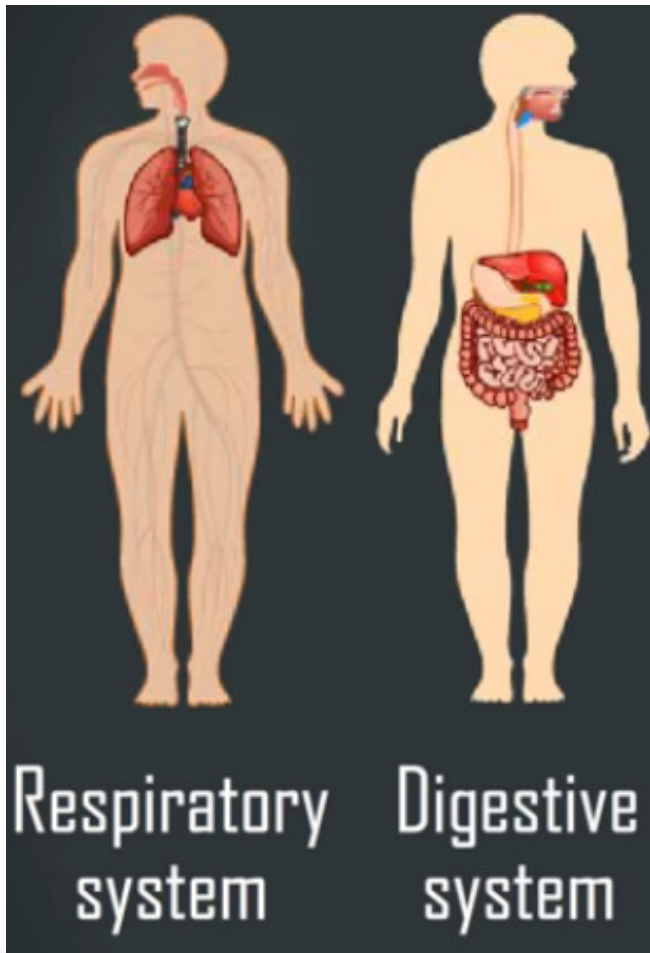
**NORMAL LUNG**



**ACUTE LUNG INJURY**

Acute lung injury associated with vaping

# Would You Breath Food?



Mazzarella Educational Media, 2014. *Gaseous Exchange in the Alveoli*. [Video Segment]. Available from <http://www.discoveryeducation.com>



# Diacetyl detected in vape smoke associated flavorings

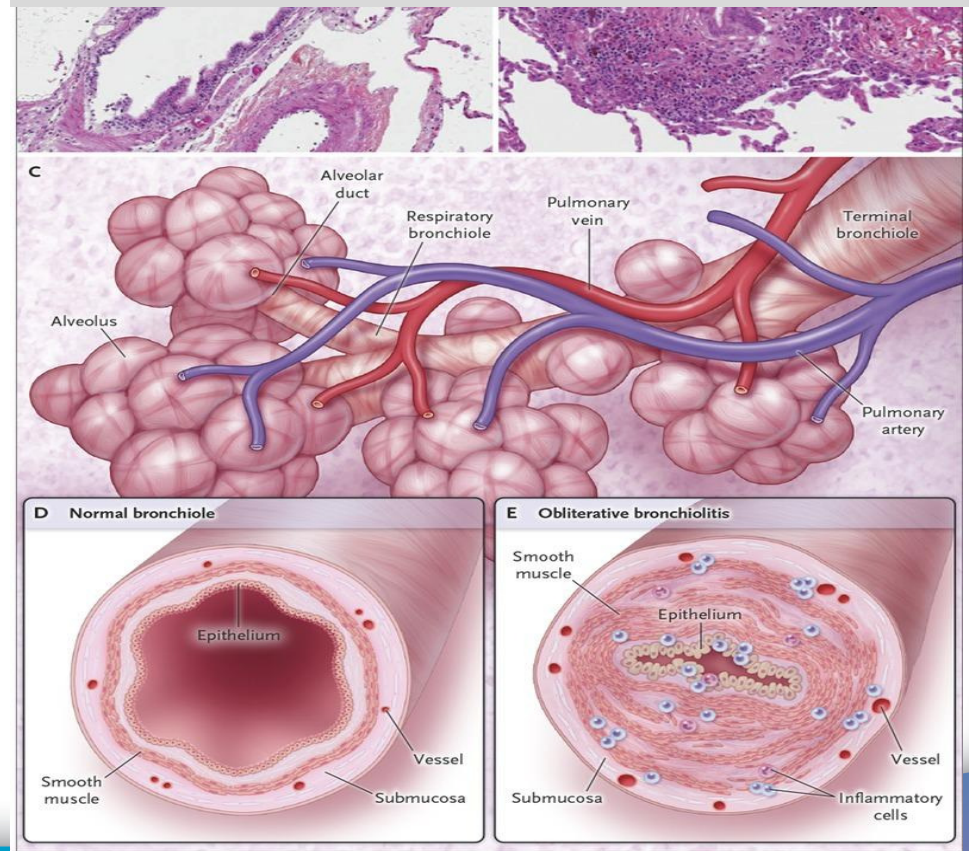
## How Harmful is Diacetyl?



