

MYTHS IN THE MIST? VAPING ETHANOL, SOLVENTS, AND OTHER DRUGS

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LFTTR

Laboratory for Forensic
Toxicology Research



VCU



Texas Statewide
IMPAIRED
DRIVING FORUM

NIJ STATEMENT AND FINANCIAL DISCLOSURE

- Characterization and Abuse of Electronic Cigarettes: The Efficacy of Personal Vaporizers as an Illicit Drug Delivery System
- Chasing the E-cigarette Dragon: Characterizing the Evolution and Impact of Design and Content
- Addressing Analytical Challenges of Proliferating THC Analogues
- Evaluating Vaping Products Confiscated Across Virginia

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OUR VISION:
The Laboratory for Forensic Toxicology Research will be a beacon for transformative information that will empower communities. We will science today for a safer tomorrow.

OUR MISSION:
The Laboratory for Forensic Toxicology Research aims to create courageous scientific leaders by cultivating an environment of integrity and care. We strive to learn and teach fundamentals, develop innovative strategies and techniques, and empower our communities with the knowledge to make evidence-based decisions.



PRODUCT EVOLUTION

2007

2012



2014



2015

2017

2018-2019

1st Generation “Cigalike”

- Disposable or rechargeable
- No tank or pod



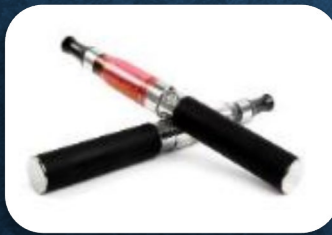
PAX

- Cannabis discreet vaping



2nd Generation “Vape pens” or “Battery pens”

- Prefilled or refillable



3rd Generation “Mods”

- Typically refillable
- Variable voltage/wattage
- Bulky
- Customizable



4th Generation JUUL

- Prefilled or refillable
- More discreet



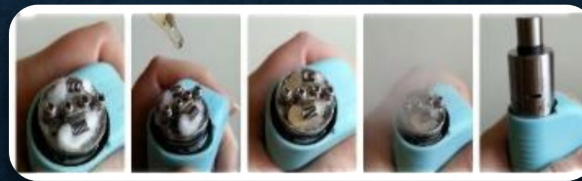
5th Generation “Drippers” “Dab rigs”

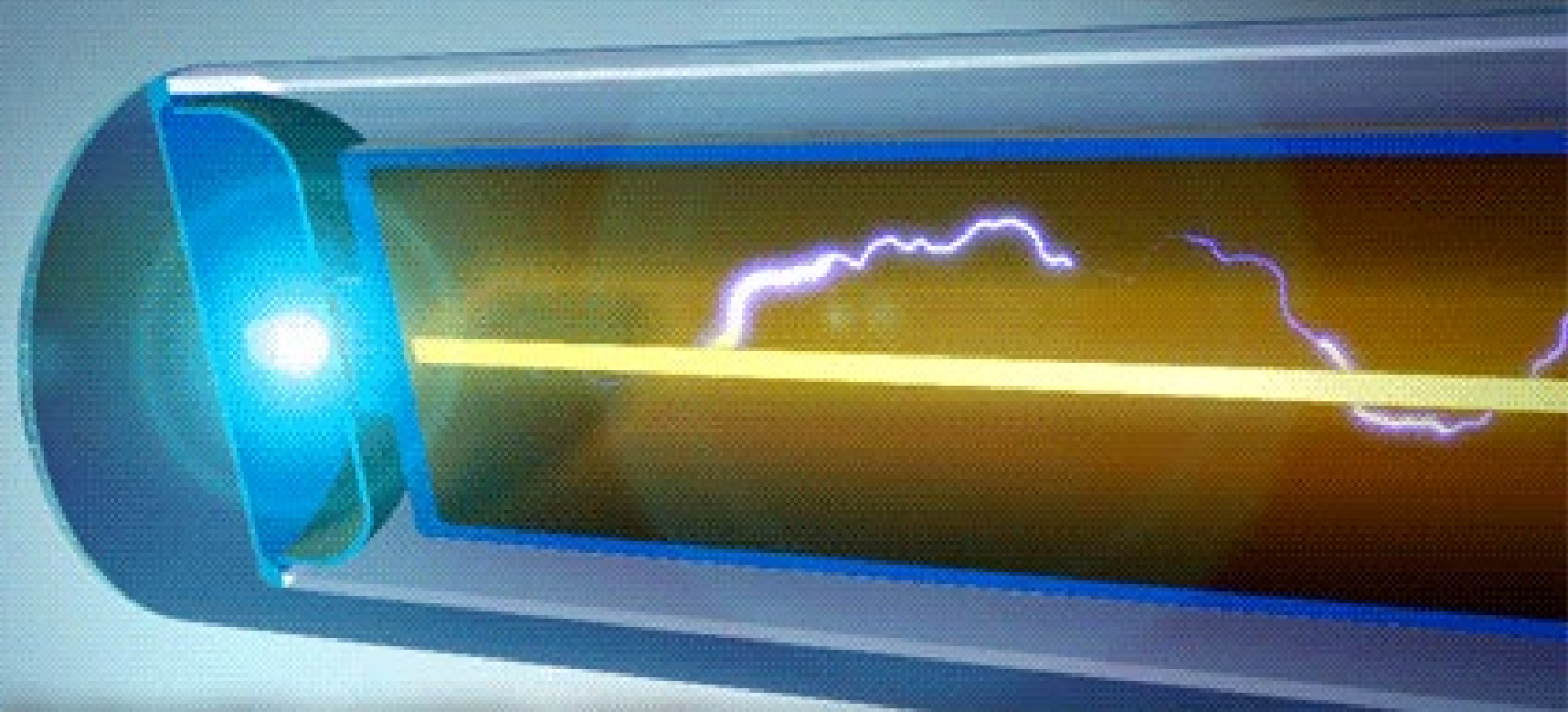
- Wider mouthpiece
- Used with a wider variety of products



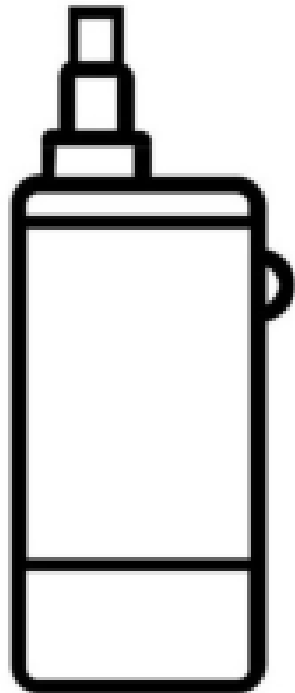
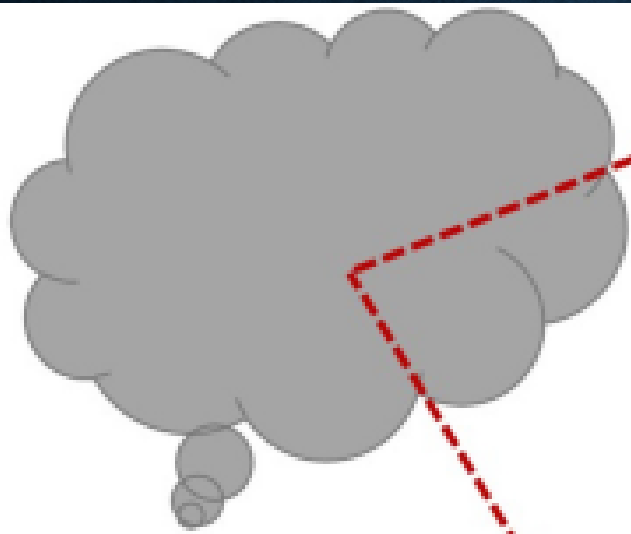
6th Generation “Pod mods”

- Prefilled or refillable
- May or may not allow user to change settings
- More discreet



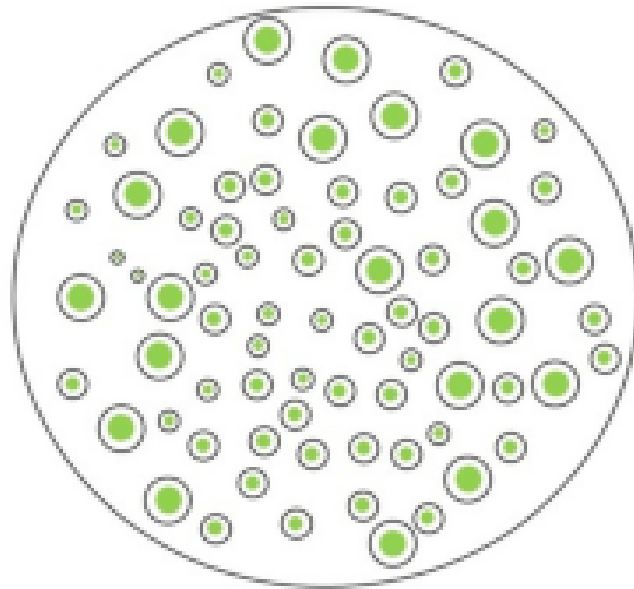


1. E-cigarettes contain a battery-powered atomizer.



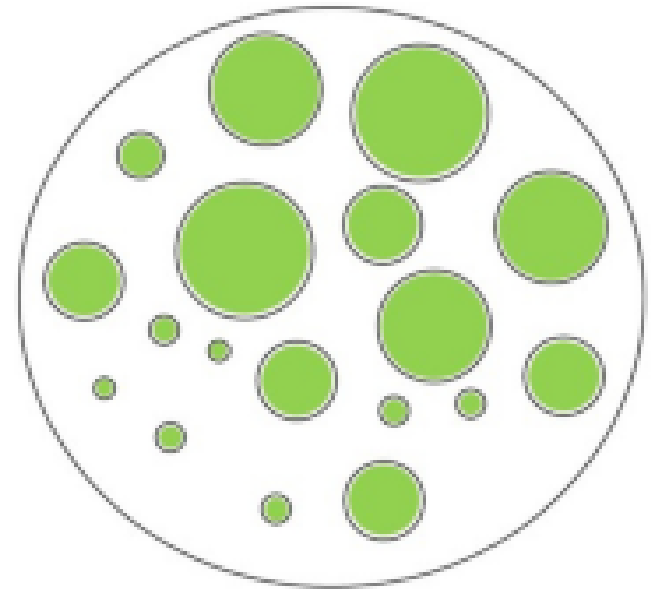
Nicotine concentration of 18mg/mL
3 power levels: 15, 25 and 50W

