

9/13 1:00 – 2:00 PM TOBACCO CESSATION FOLLOW-UP - MANDATORY FOR PHARMACISTS W/ TOBACCO CESSATION PRESCRIPTIVE AUTHORITY (ONE CE HOUR PER YEAR)

### HARMFUL EFFECTS OF VAPING: LUNG TOXICITY AND IMPAIRMENT OF IMMUNE FUNCTION

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ACPE#: 0104-0000-20-027-L04-P CONTACT HOURS: 1.0 CEU 0.1 INITIAL RELEASE DATE: 9/13/20

FOLLOWING THIS KNOWLEDGE-BASED PRESENTATION, THE PHARMACIST PARTICIPANTS WILL BE ABLE TO:  
1) IDENTIFY THE FACTORS CONTRIBUTING TO THE 2019 EVALI (E-CIGARETTE AND VAPING-ASSOCIATED LUNG INJURY) OUTBREAK AND 2) LEARN POTENTIAL ISSUES WITH NEW VAPING PRODUCTS AND HOW THEY AFFECT THE LUNGS AND IMMUNE SYSTEM.

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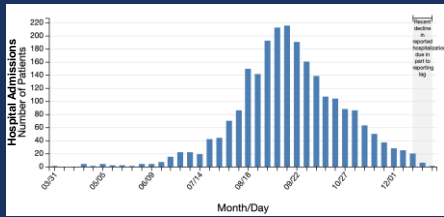
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### VAPING – REASONS FOR CONCERN: SUDDEN, UNKNOWN ILLNESS, SOMETIMES FATAL



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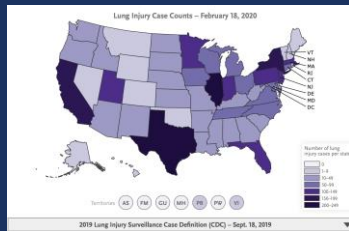
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### VAPING – REASONS FOR CONCERN

- Most recent data (Feb, 2020):
  - 2807 cases nationwide (CDC)
    - Many at UNM
  - 68 deaths
  - Most patients have reported a history of using e-cigarette products containing THC.
  - ANY INFECTIOUS DISEASE WAS AN AUTOMATIC RULE-OUT



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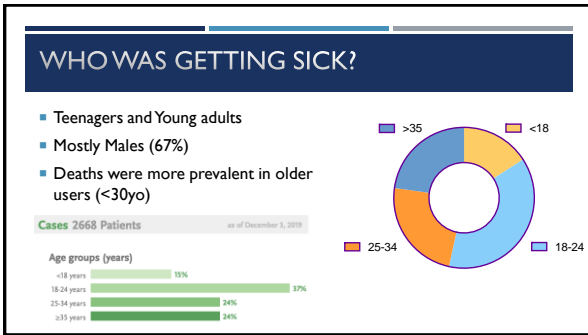
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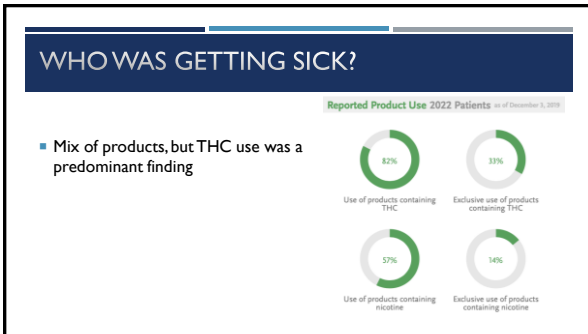
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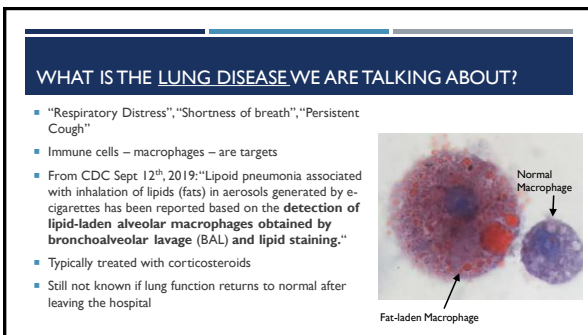
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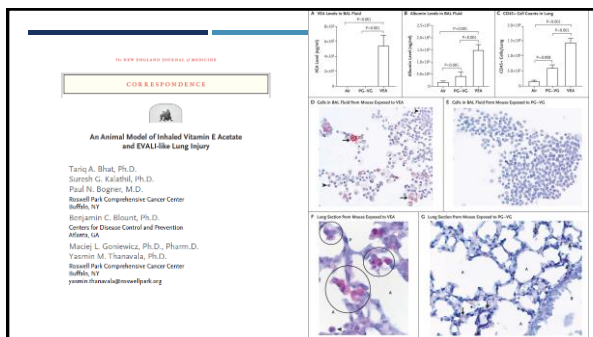
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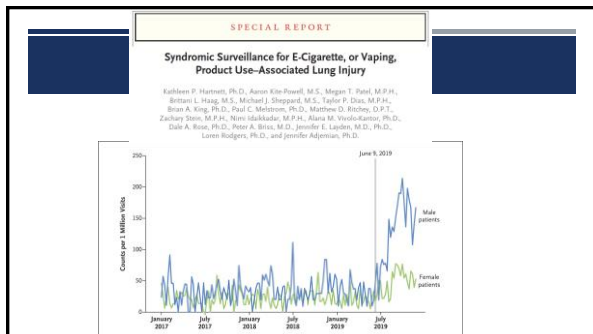
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### WHAT IS ACCIDENTALLY IN E-CIGARETTES?