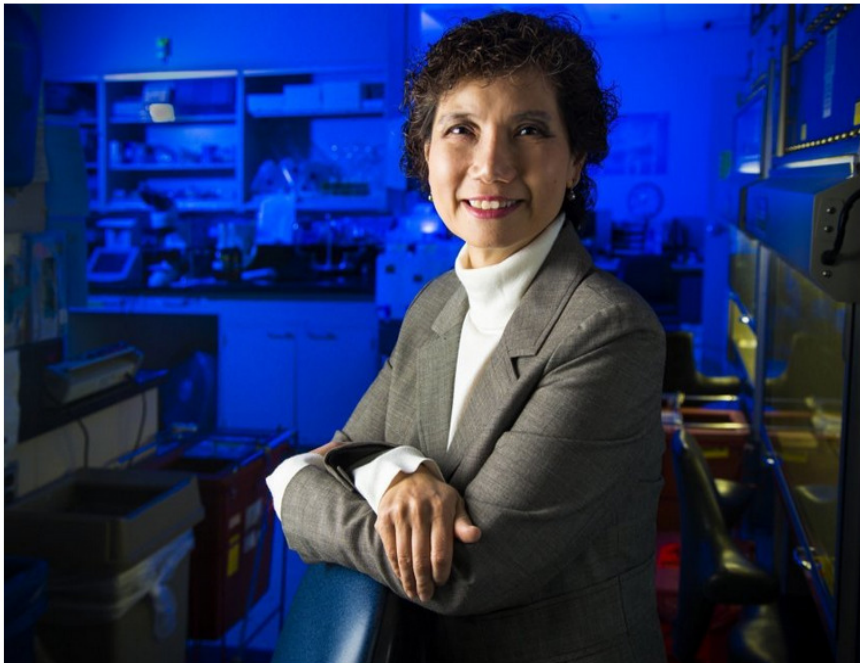
What it is?

Diacetyl was measured to be above the laboratory limit of detection in 39 of 51 of the flavors tested. (Harvard 2015)

Bronchiolitis obliterans (aka popcorn lungs) is an inflammatory condition caused by Diacetyl. (NIH 2016)



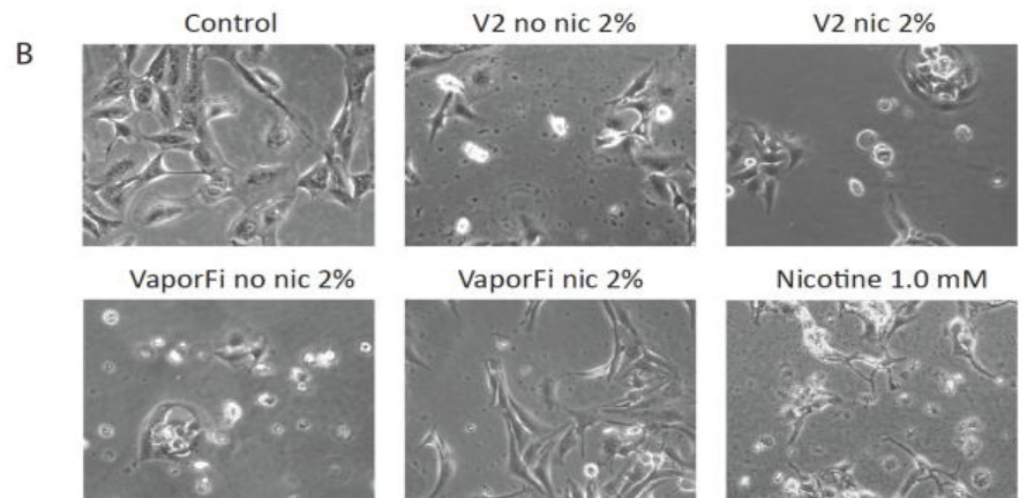
## E-cigs damage DNA in lab study



Jessica Wang-Rodriguez, M.D., is the chief of pathology and laboratory medicine at the Veterans Affairs Healthcare System in La Jolla and is a researcher on a new study showing e-cigarettes damage cells in a way that could lead to cancer. (Howard Lipin)

By BRADLEY J. FIKES DEC. 31, 2015 | 2:56 PM

Heavy exposure to electronic cigarette vapor damages DNA in cell cultures, causing genetic instability that could lead to cancer, ..” Epithelial cells from organs (also lung)



“Moreover, even nicotine-free vapor induces this damage, indicating that other substances in e-cigarettes can damage cells, the study stated.”