15-25W using low-power atomizer



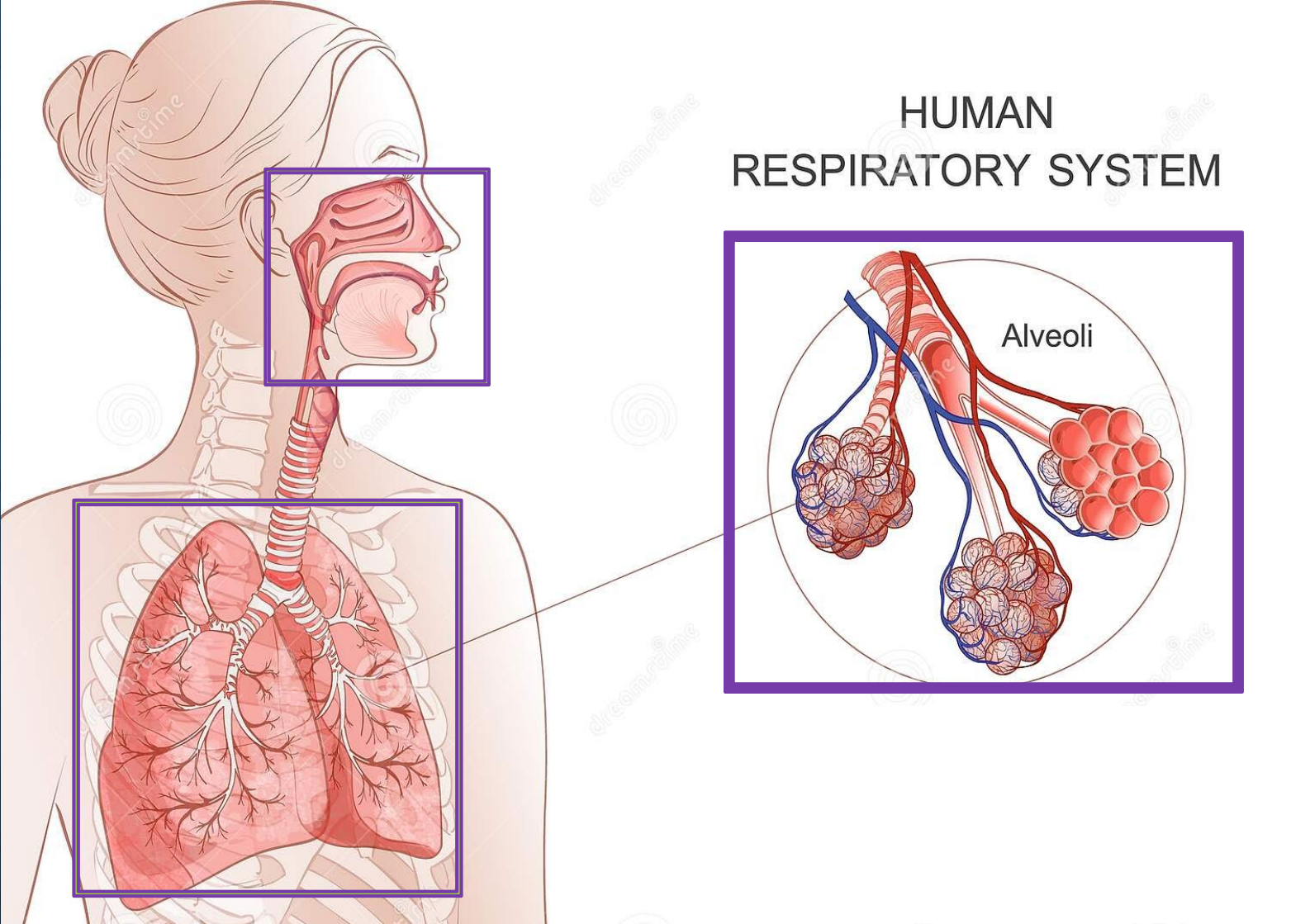
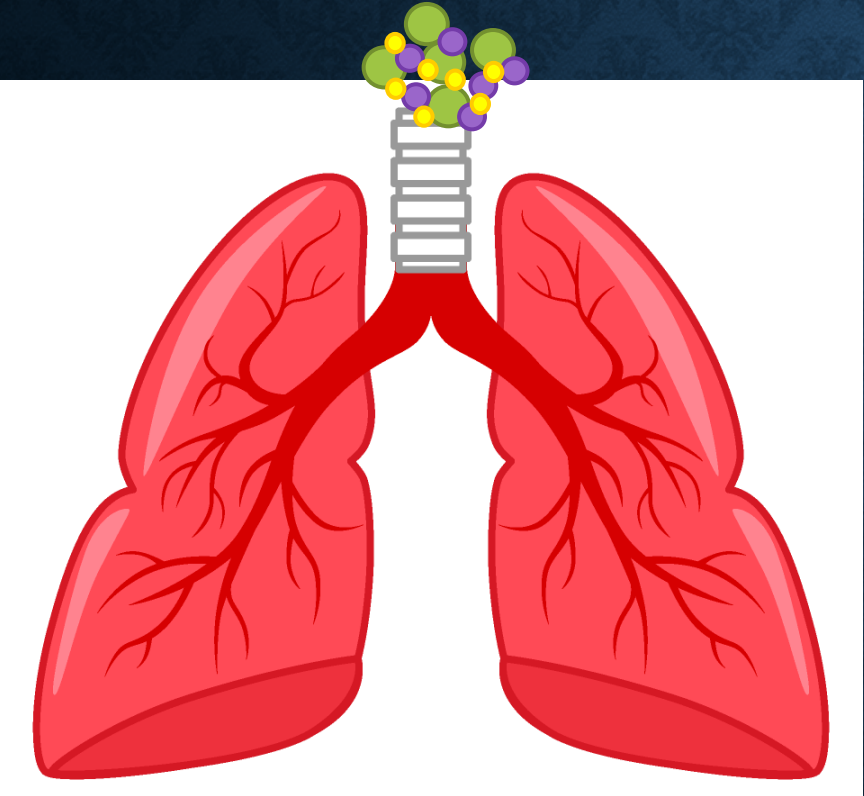
MMAD: ~ 1,1 μm
Nicotine concentration
in droplets: ~11 mg/mL
Nicotine in particle phase: ~60%
Nicotine in gas phase: ~40%

50W using high-power atomizer



MMAD: ~ 2,4 μm
Nicotine concentration
in droplets: ~16 mg/mL

Three main respiratory regions:

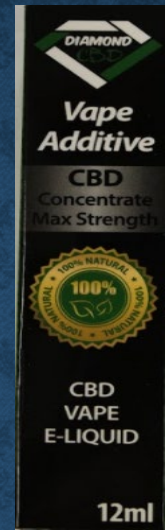


E-liquid Composition

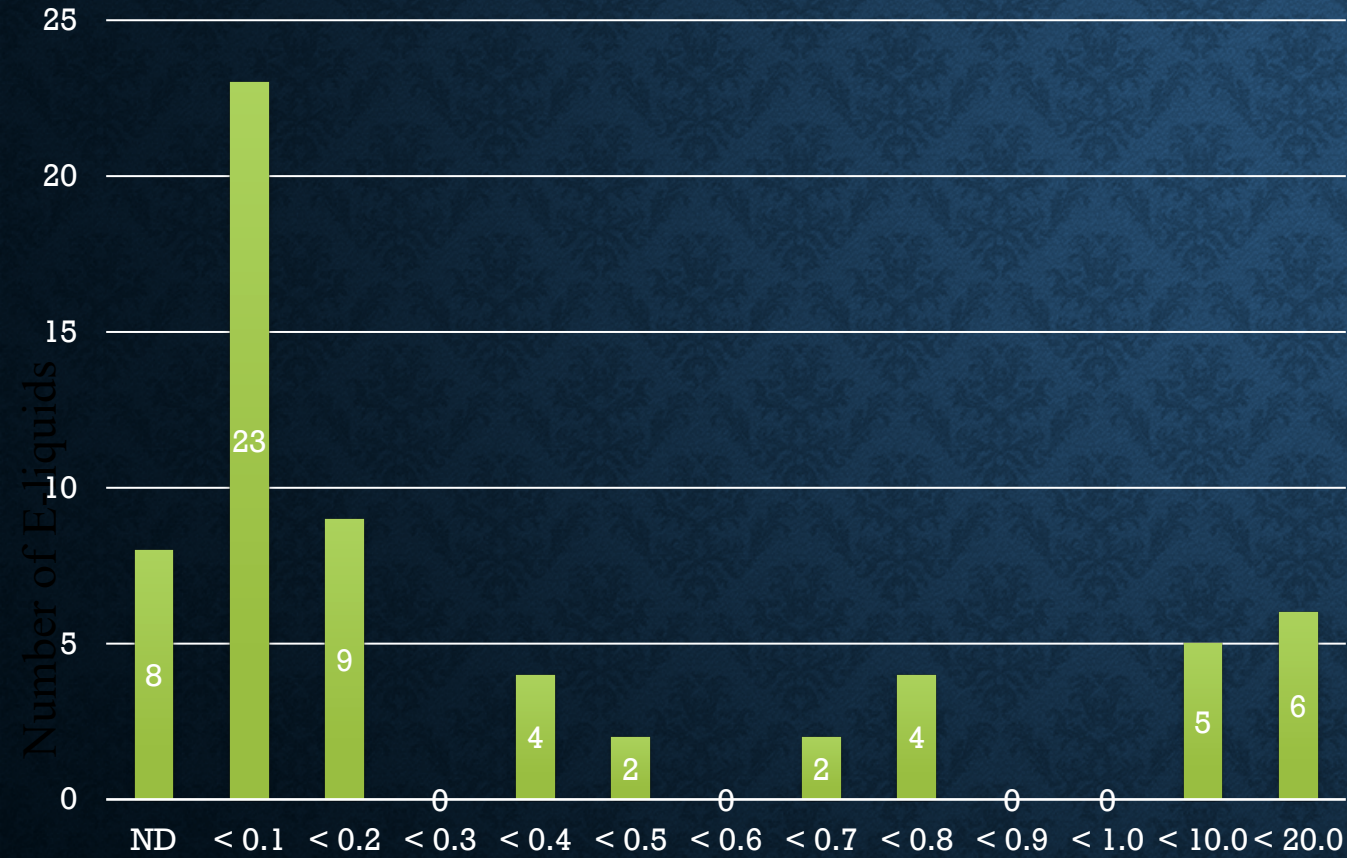
- Carriers
 - Propylene Glycol (PG) } Most
 - Vegetable Glycerin (VG) } common
 - Polyethylene Glycol (PEG)
 - Used in laxatives, pharmaceutical binders, food additives, toothpaste, creams/lotions...
 - Medium Chain Triglycerides (MCTs)
 - Components of Coconut and Palm Oils
 - Easy to digest
- Flavorants



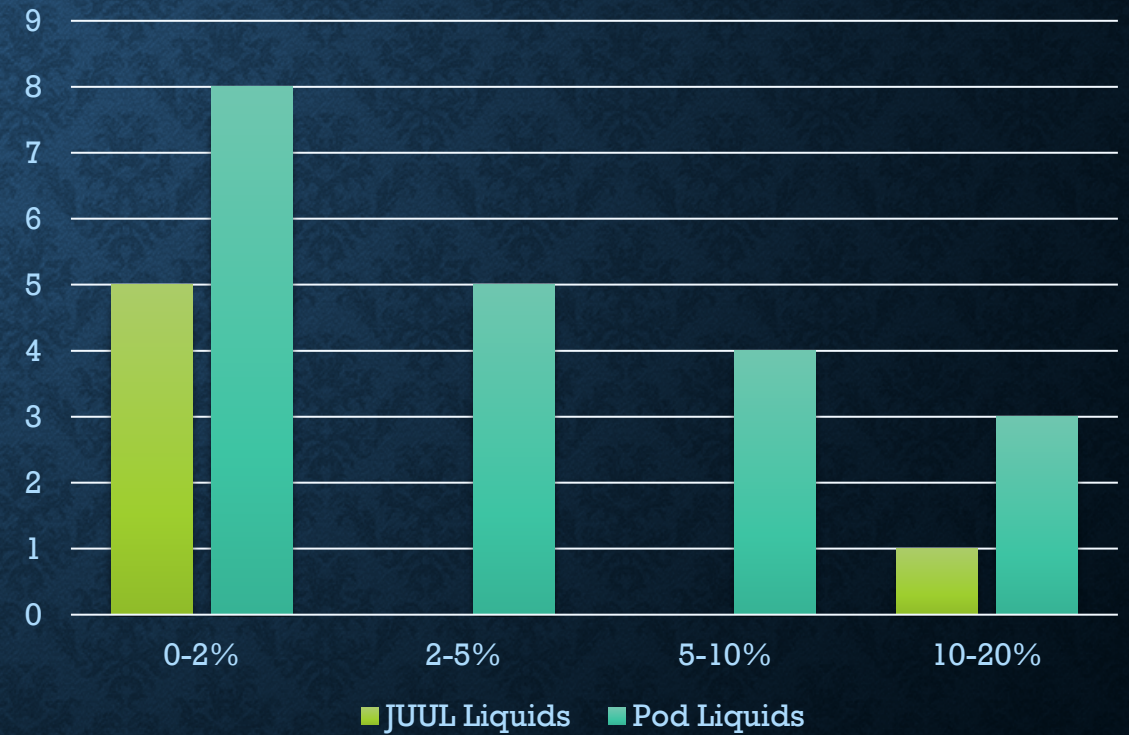
- Additives and “Enhancers”
 - Product stabilizers
 - Organic acids for Nic Salt formulations
 - Vitamins
- Active ingredients
 - Nicotine
 - Drugs Other Than Nicotine (DOTNs)
 - Ethanol
 - Natural products/plant materials
 - Dietary Supplements
 - Scheduled Drugs
 - Designer Drugs



Concentration of Ethanol in % by Weight per Volume



Ethanol Content of Pod-based E-liquids



SOURCES OF ETHANOL IN E-LIQUIDS

- Flavorants
- Used as a thinning agent
- Used to dissolve substances that otherwise do not dissolve in carriers
- Intentionally as a means to administer ethanol



STUDY BACKGROUND



Even though vaped alcohol doesn't go through the body in the traditional route, it can still be detected on a Breathalyzer test. Remember that these tests involve blowing into the device. They determine a person's blood alcohol concentration (BAC) based on the air in a person's lungs. Someone who's been vaping alcohol before getting behind the wheel could well end up arrested for DUI.