- Nicotine-based contaminants (chemicals, bacteria/fungus/mold, pesticides)
- Chemical toxicants from the nicotine/THC/CBD extraction
- Carcinogens from the heat of vaporization (acetaldehyde, formaldehyde, acrolein)

■ **2 key concepts:**

- There are a million things that are safer to put in your stomach than your lung
- Dose makes the poison
  - More frequent use/abuse, multiple products (CBD, Nic, THC)

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The Journal of Clinical Investigation RESEARCH ARTICLE

## Electronic cigarettes disrupt lung lipid homeostasis and innate immunity independent of nicotine

Matthew C. Madison,<sup>1,2</sup> Cameron T. Landiers,<sup>1,2</sup> Bon-Hee Gu,<sup>1</sup> Cheng-Yen Chang,<sup>1,2</sup> Hui-Ying Tung,<sup>3</sup> Ran You,<sup>4</sup> Monica J. Hong,<sup>1,2</sup> Nima Baghaei,<sup>1</sup> Li-Zhen Song,<sup>1</sup> Paul Portez,<sup>1</sup> Nagreddy Putluri,<sup>4</sup> Ramiro Salas,<sup>1</sup> Brian E. Gilbert,<sup>1</sup> Ilya Levental,<sup>2</sup> Matthew J. Campen,<sup>1</sup> David B. Corry,<sup>1,2,5,6,7,8</sup> and Farrah Kheradmand<sup>1,2,5,6,7,8</sup>

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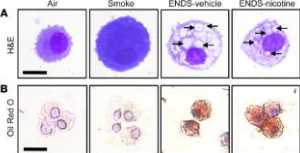
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### GENERAL FINDINGS OF OUR PAPER: LIPID-LADEN MACROPHAGES FROM PROPYLENE GLYCOL

- We compared traditional cigarette smoke with inhalation of the vehicle (PG/VG) with and without nicotine
  - 2 month old female C57 mice
  - 4 months of exposure
- While smoking led to uptake of particulates in lung immune cells (macrophages), the PG/VG inhalation led to foamy macrophage development
- Effects were independent of nicotine

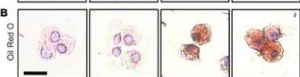
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H&E