@LBCN151

## E-CIGARETTE STUDY

LOCAL 12

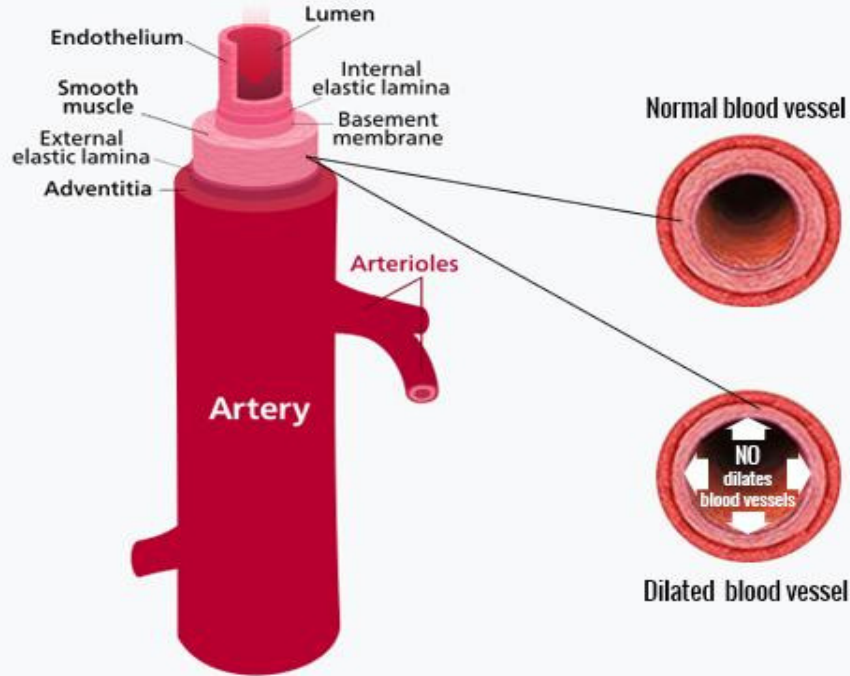
FLAVORS LINKED TO INCREASED RISKS FOR HEART PROBLEMS IN LAB STUDIES

# E-cigarettes affect a person's blood vessels after just one use, study finds

BY CAITLIN O'KANE  
AUGUST 22, 2019 / 3:09 PM / CBS NEWS

## Short Term Effects of Vaping

Inhaling nicotine-free electronic cigarette aerosol for short time impacted endothelial function in healthy nonsmokers