Forums > Vaping and the E-Cigarette > General Vaping Discussion >

WARNING!! DUI from mentholated e-juice

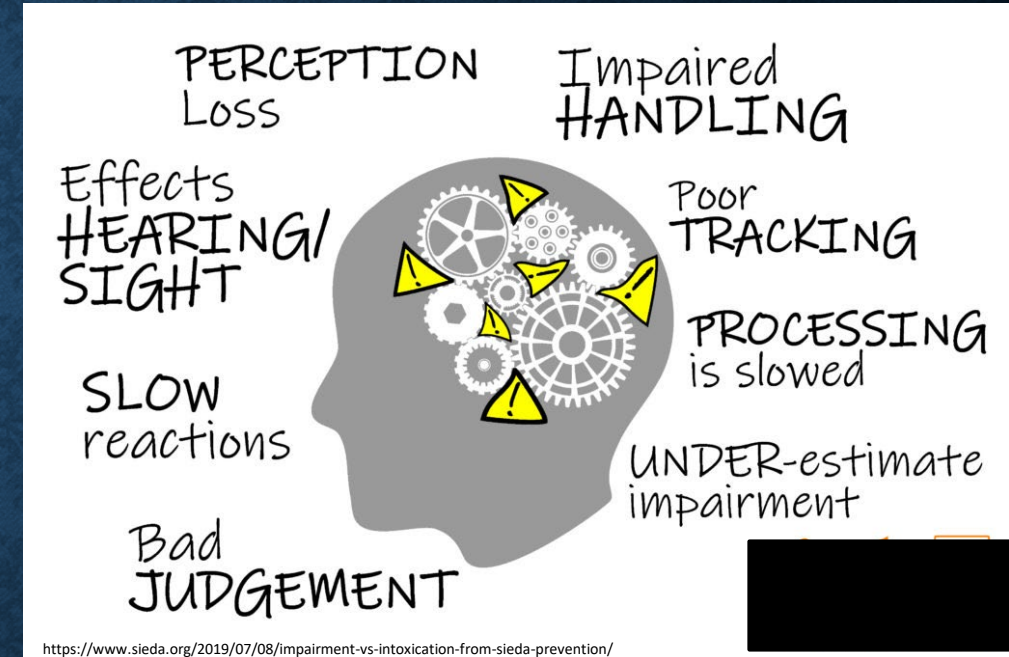
Discussion in 'General Vaping Discussion' started by abstractcousin, Nov 5, 2013.



<https://valleydailypost.com/blog/new-study-says-vaping-could-lead-to-dwi/>

IMPACTS TO DUI INVESTIGATIONS?

- Preliminary Breath Test (PBT)
- Evidentiary Breath Test (EBT)
- Observation Period
- Standardized Field Sobriety Test (SFST)
- Self-perceived Intoxication



<https://www.dvspringfield.com/blog/what-should-you-do-if-youve-been-charged-with-a-dwi/>



<https://kcdefensecounsel.com/refusing-a-breathalyzer-or-blood-test-in-missouri/>

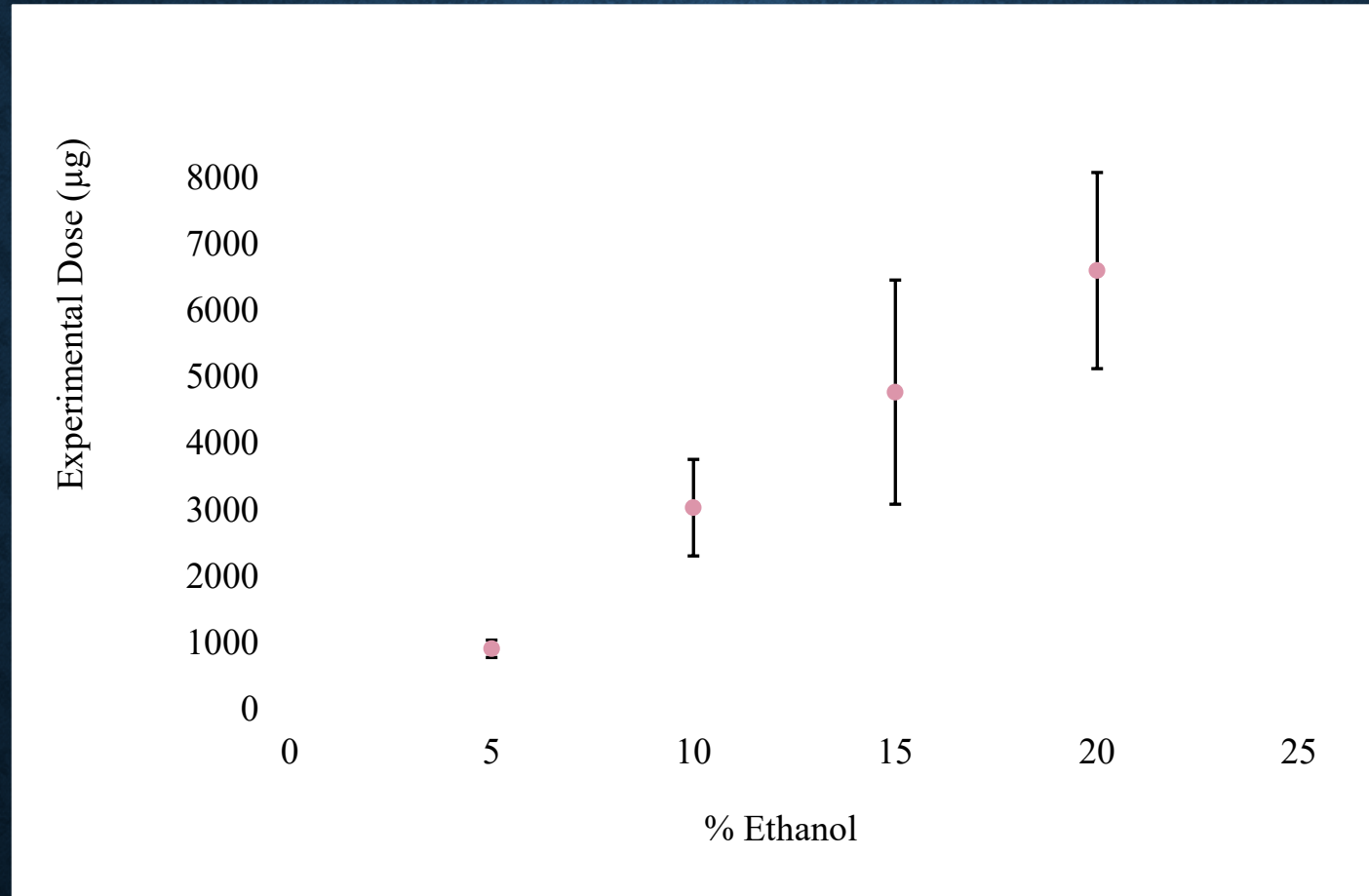


<https://www.judnichaw.com/should-you-take-field-sobriety-tests/>

CORRESPONDENCE REGARDING POSITIVE PRELIMINARY BREATH TESTS AFTER VAPING

SOURCE	CORRESPONDENCE
Assistant Public Defender	<ul style="list-style-type: none">• Has a client charged with operating while intoxicated by liquor and who was smoking a Juul e-cigarette when he was stopped by police. His PBT, taken 15 minutes after his last use of the Juul, was .10 (the legal limit in Michigan is .08).• Can an e-cigarette interfere with PBT results?
Mother from New Zealand	<ul style="list-style-type: none">• Son was stopped by police and PBT was “very high” despite son appearing unimpaired (though had admittedly drunk alcohol that night)• Police took over an hour to get a “decent” breath sample• Police said it was the highest PBT they had seen• Reports son was vaping the entire hour it took to acquire a satisfactory breath sample

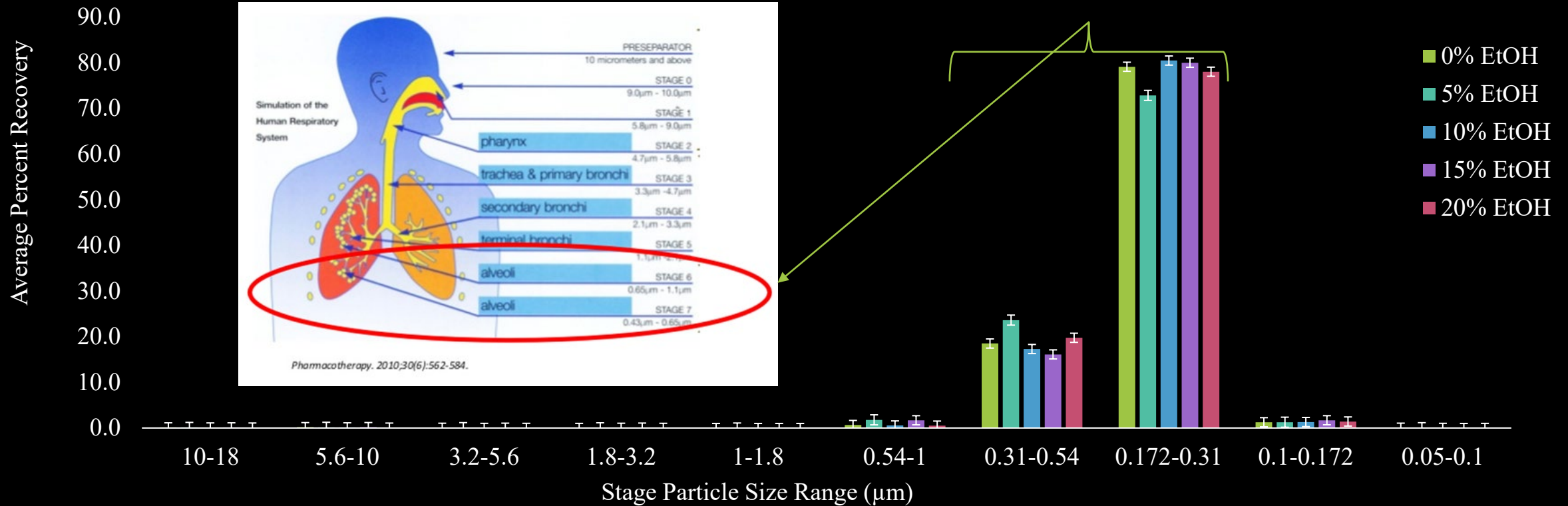
ETHANOL IN E-LIQUIDS



Unpublished LFTR Data

PARTICLE SIZE DISTRIBUTION OF AEROSOL

Particle Size Percent Recovery per MOUDI Stage



VAPING ETHANOL STUDY REQUIRED CRITICAL COLLABORATIONS

LFTR

Laboratory for
Forensic Toxicology
Research



VCU

Center for the Study
of Tobacco Products

The logo for VCU Police, featuring the VCU seal and the text "VCU POLICE" in bold black letters with a yellow swoosh underneath.



STANDARDIZED FIELD SOBRIETY TEST

In Virginia

Horizontal Gaze Nystagmus Test*

Walk and Turn Test*

One-Leg Stand Test*



https://www.wsp.wa.gov/breathtest/docs/dre/manuals/SFST/SFST_refresh/2009/student_SFSTrefresh_session2_3rdtr_2009.pdf



ARMS AT YOUR SIDE

HEEL TO TOE NO MORE THAN 6" APART



ARMS TIGHT AT SIDES

NOT TOO HIGH

<https://www.brill-legal.com/our-services/criminal-defense/dwi/the-new-york-dui-field-sobriety-tests/>

SUBJECT NAME _____

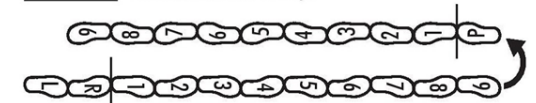
INCIDENT # _____

HORIZONTAL GAZE NYSTAGMUS TEST

- * Check for equal tracking, pupil size and resting nystagmus
- _____ Lack of smooth pursuit: Left eye
- _____ Lack of smooth pursuit: Right eye
- _____ Distinct and sustained nystagmus at maximum deviation: Left eye
- _____ Distinct and sustained nystagmus at maximum deviation: Right eye
- _____ Onset of nystagmus prior to 45degrees: Left eye
- _____ Onset of nystagmus prior to 45 degrees: Right eye
- _____ Check for vertical gaze nystagmus
- _____ **TOTAL CLUES OBSERVED (6 MAX)**

WALK AND TURN TEST

- _____ Can't keep balance during instructions
- _____ Starts too soon
- _____ Stops walking
- _____ Misses heel-to-toe
- _____ Steps off line
- _____ Uses arms for balance
- _____ Improper turn
- _____ Incorrect number of steps



TOTAL CLUES OBSERVED (8 MAX)

ONE-LEG STAND TEST

- _____ Sways while balancing
- _____ Uses arms to balance
- _____ Hopping
- _____ Puts foot down
- _____ Foot Raised
- _____ **TOTAL CLUES OBSERVED (4 MAX)**

DATE: _____

TIME: _____

<https://stengellaw.com/dwi-standardized-sobriety-tests-new-york/>

DAX & HGN



PRELIMINARY AND EVIDENTIARY BREATH TEST



Incorporates the latest electrochemical fuel cell, microcontroller, and display technology to provide an easy to operate rugged screener.

Easy to operate. Intuitive menu with directional keys makes operating the instrument very simple.