**B**

Oil Red O



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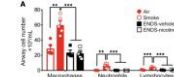
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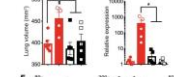
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### CIGARETTE SMOKE, BUT NOT PG/VG CAUSED LUNG INFLAMMATION

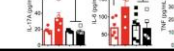
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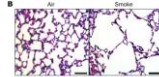
**C**




**E**



**B**



**D**



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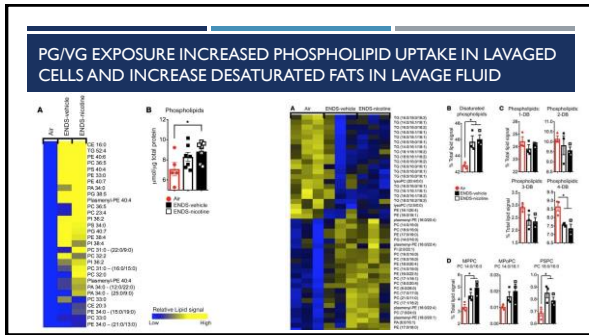
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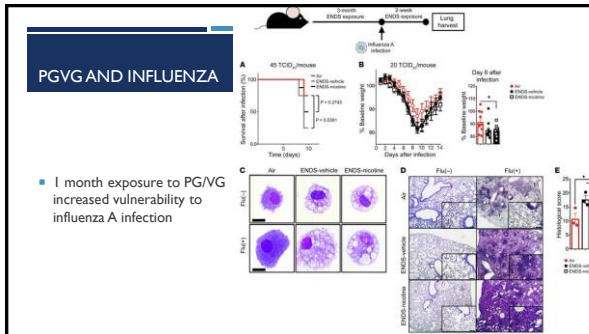
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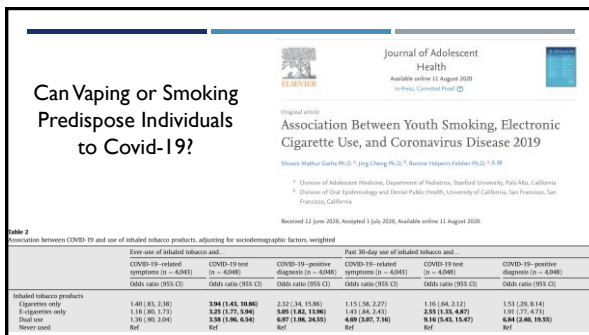
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### Can Vaping or Smoking Predispose Individuals to Covid-19?

**Abstract**  
**Smoking Upregulates Angiotensin-Converting Enzyme-2 Receptor: A Potential Adhesion Site for Novel Coronavirus SARS-CoV-2 (Covid-19)**

Nasim Izzah Bhatti<sup>1</sup>, Khatun Barakat<sup>2</sup>, Moinak U<sup>3</sup>, Karim Davary<sup>4</sup>, M. Amirul Haque<sup>5</sup>, Mahesh Singh<sup>6</sup> and Sahadevan Sridharan<sup>7</sup>

<sup>1</sup> Department of Translational Research Group, Department of Cellular Medicine, School of Health Sciences, University of Toronto, Toronto, Canada; <sup>2</sup> Department of Anatomy, All India Institute of Medical Sciences (AIIMS), New Delhi, India; <sup>3</sup> Department of Pharmacology, All India Institute of Medical Sciences (AIIMS), New Delhi, India; <sup>4</sup> School of Medicine, University of Toronto, Toronto, Canada; <sup>5</sup> School of Health Sciences, University of Toronto, Toronto, Canada; <sup>6</sup> School of Health Sciences, University of Toronto, Toronto, Canada; <sup>7</sup> Department of Cellular Medicine, School of Health Sciences, University of Toronto, Toronto, Canada

Received: 17 March 2020; Accepted: 24 March 2020; Published: 24 March 2020

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### PROTEOMIC CHANGES IN LUNG LINING FLUID AFTER 3 MONTHS OF PG/VG EXPOSURE

**Downregulated**

**Upregulated**

Inductions of stress response (red) enzymes shown

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### FRONTAL CORTEX TRANSCRIPTIONAL MARKERS OF INFLAMMATION AND AGING