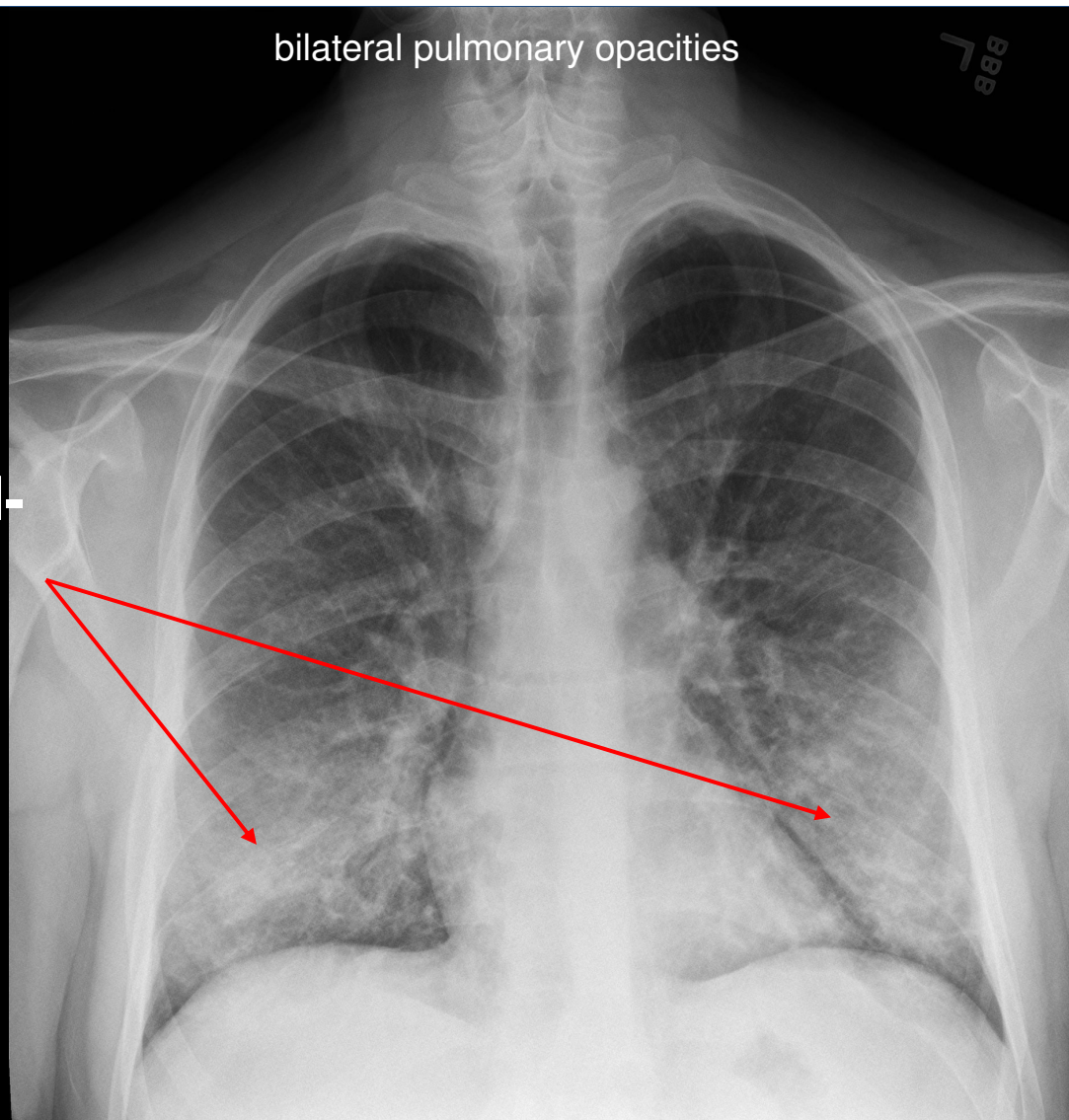


- 20% reduction in venous oxygen saturation
- Post-vaping: blood vessels did not dilate, widen, as much as before

"Acute Effects of Electronic Cigarette Aerosol Inhalation on Vascular Function Detected at Quantitative MRI." Collaborating with Drs. Caporale, Wehrli and Langham were Wensheng Guo, Ph.D., Alyssa Johncola, B.A., and Shampa Chatterjee, Ph.D. August, 2019.

An X-ray of a patient with a vaping habit, showing lung damage — densities or **whitish cloud-like areas** typically associated with some pneumonias, fluid in the lungs or inflammation.

Credit: Intermountain Healthcare

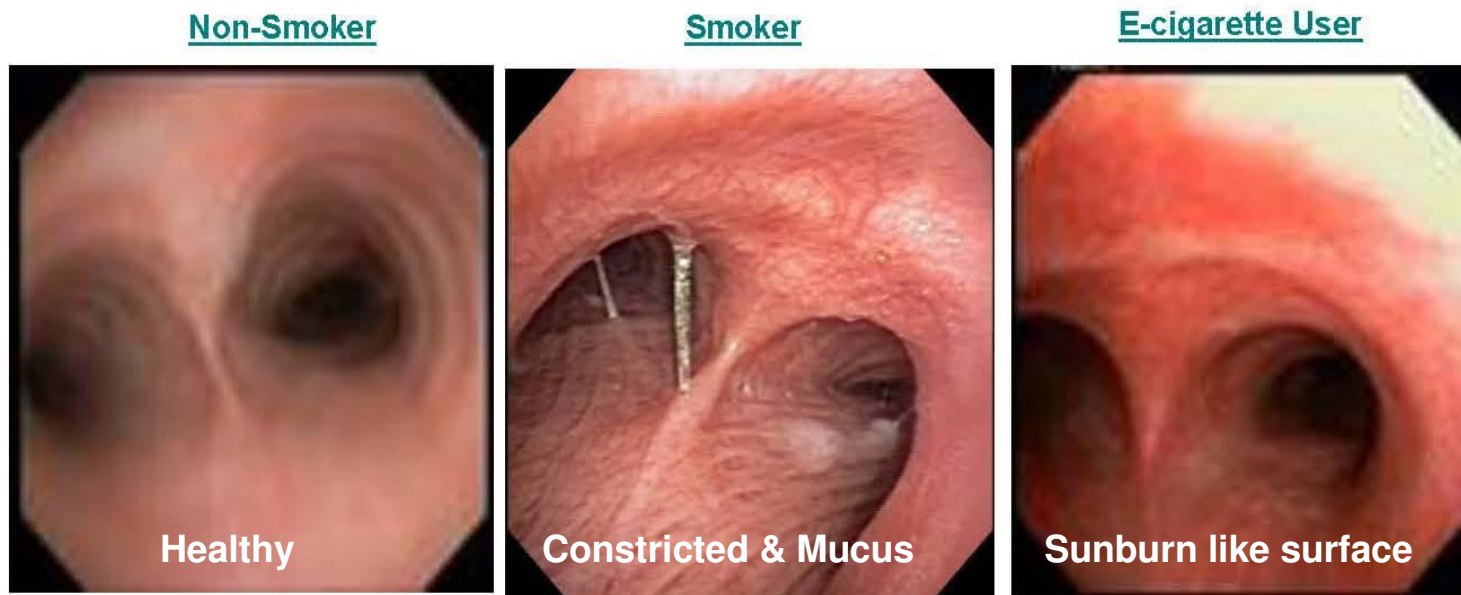


<https://www.nytimes.com/2019/08/31/health/vaping-marijuana-cigarettes-sickness.html#click=https://t.co/Qlc122Conk>