- Evidential Grade Sampling System
- Safe & Sanitary Side Exhaust
- On-Screen Battery & Temp. status
- Rugged Ergonomic Construction
- Large Bright Multi-Color Display
- Mouthpiece Detection



<https://www.alcoholtest.com/intoxilyzer-800/>

Intox EC/IR® II

Court-accepted, evidential-grade desktop unit with combined fuel cell and infrared technologies



<https://www.intox.com/product/intox-ec-ir-ii/>

PARTICIPANT ELIGIBILITY CRITERIA

- Must be a 21-or-older daily e-cig user
- Must pass the Alcohol Use Disorders Identification Test (AUDIT)
- Must meet minimum medical and psychiatric health criteria
- Must have a negative
 - pregnancy test (at pre-screen)
 - urine drug screen (at pre-screen and each session day)

IRB# HM20015064

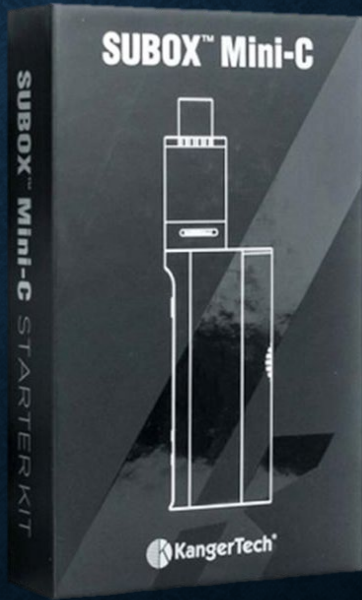
E-LIQUID, DEVICE, & VAPING REGIMEN



Vape Regimen	
1 puff 0% EtOH	10 puffs 0% EtOH
1 puff 20% EtOH	10 puffs 20% EtOH

0% Ethanol
50%VG / 50%PG

20% Ethanol
40%VG / 40%PG



CLINICAL DESIGN



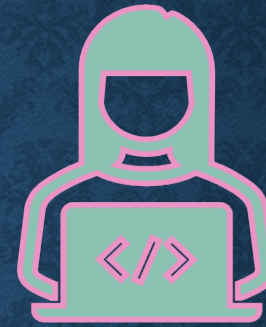
PBT



EBT



SFST



SELF
ASSESSMENT



PUFF
TOPOGRAPHY



CONTROLS

Min:

0

2

12

22

27

29

32

34

37

39

42

52

57

59



Timepoint: 1

PUFF

2

3

4

5

6

TOPICS IN SELF-ASSESSMENT

Biphasic Alcohol Effects Scale

Difficulty concentrating										
Not at all			Moderately					Extremely		
0	1	2	3	4	5	6	7	8	9	10
Down										
Not at all			Moderately					Extremely		
0	1	2	3	4	5	6	7	8	9	10
Elated										
Not at all			Moderately					Extremely		
0	1	2	3	4	5	6	7	8	9	10

Subjective High Assessment Scale

Uncomfortable

Normal-----Extremely

High

Normal-----Extremely

Clumsy

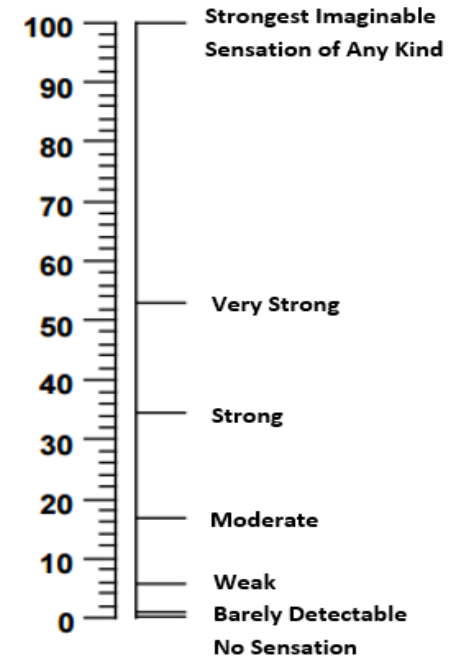
Normal-----Extremely

Muddled or confused

Normal-----Extremely

General Labeled Magnitude Scale

How would you describe the overall harshness/irritancy of the ECIG you just used?



Labeled Hedonic

How would you describe the overall flavor sensation of the ECIG you just used?	Most disliked sensation imaginable	Most liked sensation imaginable
(Place a mark on the scale above)		
How would you describe the overall harshness/irritancy of the ECIG you just used?	Most disliked sensation imaginable	Most liked sensation imaginable
(Place a mark on the scale above)		
How would you describe the overall throat hit of the ECIG you just used?	Most disliked sensation imaginable	Most liked sensation imaginable
(Place a mark on the scale above)		
How would you describe the overall warmth of the vapor of the ECIG you just used?	Most disliked sensation imaginable	Most liked sensation imaginable
(Place a mark on the scale above)		

Direct Effects of Vaping

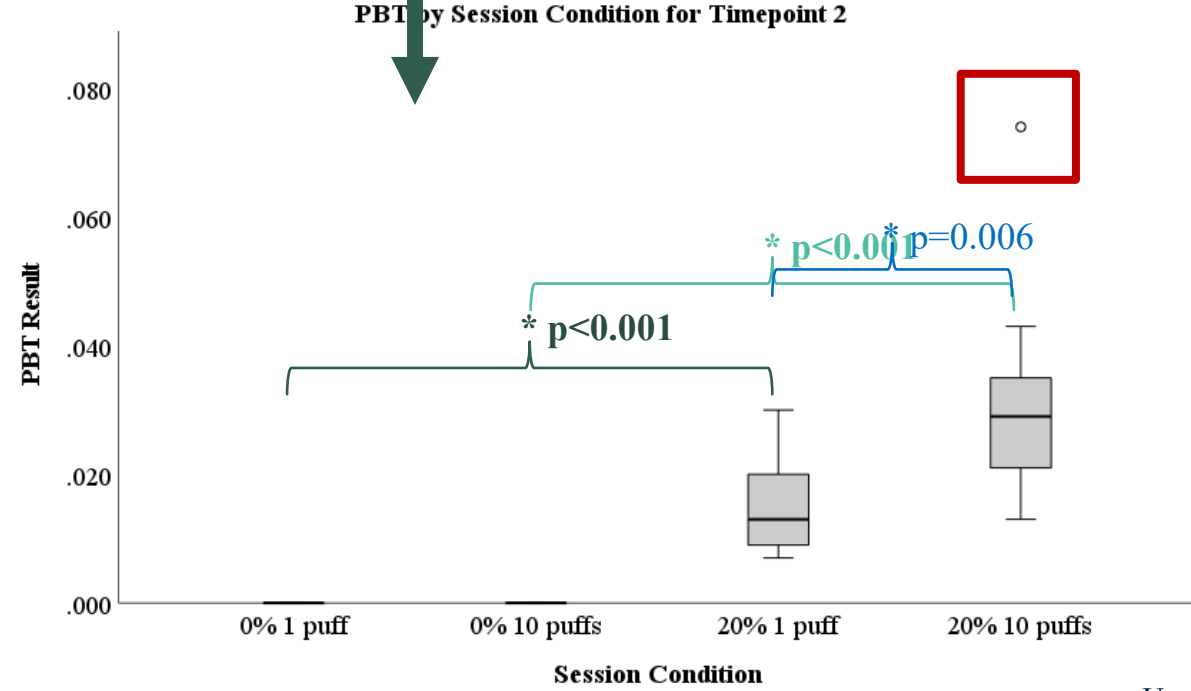
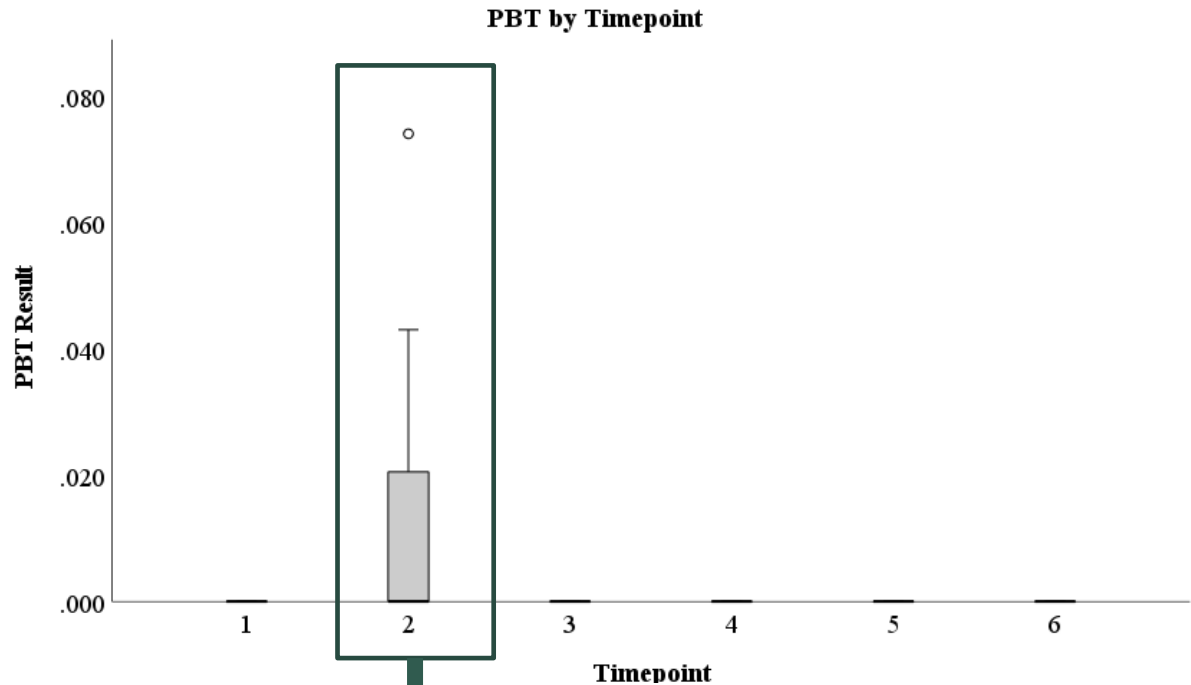
	Not at all	Extremely
1. Was the e-cig satisfying?	_____	_____
2. Was the e-cig pleasant?	_____	_____
3. Did the e-cig taste good?	_____	_____
4. Did the e-cig make you dizzy?	_____	_____
5. Did the e-cig calm you down?	_____	_____
6. Did the e-cig help you concentrate?	_____	_____
7. Did the e-cig make you feel more awake?	_____	_____
8. Did the e-cig reduce your hunger for food?	_____	_____
9. Did the e-cig make you sick?	_____	_____
10. Would you like to use another e-cig RIGHT NOW?	_____	_____