**Neuroinflammation**

Marker	Control	PG/VG	PG/VG + Nic
IL6	~1.0	~1.5	~1.4
TNF- $\alpha$	~1.0	~1.0	~1.4
P21	~1.0	~1.5	~1.3

Relative Expression

Control PG/VG PG/VG + Nic

Raul Salazar PharmD.co 2023

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### FLAVORINGS MAY INFLUENCE LUNG RESPONSES

**Electronic-Cigarette Vehicles and Flavoring Affect Lung Function and Immune Responses in a Murine Model**

**Cell Counts**

Cell Type	AIR	VGPG	VGPG+Flv
T Helper	~15	~15	~25
Cytotoxic T Cells	~15	~15	~25
B Cells	~15	~15	~25

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### MAJOR RESEARCH GAPS

- Long-term consequences
- Systemic vascular, target organ, immune effects
- Complex mixtures – new devices, new ingredients
- Add in CBD and marijuana legalization...

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### JUUL IS "FACEBOOK MEETS A DRUG CARTEL"

STANTON GLANTZ, UNIV OF CALIFORNIA, SAN FRANCISCO

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### PROFIT OVER PEOPLE: LACK OF ETHICS FROM THE VAPING INDUSTRY

- Companies like Juul and Blu have targeted the youth market
- Flavorings like mango, mint, cinnamon bun
- Advertising clearly geared towards teenagers
- Many studies have documented that vaping among teenagers and young adults has increased dramatically in the past decade.

Year	Any tobacco product (high school)	E-cigarettes (high school)	Any tobacco product (middle school)	E-cigarettes (middle school)
2011	25	0	5	0
2012	25	0	5	0
2013	25	0	5	0
2014	25	10	5	0
2015	25	15	5	0
2016	20	10	5	0
2017	20	10	5	0
2018	30	20	5	0

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### JUUL DIRECTLY ADVERTISED TO TEENAGERS

- Juul claims everyone in their ads is over 21??
- North Carolina' sued because Juul has been "deceptively downplaying the potency and danger of the nicotine."
- The entire country of India (1.3 billion people) has banned vaping due to health concerns, especially for youth

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### "TOBACCO GIANT ALTRIA BUYS 35% OF JUUL"

- Altria - largest tobacco company in the US
- Invested \$12.8 billion cash (plus \$2 billion bonus)
- Gives Juul top-shelf space alongside Marlboro
- Helps with distribution & logistics
  - 230,000 retail locations
- Lobbying and legal expertise
- E-cigarettes are not an alternative to tobacco – they ARE big tobacco**

www.cnbc.com/2018/12/20/altria-takes-stake-in-juul-a-pivotal-moment-for-the-e-cigarette-maker.html

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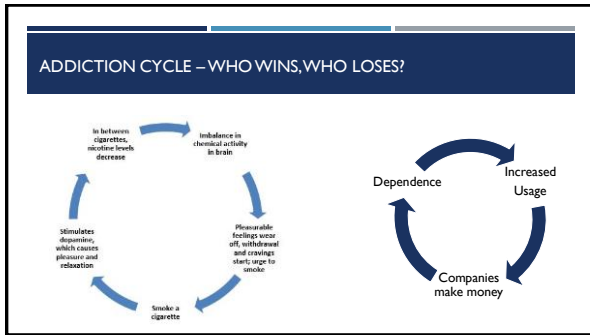
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### ACKNOWLEDGMENTS

UNM COLLEGE OF PHARMACY

- UNM: Raul Salazar, Jessica Begay, Russell Hunter, Tamara Young, Guy Herbert, Selita Lucas, Barry Bleske, Thomas Wilson, Marcus Garcia, Jessie Denson, Katie Zychowski, David Scieska, Rita Sarracino
- Baylor: Farrah Kheradmand, Matthew Madison
- University of Arkansas Medical School: Stephanie Byrum, Samuel Mackintosh

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