18-year-old:  
(Long Island)  
Emergency Room.  
-Gaspings for breath  
-Coughing  
-Chest pain  
-Vomiting (days)  
-Dizzy.  
-Shortness of breath,  
- Diarrhea  
-fever  
-Fatigue  
-Weight loss

# Fiberoptic bronchoscopy

## The Airways of “Healthy” E-cigarette Users Seem Abnormal!



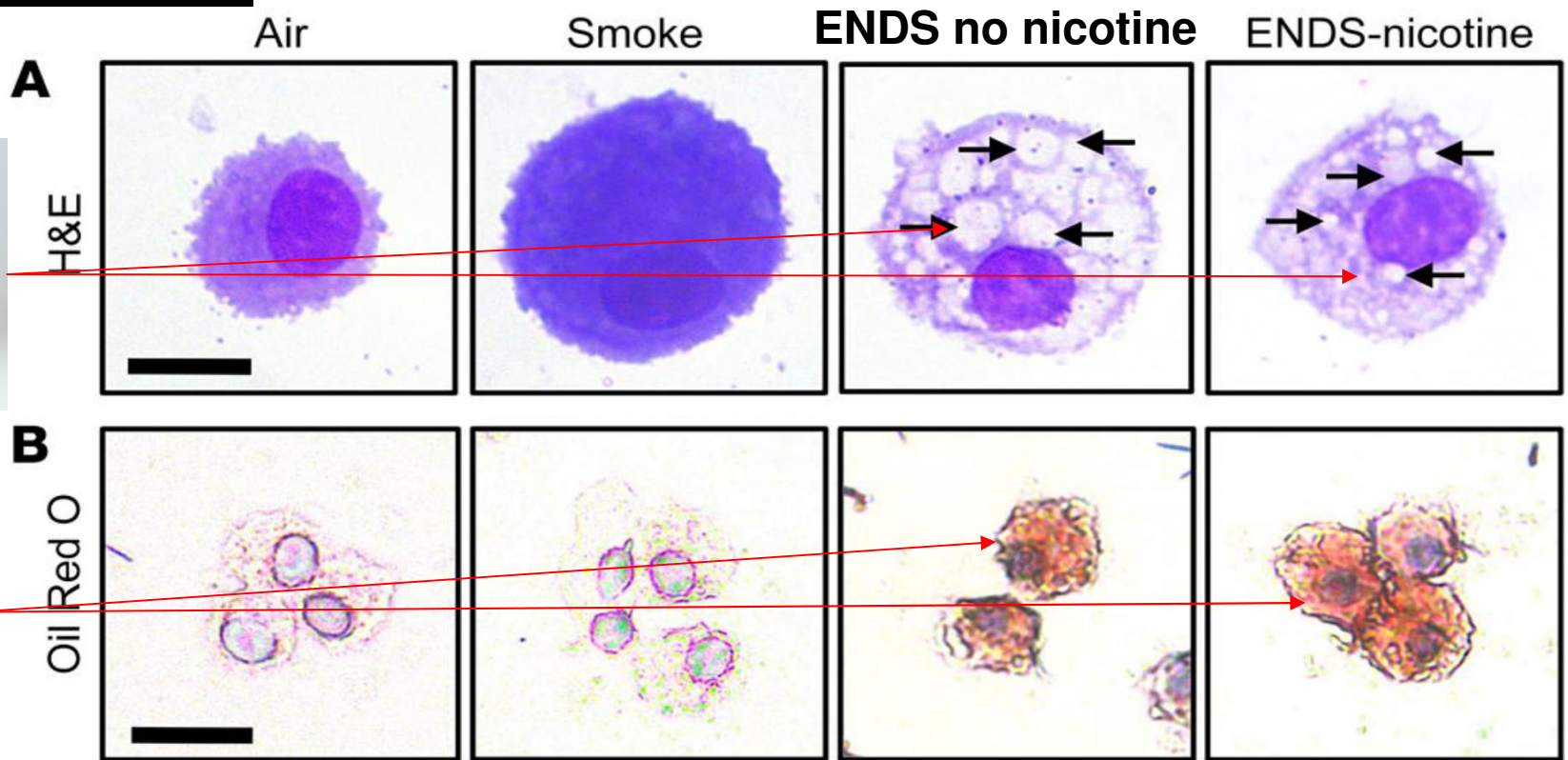
Ghosh A, et al. Fig S1. Chronic E-cigarette Exposure Alters the Human Bronchial Epithelial Proteome. *Am J Respir Crit Care Med.* 2018 Feb 26.

IMMUNE CELL



# Does vaping forms inclusions of lipids in the cell cytoplasm?: Yes

Alveolar macrophages cells

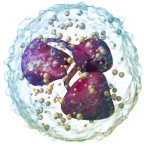


Showed increased lipid accumulation independent of nicotine

-Mice were exposed to Air, Smoke, vape no-nicotine smoke , or vape nicotine for 4 months.