RESULTS

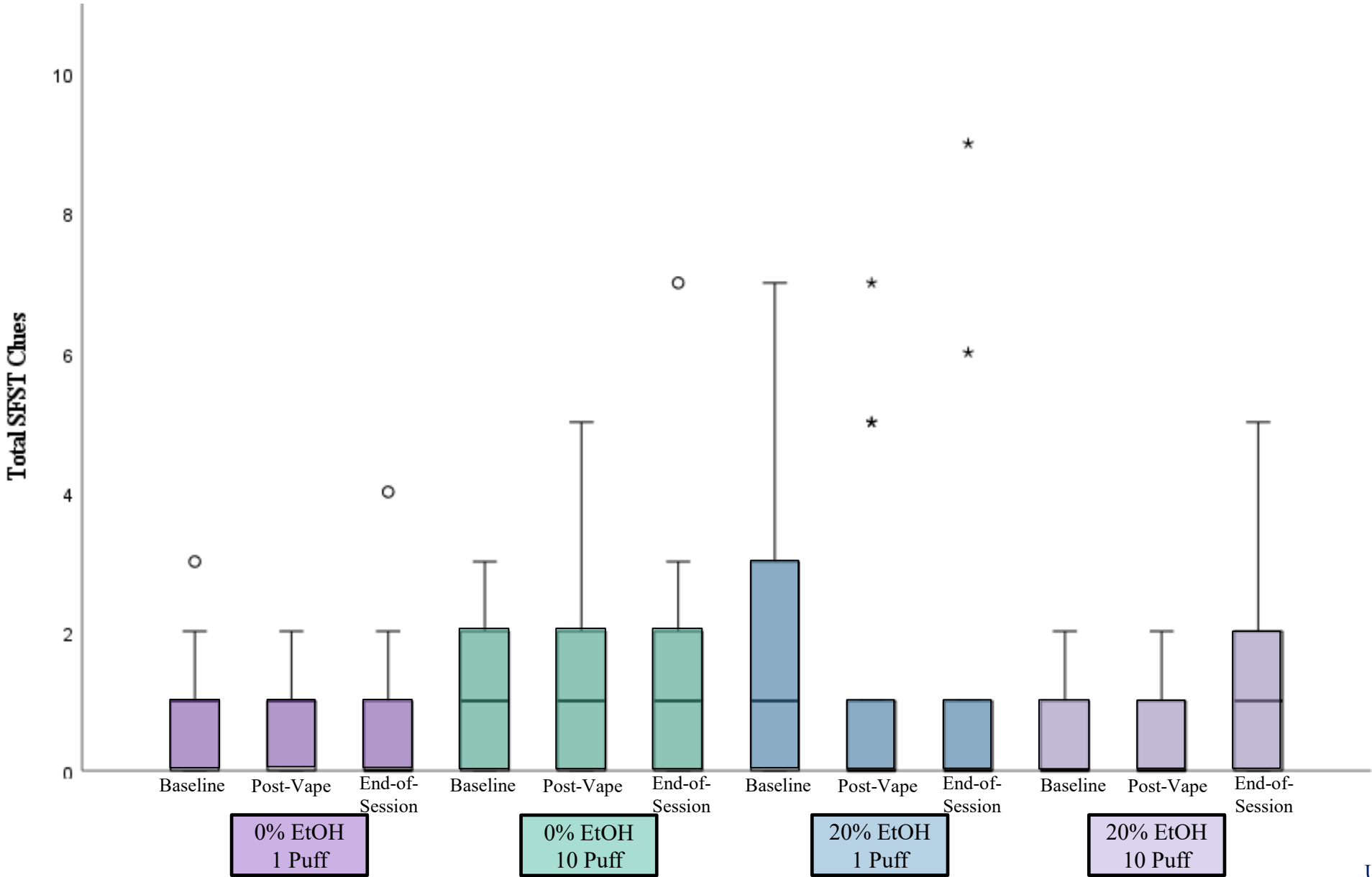
N=13

PBT & EBT

BAC BY TIMEPOINT AND PUFF CONDITION



TOTAL SFST CLUES BY TIMEPOINT AND SESSION CONDITION

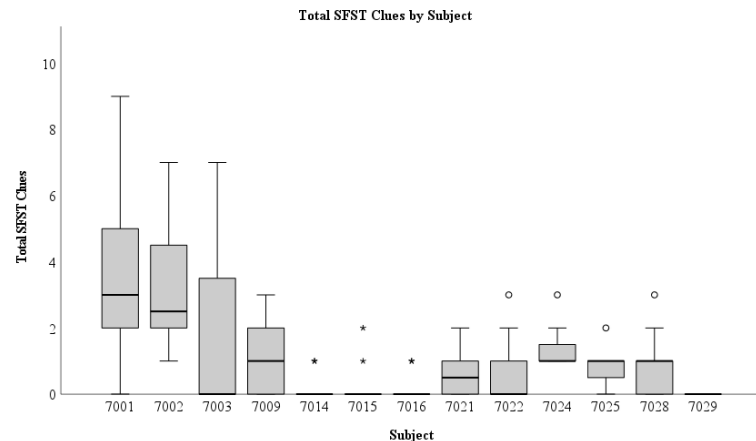


SFST

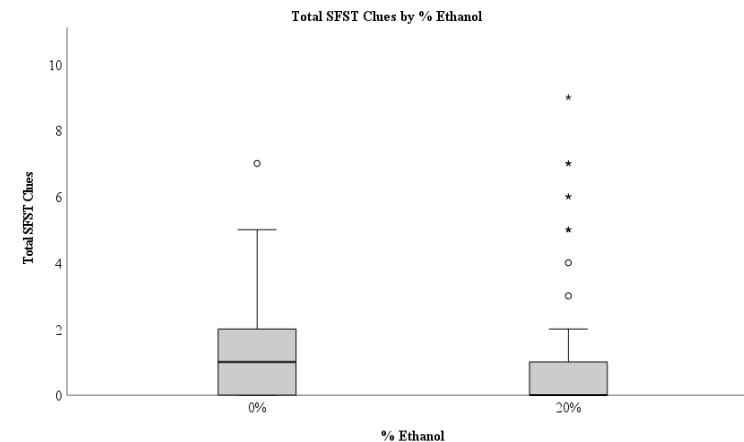
TOTAL CLUES BY:

SUBJECT
% ETHANOL
PUFF
TIMEPOINT

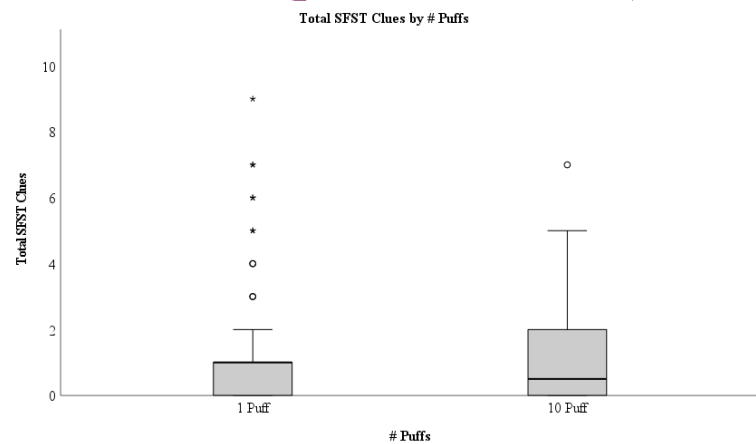
Wide variation between subjects



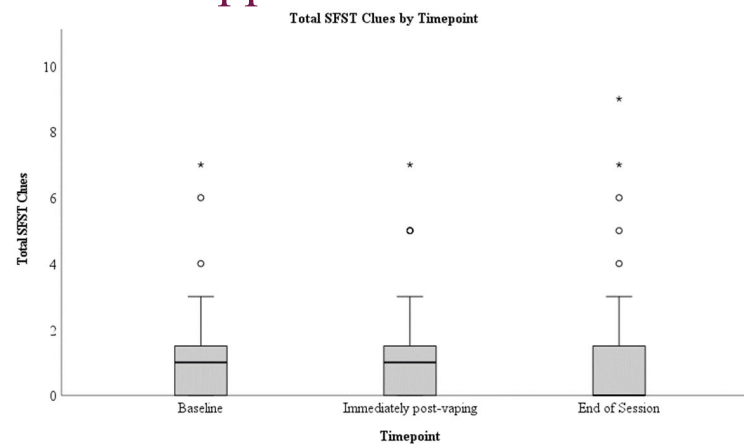
% EtOH did not appear to affect results (p-value = 0.618)



puffs did not appear to affect results (p-value = 0.320)



Evaluation at different time points appear consistent



PRELIMINARY FINDINGS

SELF-ASSESSMENT

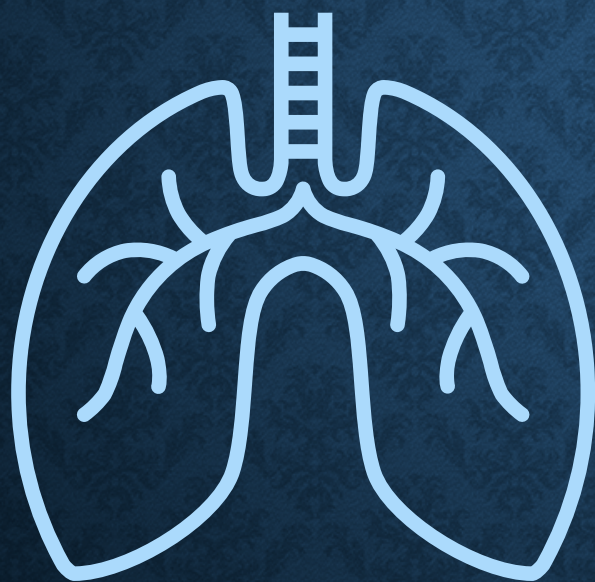
Subjective	Timepoint	Avg. Response				Subjective	Timepoint	Avg. Response				Subjective	Timepoint	Avg. Response			
		0% - 1 Puff	0% - 10 Puffs	20% - 1 Puff	20% - 10 Puffs			0% - 1 Puff	0% - 10 Puffs	20% - 1 Puff	20% - 10 Puffs			0% - 1 Puff	0% - 10 Puffs	20% - 1 Puff	20% - 10 Puffs
BAES - Difficulty concentrating	1	0.90909	0.90909	0.81818	1.27273	BAES - Down Head	1	1.45455	0.63636	1.36364	0.81818	BAES - Heavy Head	1	0.72727	0.90909	1.00000	0.90909
	2	0.45455	2.09091	1.69091	1.27273		2	1.09091	0.90909	1.30000	0.99091		2	1.18182	2.00000	0.80000	1.27273
	5	0.40000	1.70000	1.72727	1.27273		5	0.80000	0.90000	0.54545	0.72727		5	0.50000	1.10000	0.81818	0.81818
BAES - Inactive	1	2.45455	2.72727	1.90909	2.90909	BAES - Sedated	1	0.45455	1.27273	0.72727	0.81818	BAES - Slow Thoughts	1	0.27273	0.81818	0.63636	0.45455
	2	2.00000	1.90909	1.40000	1.63636		2	0.81818	1.81818	0.80000	1.09091		2	0.54545	1.18182	0.90000	0.90909
	5	1.20000	1.50000	1.18182	1.36364		5	0.40000	0.80000	0.36364	0.72727		5	0.20000	0.60000	0.81818	0.90909
BAES - Sluggish	1	1.63636	2.09091	1.90909	1.63636	BAES - Elated	1	1.63636	2.09091	1.63636	0.81818	BAES - Energized	1	2.81818	2.45455	2.27273	2.90909
	2	0.90909	2.00000	1.20000	1.81818		2	0.90909	1.72727	1.50000	1.18182		2	2.27273	1.72727	3.40000	2.09091
	5	0.80000	2.00000	1.00000	1.27273		5	0.80000	1.10000	1.18182	0.81818		5	2.20000	1.70000	2.90909	1.81818
BAES - Excited	1	2.36364	1.81818	2.27273	2.00000	BAES - Stimulated	1	1.36364	0.81818	1.54545	1.45455	BAES - Talkative	1	2.27273	2.36364	1.90909	2.72727
	2	1.90909	2.18182	2.90909	2.00000		2	1.45455	1.81818	1.90909	2.00000		2	2.09091	2.20000	3.40000	3.00000
	5	1.90909	1.70000	1.27273	1.36364		5	1.10000	0.80000	1.30909	1.81818		5	1.80000	2.00000	2.81818	2.63636
BAES - Up	1	2.18182	2.90909	2.00000	2.63636	BAES - Vigorous	1	1.00000	1.36364	1.45455	1.27273	SHAS - Buzzed	1	0.18182	0.36364	0.18182	0.72727
	2	1.90909	2.45455	3.40000	2.18182		2	1.27273	0.72727	1.90000	0.90909		2	10.72727	13.18182	2.40000	5.72727
	5	2.60000	2.00000	2.72727	1.90909		5	0.90000	0.40000	1.45455	0.90909		5	2.50000	0.80000	2.09091	4.18182
SHAS - Clumsy	1	5.81818	6.81818	2.27273	1.36364	SHAS - Difficulty concentrating	1	0.18182	4.09091	5.27273	0.90909	SHAS - Distorted Time	1	0.36364	1.18182	2.45455	0.63636
	2	11.90909	9.18182	5.40000	6.36364		2	6.90909	9.00000	4.30000	4.36364		2	10.72727	2.27273	4.90000	3.54545
	5	0.40000	9.50000	1.09091	2.00000		5	1.50000	6.60000	5.54545	4.18182		5	0.50000	2.10000	1.09091	4.27273
SHAS - Dizzy	1	0.81818	0.36364	0.45455	0.54545	SHAS - Drowsy or Intoxicated	1	0.94545	0.81818	1.01818	0.36364	SHAS - Effects of Alcohol	1	1.81818	0.27273	0.27273	0.27273
	2	6.81818	8.00000	2.00000	7.27273		2	4.72727	0.45455	6.30000	3.27273		2	4.72727	0.81818	1.20000	2.81818
	5	2.20000	1.70000	5.09091	2.54545		5	0.40000	0.30000	0.18182	0.90909		5	0.10000	0.10000	0.27273	4.54545
SHAS - Floating	1	0.36364	0.36364	1.45455	0.45455	SHAS - High	1	19.00000	17.09091	10.63636	16.63636	SHAS - Muddled or Confused	1	6.54545	3.72727	0.90909	2.81818
	2	4.63636	6.90909	3.70000	1.72727		2	4.72727	4.00000	8.30000	6.72727		2	4.81818	2.36364	1.90000	1.36364
	5	0.40000	3.30000	0.27273	1.09091		5	3.40000	1.10000	1.90909	2.90909		5	1.10000	2.20000	0.63636	2.63636
SHAS - Nauseated	1	0.90909	0.45455	0.18182	0.27273	SHAS - Sleepy	1	12.90909	14.18182	10.09091	17.36364	SHAS - Slurred Speech	1	0.27273	0.45455	0.54545	0.36364
	2	7.27273	5.18182	0.30000	1.00000		2	27.27273	32.63636	11.00000	20.63636		2	4.63636	0.45455	0.50000	0.27273
	5	1.40000	0.20000	0.36364	0.45455		5	19.30000	29.90000	9.54545	20.18182		5	0.30000	0.30000	0.36364	0.81818

• Some participants reported feeling some level of effects at various timepoints

• Vaping ethanol did not appear to have any statistically significant impact on self-

assessment measures

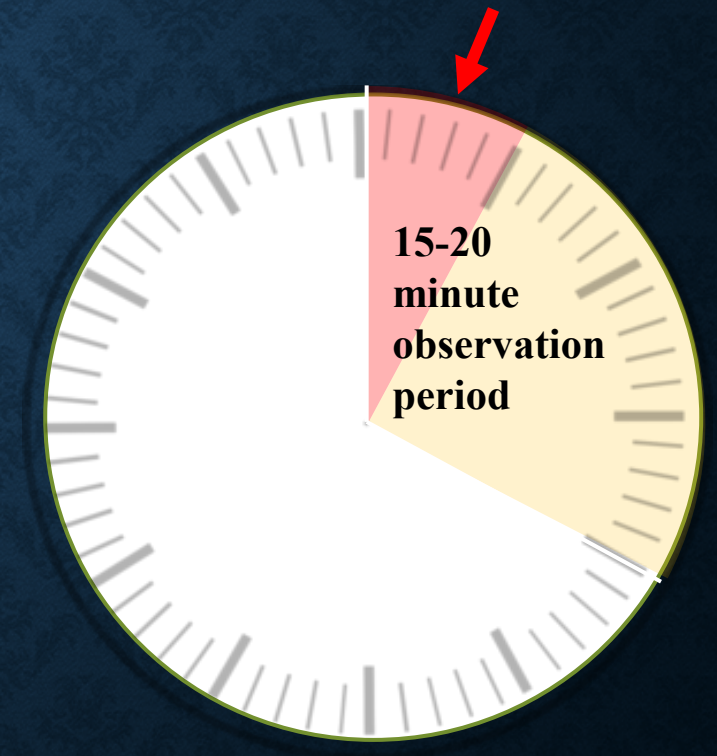
PUFF TOPOGRAPHY



CONCLUSIONS

- PG and VG did not interfere with PBT or EBT
- PBT immediately after vaping
 - Ethanol detected (>0.001 g/210L)
 - Puff-dependent
- Ethanol not detected by EBT
- Standard “observation period” is **NECESSARY!!**
- No statistically significant differences in SFSTs
- Some subjective effects reported

Breath test may detect alcohol!!!



IMPLICATIONS BEYOND A DUI INVESTIGATION

- Drug courts
- Substance use treatment centers
- Workplace testing
 - Regulated Companies/Industries:
 - Nuclear Power Plants
 - Trucking, Airline, Rail, Transit, Pipeline, and Maritime Industries
 - Non-regulated Companies/Industries
 - Substance abuse leads to increases in
 - Liabilities
 - Insurance premiums
 - Workers' compensation costs
- Interlock System



FINAL PROJECT

HOW DOES VAPING ETHANOL
IMPACT THE PHARMACOKINETIC
PROFILE OF ETHANOL AND
BIOMARKERS?

SOURCE

CORRESPONDENCE

- A physician assistant had a bloodspot PEth test positive at 64 ng/mL and claimed using vape fluids of various types.
- Medical Director
- “Have you studied the effect of vaping with these higher ethanol containing fluids on ETG or PETH? That would be of great interest in my world where we monitor health care professionals in recovery.”
- Reports they got a false positive for alcohol on a 72-hour urinary analysis on August 5th
- Citizen on probation
- “I can’t and haven’t used any drugs or alcohol. I have been sober since January 5th. My father purchased a vape for me, which I started using on August 2nd.”
- Dentist
- A recovering alcoholic sober since last June
 - Passed several urine and blood tests since alcohol testing began
 - Recently had two PEth tests come back positive
 - Does not knowingly drink or eat any foods or medicine with alcohol
 - Only reports use of hand sanitizer and vaping
 - Methadone maintenance patient positive for oral fluid ethanol
 - No history of alcohol positive drug screens and denied any recent alcohol consumption leading
 - Patient reports use of several e-cig and e-liquid brands
- Substance Abuse Counselor
- “This may actually provide an explanation for a LOT of alcohol positive screens we have received from patients who adamantly deny any recent alcohol consumption.”
- Inquiring citizen
- Received a positive PEth test result on October 1st
 - Denies consuming any alcohol since August 2nd
- Mother at risk of losing parental rights
- Three recent alcohol-positive saliva screens (.11 g/dL, .3 g/dL, and .04 g/DL)
 - Denies drinking any alcohol, but vapes

CORRESPONDENCE TO OUR LAB REGARDING OTHER ETHANOL-POSITIVE TESTS AFTER VAPING

MEASURES



PBT



URINE



ORAL FLUID ASSESSMENT



BLOOD



SFST



SELF FLUID ASSESSMENT

Collection Time

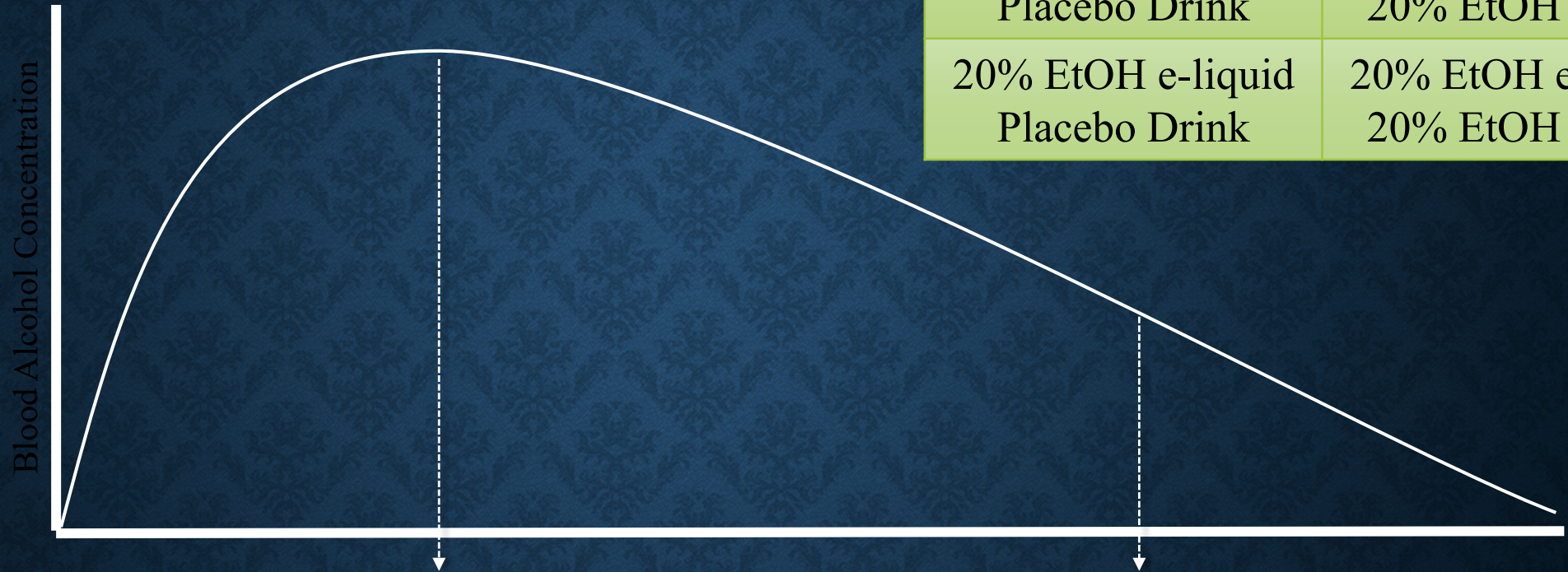
Vape/Drink Regimen

0% EtOH e-liquid
Placebo Drink

0% EtOH e-liquid
20% EtOH Drink

20% EtOH e-liquid
Placebo Drink

20% EtOH e-liquid
20% EtOH Drink



CONTROLS

DRINK

0

5

10

20

40

50

55

90

120

165

200

210

215

240

270



OR



VAPE



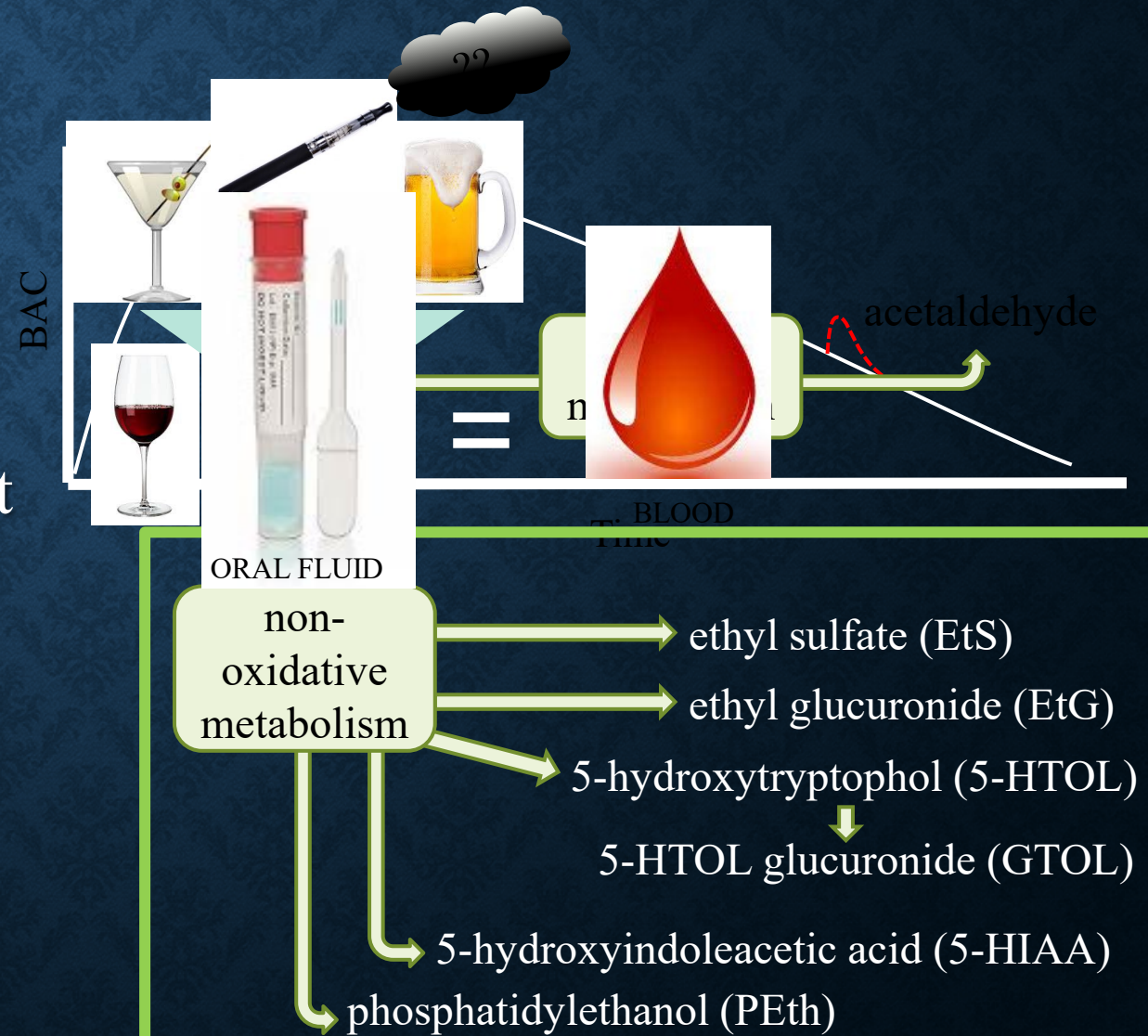
VAPE



??

STUDY MEASURES

1. Does vaping ethanol impact the absorption profile/ BAC peak?
2. Does vaping ethanol during the elimination phase impact BAC measures or the elimination profile?
3. Does vaping ethanol increase relevant biomarkers?
4. Evaluate correlation of biomarkers between OF and blood.





Juul accused of selling 1 million tainted vaping pods

Former Juul senior vice president Siddharth Breja claims he was fired in March for raising concerns about contaminated pods

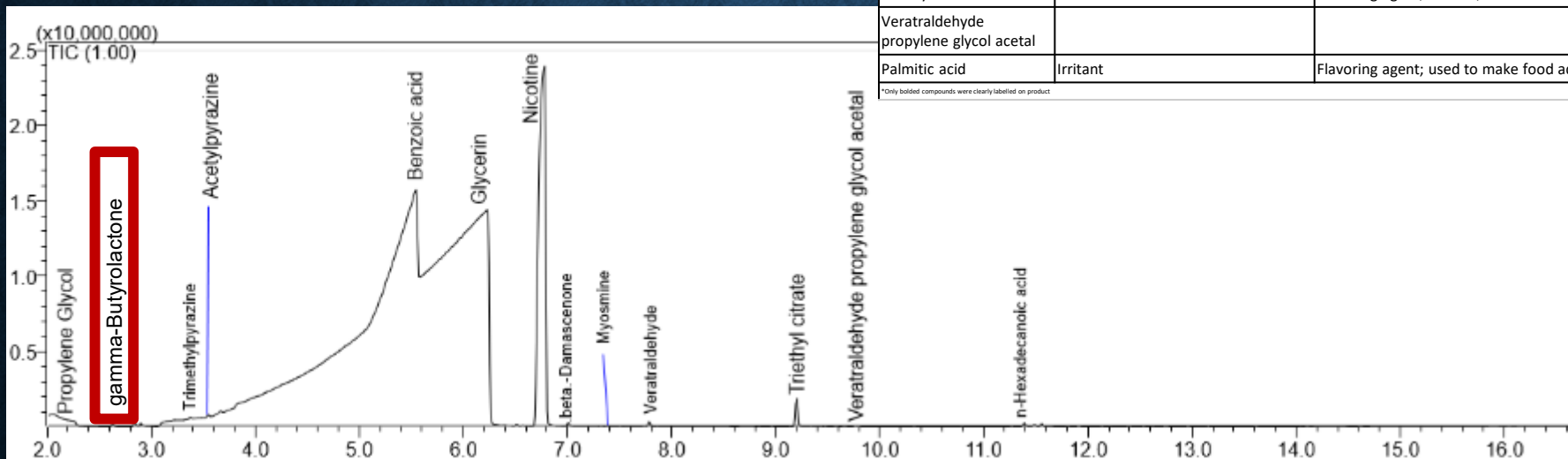
OCT 30, 2019

According to the lawsuit, then-CEO Kevin Burns responded to those concerns saying: "Half our customers are drunk and vaping like mo-fo's, who the f*** is going to notice the quality of our pods?"