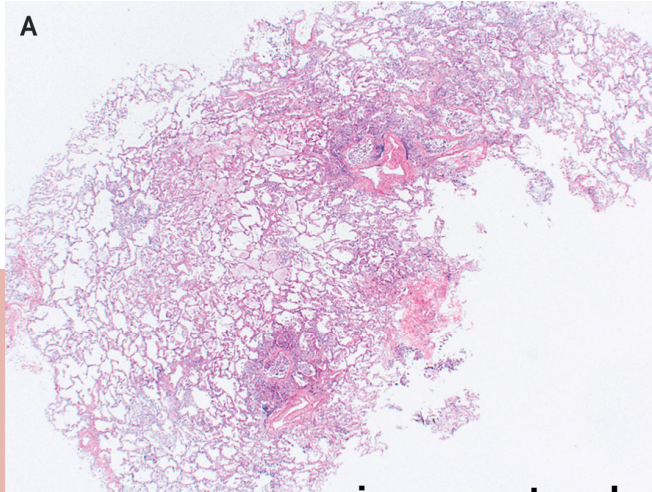
- Lavage fluid
- Foamy macrophage
- Neutrophils



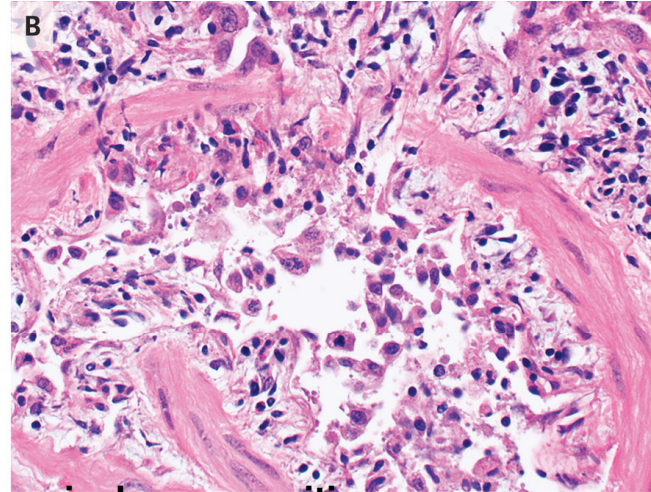
**17 cases**

'sentinel cells' increased in the surrounding the bronchioles tissue and alveoli cells

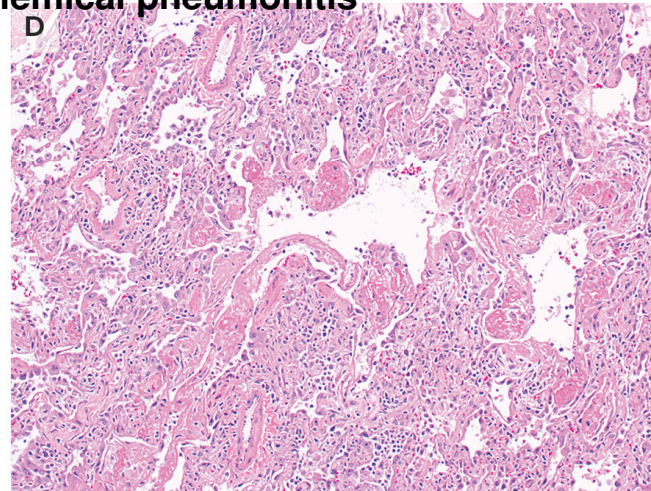
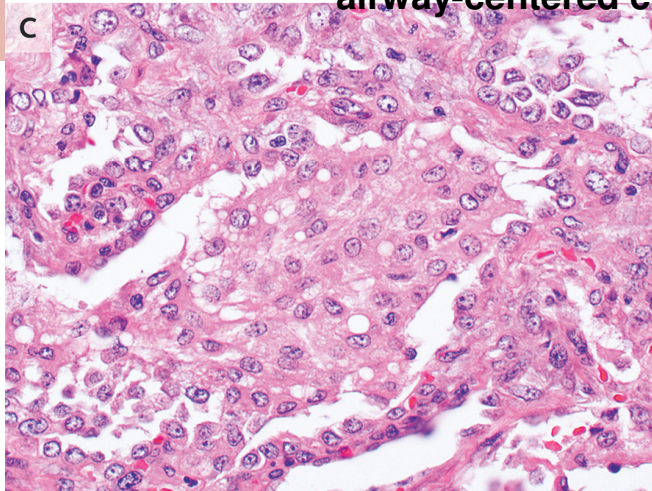
Bronchial wall thickening,  
Bronchial wall deformation



- Casting-off dead tissue
- Mucosal swelling
- More tissue surrounding the bronchiolus



airway-centered chemical pneumonitis



Spread alveolar damage

**Pathology of Vaping-Associated Lung Injury**

bacteria, viruses, fungi, poisons, cancer cells

A person is lying in a hospital bed, appearing to be in a medical setting. They are wearing a white hospital gown and have a nasal cannula in their nose. The background shows various medical equipment, including monitors and tubes, suggesting an intensive care or hospital ward environment. The overall tone is somber and clinical.