The tests in the report focused on properties including nicotine levels, density, acidity, and a visual measure called refractive index. On their own "to be dramatic if someone had contaminated the products with a potent contaminant, these tests would never reveal that information," Michelle Peace, an associate professor of forensic science at Virginia Commonwealth University who has studied e-liquids, told BuzzFeed News by email.

JUUL VIRGINIA TOBACCO

Gamma-Butyrolactone (GBL) is a pro-drug of gamma-Hydroxybutyric acid (GHB), a Schedule 1 drug



GC-MS TIC of JUUL Virginia Tobacco e-liquid

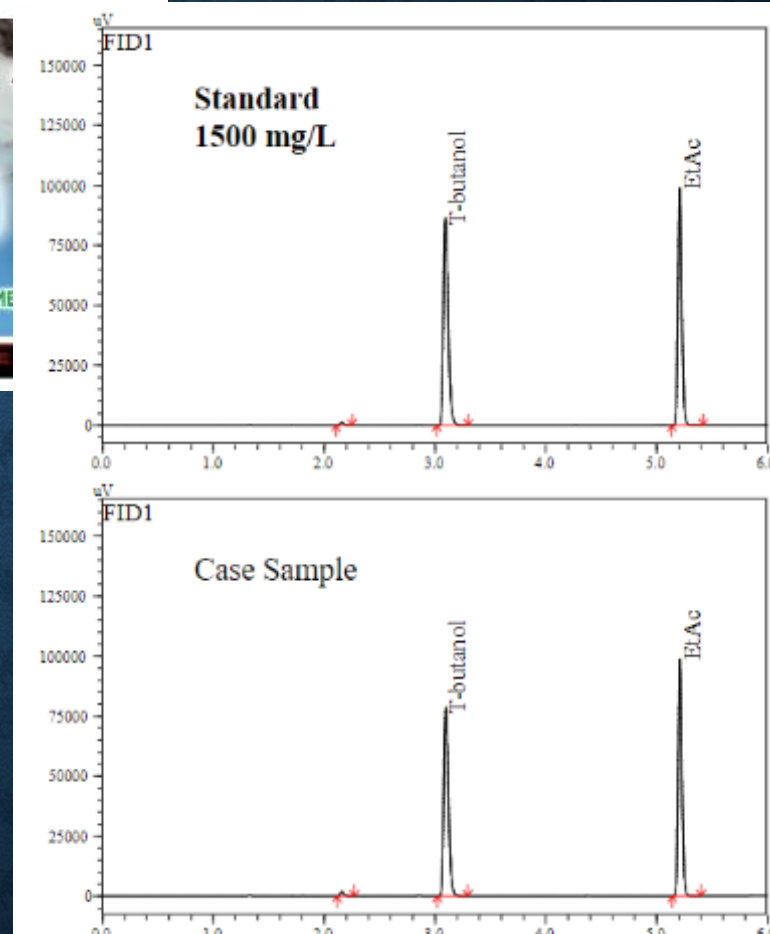
INGREDIENT*:	GHS CLASSIFICATION ⁴	USES ⁴
Propylene glycol		Antifreeze; food additive; solvent; humectant
gamma-Butyrolactone	Corrosive, Acute Toxic (oral, inhalation), Irritant, Flammable	Flavoring agent; solvent; food stabilizer; CNS depressant
Trimethylpyrazine	Flammable, Irritant (Acute toxicity, oral)	Flavoring agent
Acetylpyrazine	Irritant	Flavoring agent
Benzoic acid	Corrosive, Irritant, Health Hazard	Used to make other chemicals; food preservative; flavoring agent;
Glycerin		Solvent; humectant; vehicle/carrier; flavoring agent; emulsifier; thickener
Nicotine	Acute toxic (oral, dermal, inhalation), Environmental Hazard	CNS stimulant; Insecticide
beta-Damascenone	Irritant, Environmental Hazard	Flavoring agent
Myosmine	Irritant (Acute toxicity, oral)	*suspected Nicotine impurity*
Veratraldehyde	Irritant (Acute toxicity, oral)	Flavoring agent
Triethyl citrate	Irritant	Flavoring agent; solvent; food stabilizer
Veratraldehyde propylene glycol acetal		
Palmitic acid	Irritant	Flavoring agent; used to make food additives

*Only bolded compounds were clearly labelled on product

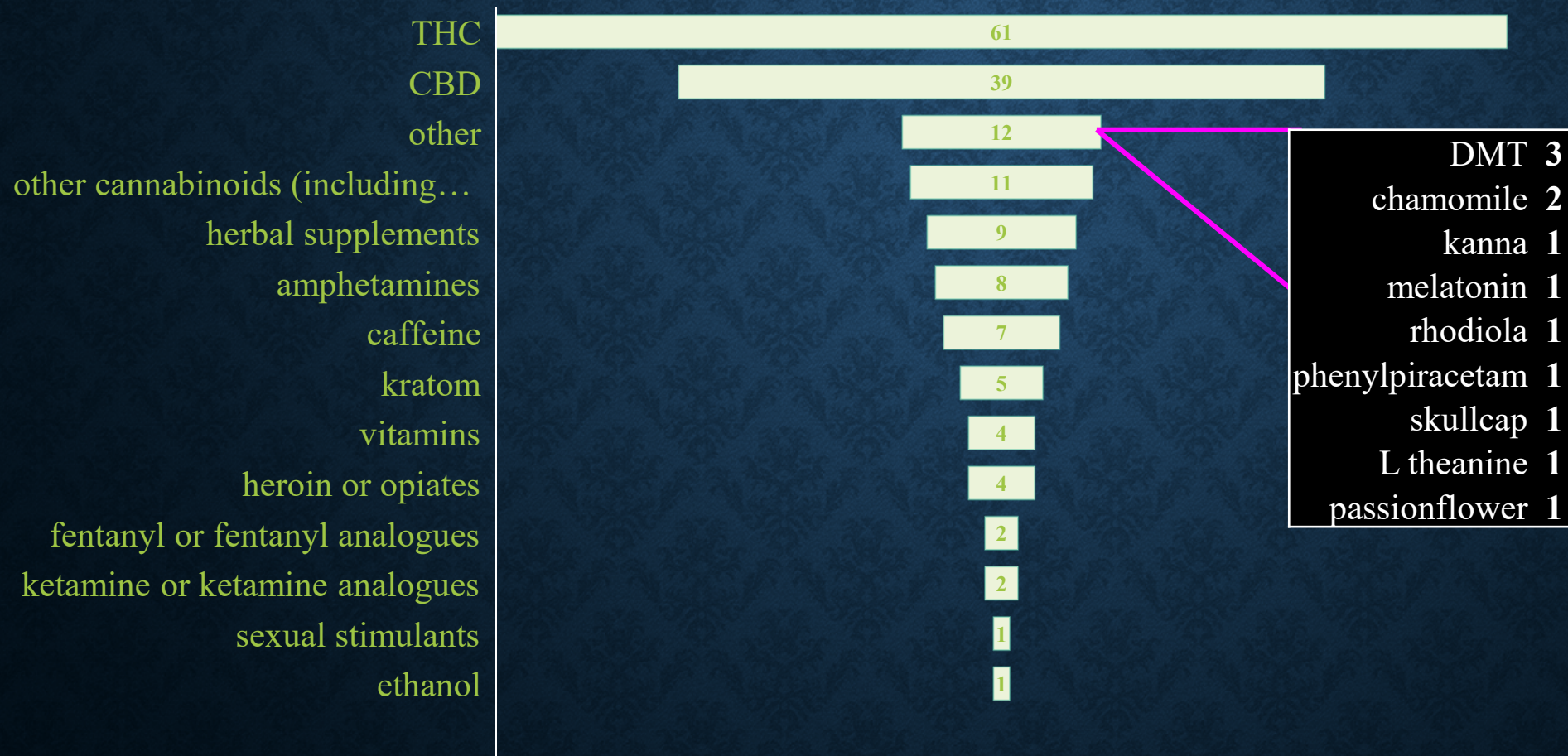
Please note, Innevepe Labs Heisenberg Menthol now come in 120ml chubby gorilla bottles, filled up to 100ml with excess room of 20ml to mix in whatever you need!



- Safety Sensitive Position
- Alcohol Abstinence Program
- Vaped on way to testing facility
- Preferred e-liquid
- PBT = 0.019%



Survey of US Residents and the Use of Electronic Cigarettes to Vape Drugs Other Than Nicotine

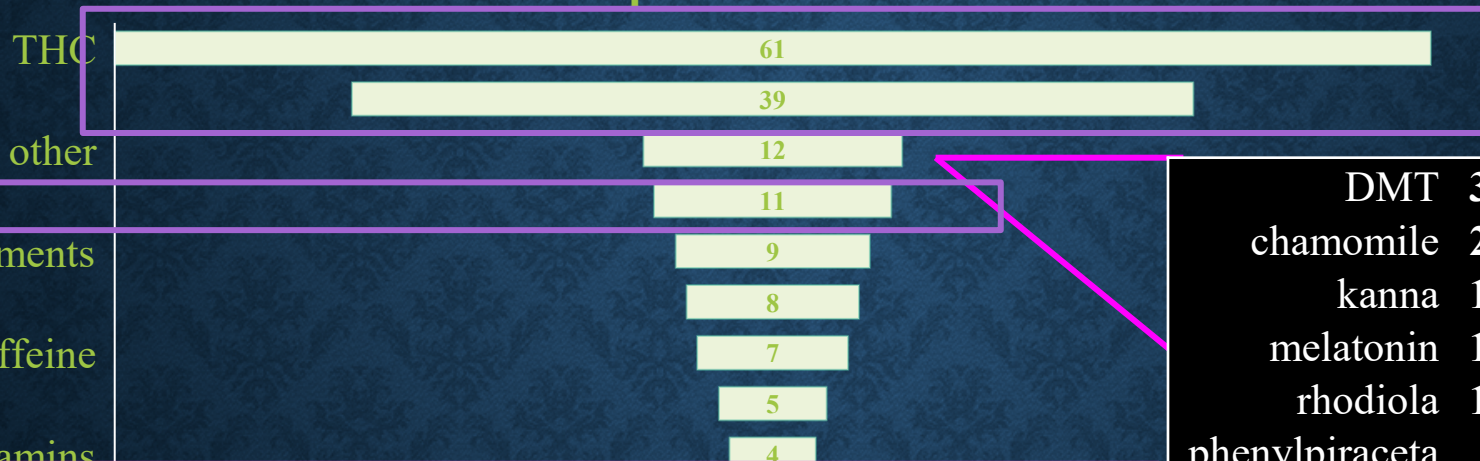


Unique combinations of substances ever used:

THC & CBD	12
phenylpiracetam & CBD	1
methamphetamine & CBD	1
nicotine & methamphetamine	1
nicotine & CBD	3
nicotine & THC	4
nicotine & DMT	2
THC & DMT	1
THC & CBD & other cannabinoids	1
THC & herbal supplements	1
kratom & THC	1
CBD & herbal supplements	1
THC & CBD & nicotine & caffeine	1
THC & CBD & Xanax & ketamine & LSD & vyvanse & coffee	1

Survey of US Residents and the Use of Electronic Cigarettes to Vape Drugs Other Than Nicotine

DOTN Ever Vaped



- DMT 3
- chamomile 2
- kanna 1
- melatonin 1
- rhodiola 1
- phenylpiracetam 1
- skullcap 1
- L theanine 1
- passionflower 1

- Unique combinations of substances ever used:
- THC & CBD 12
 - phenylpiracetam & CBD 1
 - methamphetamine & CBD 1
 - nicotine & methamphetamine 1
 - nicotine & CBD 3
 - nicotine & THC 4
 - nicotine & DMT 2
 - THC & DMT 1
 - THC & CBD & other cannabinoids 1
 - THC & herbal supplements 1
 - kratom & THC 1
 - CBD & herbal supplements 1
 - THC & CBD & nicotine & caffeine 1
 - THC & CBD & Xanax & ketamine & LSD & vyvanse & coffee 1

N=82	USE	CONTEXT									
		alone	with friends	socially	drinking	driving	home	work	school	indoor	outdoor
amphetamines	8 (9.8%)	3	2	1	0	3	3	2	2	3	2
CBD	40 (48.8%)	25	16	8	2	6	15	8	5	14	11
“other cannabinoids”	22 (26.8%)	15	13	8	1	5	11	5	4	9	10
Δ9-THC	62 (75.6%)	35	34	22	1	13	26	14	10	27	26
herbal products	9 (11.0%)	4	1	0	0	1	3	0	0	2	1
kratom	5 (6.1%)	1	1	1	1	0	1	0	0	0	0