severe respiratory illness, possibly from vaping

vaping-associated lung injury

**Chronic Obstructive Pulmonary Disease (COPD)** is an umbrella term used to describe progressive lung diseases including emphysema, chronic bronchitis, and refractory (non-reversible) asthma. This disease is characterized by increasing breathlessness



## Physical Withdrawals

# Nicotine

## Emotional Withdrawals

I can't concentrate

I feel anxious,  
If I use I will  
feel better

My sleep is  
messed up, I feel  
tired and restless

I am feeling  
depressed

It's like I cannot control  
my emotions, it  
suddenly changes

it's like  
everything  
irritates me

It just does not  
occur to me  
thinking about  
consequences

I feel the rush  
for adrenaline

# Nicotine in Adolescents

Nicotine interferes with the pre-frontal cortex maturation

- Increases risk-taking
- Increases impulsivity
- Long term cognitive impairment
- Reduced prefrontal cortex activity
- Associated to later substance abuse and mental health problems
- Associated to higher level of addiction in adulthood
- Vulnerability to initiation
- Incomplete development of the prefrontal cortex (decision making, impulse control, and executive function)

Source: Herron, Abigail J., and Timothy Brennan. The ASAM Essentials of Addiction Medicine. 2nd ed., Wolters Kluwer, 2015. pg 79-83 Website Title Wolters Kluwer. The ASAM Essentials of Addiction Medicine. Accessed November 18, 2018

# Nicotine is the Drug that Causes Addiction

Nicotine:

- Mood modulator
- Stress relief
- Hunger relief
- Causes arousal during fatigue
- Relaxation during anxiety
- Women metabolize nicotine faster than men
- African Americans clear nicotine slower than Caucasians and Asians
- Low doses: high blood pressure and heart rate
- High doses: causes hypotension, and slow heart rate.

Source: Herron, Abigail J., and Timothy Brennan. The ASAM Essentials of Addiction Medicine. 2nd ed., Wolters Kluwer, 2015. pg 79-83 . Website Title Wolters Kluwer. The ASAM Essentials of Addiction Medicine. Accessed November 18, 2018

# NICOTINE ADDICTION

Diminish  
cognition

Reduce  
attention  
span

Enhance  
Impulsivity

# Among Youth, E-cigarette Use May Lead to Conventional Cigarette Use

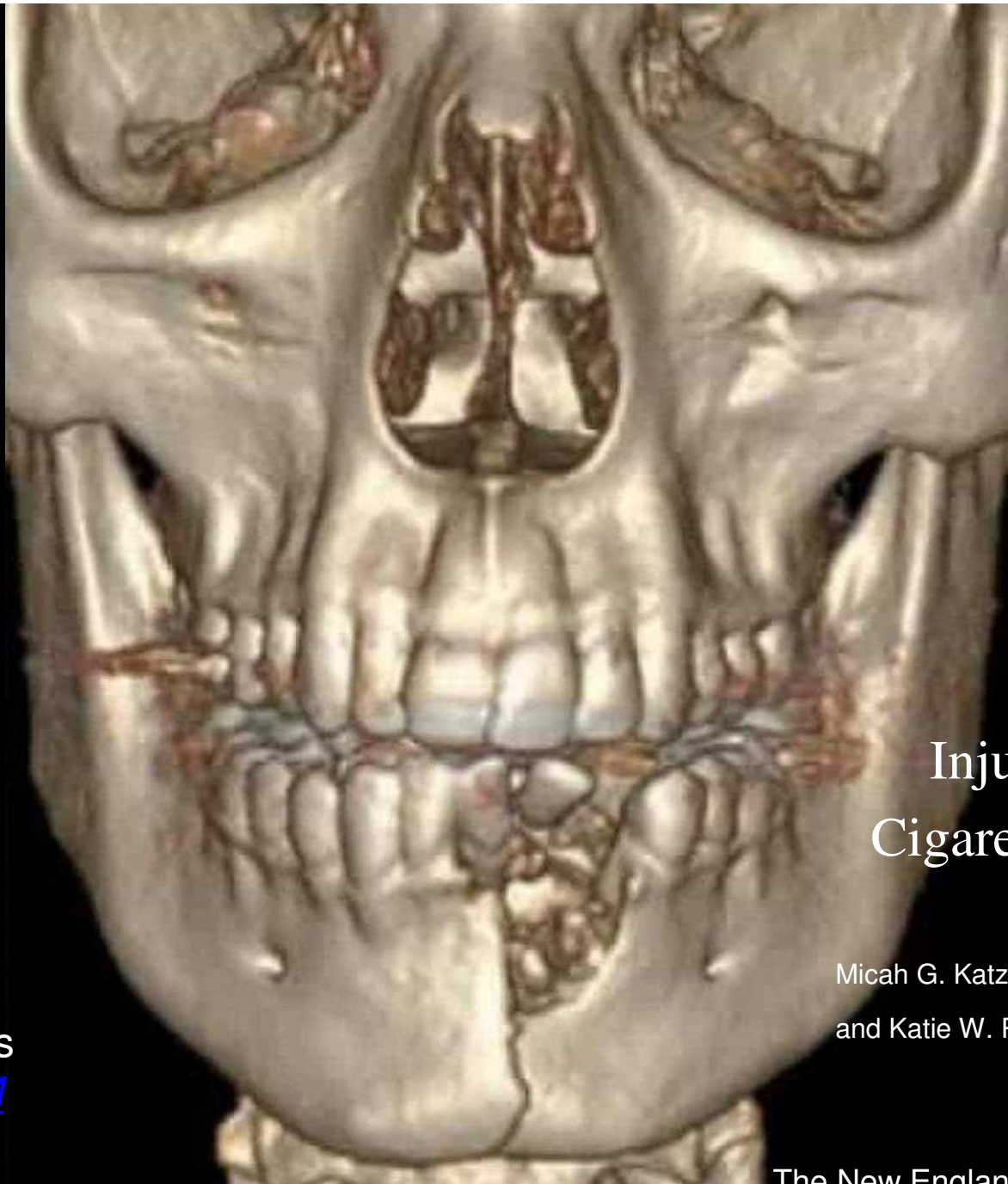
U.S. adolescents and young adults who had never smoked, but used e-cigarettes at baseline, were **8.3 times more likely to progress to cigarette smoking after 1 year than nonusers** of e-cigarettes



- US Surgeon General Report, 2016



“A reconstructed computed tomography showing a teen’s injuries after an e-cigarette exploded in his mouth”. [NEJM](https://www.nejm.org/doi/full/10.1056/NEJMicm1813769)



## Injury from E-Cigarette Explosion

Micah G. Katz, M.D.,  
and Katie W. Russell, M.D.

<https://www.nejm.org/doi/full/10.1056/NEJMicm1813769>

The New England Journal Of Medicine

# E-cigarettes and Explosions



NIGHTLY  
NEWS

# Marijuana Use and E-cigarettes

- Marijuana can be vaped
- More expensive
- Can be accessed online
- Does not smell
- More concentrated
- Impacts short term memory
- Decreases motivation
- Users can experience withdrawals



Image Source: <https://www.wweek.com/news/state/2019/10/04/flavored-vaping-ban-includes-all-non-cannabis-derived-flavors-in-thc-vapes/>



# In Closing : Effects of E-cigarette Use

1. Vaping is a surging trend between children
2. The current vaping lung illness outbreak put children at high risk
3. Vaping is an aerosol that is harmful
4. Modifications of e-cigs makes them more harmful
5. E-liquids contain many harmful substances
6. E-cigs delivers highly concentrated Salt-Nicotine levels.
7. Diacetyl in e-cigs causes respiratory illness
8. Nitrosamines in e-cigs causes causes lung cell damage
9. E-cig smoke effect the inhibition of DNA-repair activity (lung cells)
- 10.E-cig smoke causes abnormal expressions of miRNA in oral cells
- 11.E-cigs affects blood vessels after one use (endothelial function)

# Summary

- 12.E-cig smoke decrease blood vessels dilatation
- 13.Vaping causes 20% reduction in venous oxygen saturation
- 14.Vaping induces trapped micro oil droplets into the lungs
- 15.Vaping is associated with fluid in the lungs and inflammation
- 16.Vaping triggers autoimmune response resulting in inflammation
- 17.Vaping irritates respiratory airways tissue (sunburn like)
- 18.Aldehydes in e-cigs smoke diminishes mucus clearance
- 19.Vaping may builds-up of liquids in bronchus (lipoid pneumonia)
- 20.Developmental effects on the brain from nicotine exposure
- 21.Influence the initiation of use of conventional cigarettes & THC use

# Summary

- 22. Neutrophils more prominent (white cells)
- 23. bronchioloalveolar lavage fluid more available
- 24. Abundant foamy macrophages
- 25. Developmental effects on the brain from nicotine exposure
- 26. Hazard due to potential battery explosion
- 27. Accidental overdose of nicotine

# Thank you



**Superintendent**  
Dr. Gregory C. Hutchings, Jr.

**School Board**  
Cindy Anderson, *Chair*  
Veronica Nolan, *Vice Chair*

Meagan L. Alderton  
Ramee A. Gentry  
Jacinta Greene  
Margaret Lorber  
Michelle Rief



## For more information, contact:

Fredy L. Martinez

K-12 Substance Abuse Prevention and Intervention  
Services Coordinator 703-619-8278 ext.1237

[fredy.martinez@acps.k12.va.us](mailto:fredy.martinez@acps.k12.va.us)

Source:

VAPING. What is vaping?

Fredy L. Martinez B.

<https://books.apple.com/us/book/vaping/id1484299801>

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