BLUE LOTUS FLOWER CASE

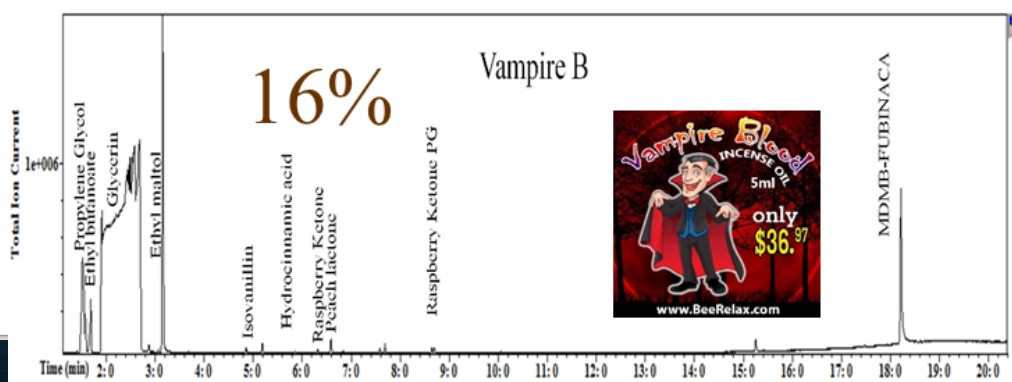
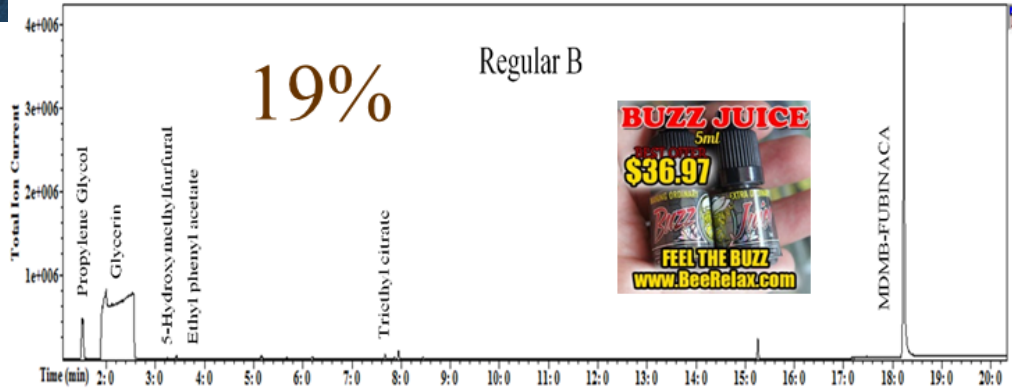
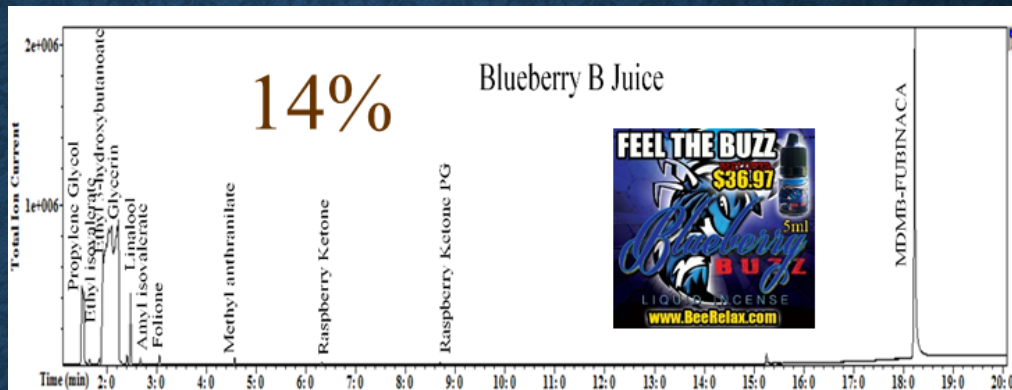
- Confiscated dark brown resin from minor
- Suspected Blue Lotus Flower resin
 - Contains apomorphine and nuciferine
 - Apomorphine
 - Non-selective dopamine agonist
 - Used as both a sedative hypnotic and stimulant to treat erectile dysfunction
 - Nuciferine
 - Antagonist and reverse agonist for multiple 5-HT receptors
 - Used as potential anti-psychotic and vascular disease treatment
 - Not approved by the FDA



Table 1. Concentrations of apomorphine and nuciferine.

Sample (n = 3; mean ± SD)	Apomorphine (ng/mL or ng/g)	Nuciferine (ng/mL or ng/g)
Confiscated resin	ND	4,300 ± 170
Blue Lotus Herbal E-Liquid	<1.0	<1.0
Blue Lotus Flower Powder	ND	<1.0
Blue Lotus Resin Extract	ND	25 ± 3
Space Lotus Resin Extract	130 ± 10	2,700 ± 400

ND = None detected



Sale!

Blueberry BUZZ JUICE 5ml

BLUEBERRY BUZZ

\$36.00 - \$2,150.00

Price: Choose an option

1

Add to cart

SKU: N/A Category: Liquid Incense Tags: blueberry buzz juice, blueberry kush, buzz juice

Description Additional Information Reviews (0)

DESCRIPTION

Blueberry buzz Juice liquid incense is an all New Liquid Aroma Fragrance oil that will captivate and enhance any mood!
 Taking Aromatherapy From Ordinary, to Extraordinary!
 SIT BACK, RELAX AND GET READY FOR A NEW EXPERIENCE!
 Blueberry Kush Juice liquid incense IS LIKE NO OTHER... WE ARE SURE YOU HAVE TRIED THE COMPETITION IN THE PAST... AND SADLY MOST CUSTOMERS HAVE BEEN LEFT DISAPPOINTED.

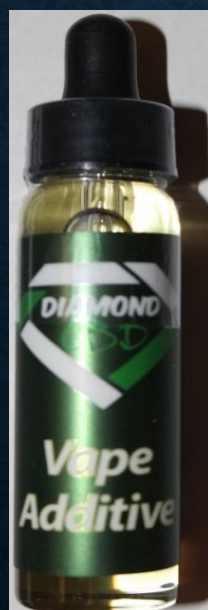
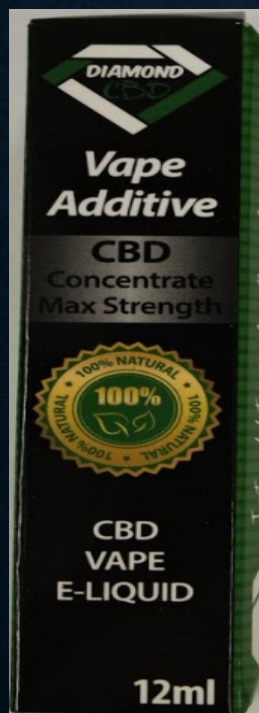
DIAMOND CBD PRODUCTS

Table 1. Detection of CBD and other psychoactive compounds in CBD e-liquids.

Sample (Received for Analysis)	CBD	THC	5F-ADB	DXM
Liquid Gold Strawberry	X		X	
Diamond CBD Vape Additive	X		X	
Samples (Purchased)	CBD	THC	5F-ADB	DXM
Liquid Gold Strawberry	X		X	
Liquid Gold Jungle Juice	X	X	X	
Diamond CBD Vape Additive	X			X
Blue CBD 250 mg	X			
Blue CBD 1000 mg	X			
Diamond CBD 50 mg	X			
Diamond CBD 1000 mg	X	X		

X-indicates detection.

SUBMITTED



PURCHASED



PROJECT: "Product Analysis" RTP Labs ID: 18-014-4

Presented below are the laboratory results of the sample received on January 29, 2018. We received the container and amount of sample as listed below. The test results are only for the sample tested and may not be representative of other samples or batches with the same product name. The sample was weighed, extracted and analyzed by full scan GC/MS for the compounds listed. The GC/MS was calibrated using validated reference standards at >95% purity and at known concentrations. The test results are based on the GC/MS retention times and molecular fragmentation patterns obtained from the reference standards. The method reporting limits are 0.05%.

*****This report is not a certification of the legality or safety of the product.*****

This report cannot be used for sales, commercial purposes, publically displayed, and modified in any way. RTP Labs cannot be held responsible for misuse of this test report. It is recommended that an attorney be consulted for advice on the legality of the product tested.

Laboratory Analysis Report

Product Name	Batch/Lot	GC/MS Test #1 Extended List Results	
Chong's Choice Vape Additive Max Strength Liquid 16 mL	Sample Date 1/27/18	Delta-9-THC <0.3%; CBD 2.2 mg/gram	
		JWH-018 (AM-678)	Not Detected
		JWH-018 N-(3methylbutyl) isomer	Not Detected
		JWH-019; JWH-073; JWH-081; JWH-122;	Not Detected
		JWH-200; JWH-203; JWH-250; JWH-398;	Not Detected
		AM-694; AM-2201; PB-22	Not Detected
		RCS-4 (SR-19); RCS-8 (BTW-8; SR-18)	Not Detected
		UR-144; XLR11; AKB48; CP 47,497; THJ2201	Not Detected
		AB-PINACA; AB-CHMINACA	Not Detected
		AB-FUBINACA;	Not Detected
		CP 47,497-C8 (Same as Cannabicyclohexanol)	Not Detected
		HU-210/211	Not Detected
		JWH-007; JWH-011; JWH-015; JWH-016; JWH-020; JWH-022; JWH-030; JWH-098; JWH-164;	Not Detected
		JWH-182; JWH-201; JWH-210; JWH-251; JWH-302; JWH-307;	Not Detected
		JWH-018 adamantyl;	Not Detected
JWH-018 adamantyl carboxamide (2NE1)	Not Detected		
CP-55,940; WIN-48098; WIN-55212-2	Not Detected		
HU-308; HU-331	Not Detected		
AM-251; AM-630; AM-1220; AM-1241; AM-1248; MAM-2201; NM-2201	Not Detected		
AM-2201 benzimidazole;	Not Detected		
AM2201-8-Quinoliny Carboxamide	Not Detected		
AM-2232; AM-2233; AM-3102	Not Detected		
URB-597; URB-602; URB-754; STS-135	Not Detected		
5F-AKB48; AKB48-4-Florobenzyl; 5F-ABICA	Not Detected		
CB-13; 5FPB-22; BB-22; NNEI; 5FNNEI	Not Detected		
5MeO-DALT	Not Detected		

Tests of CBD oils reveal three surprise chemicals, one big problem

Janet Burns

December 20, 2018



LABORATORY REPORT

Item Name: **DIAMOND CBD**
Agency/Other ID: CBD Vape Additive
Specimen Received: 11/20/18, 1045 Hours
Specimen Collected: Unknown

Test	Specimen	Result	Date Completed
Pill / Powder / Liquid Screen	Liquid Oil	See Below	November 22, 2018

Yellow liquid oil contains cannabidiol (CBD) and melatonin.

No other illicit drugs, synthetics, or pharmaceuticals were identified.

Note: Melatonin detected as the major constituent and CBD detected as the minor constituent.

Analysis performed by full scan gas chromatography-mass spectrometry.

Sample description: One "12mL Diamond CBD Vape Additive" product box containing one sealed "12mL Diamond CBD Vape Additive" dropper bottle containing yellow liquid oil.



Contents lists available at ScienceDirect

Forensic Science International

journal homepage: www.elsevier.com/locate/forensi



Short Communication

The unexpected identification of the cannabimimetic, 5F-ADB, and dextromethorphan in commercially available cannabidiol e-liquids

Justin L. Poklis^{a,*}, Haley A. Mulder^b, Michelle R. Peace^b

^a Virginia Commonwealth University, Department of Pharmacology & Toxicology, 410 North 12th Street, Room 754, Box 980613, Richmond, VA 23298-0613, USA

^b Virginia Commonwealth University, Department of Forensic Science, 1015 Hayd Avenue, Room 2015, Richmond, VA 23284, USA



The Philadelphia Inquirer

Toxic chemicals found in popular CBD products

by Sam Wood, Posted: November 15, 2018

The New York Times

Ads Pitching CBD as a Cure-All Are Everywhere. Oversight Hasn't Kept Up.



Michelle R. Peace, a forensic toxicologist at Virginia Commonwealth University, runs a lab that has tested CBD products to identify hidden ingredients.

Partner Michels-Boyer for The New York Times

By Tiffany Hsu

Aug. 13, 2019

Scientists at Virginia Commonwealth University in



Research of the Year 2018

SCIENTISTS ANALYZED THE CHEMISTRY OF POPULAR E-CIGARETTES

Studies helped explain e-liquids' appeal and uncovered unexpected contaminants





Case	Product Purchase	Victim Quotes	Unexpected Ingredient
CBD for Anxiety	Store	He was pale and glassy eyed...	Synthetic Cannabinoid
CBD for Anxiety	Store	hard high	Synthetic Cannabinoid + OTC Cough Med
Unknown	Online	Have you tested other CBD products because this is some bad [stuff]	Synthetic Cannabinoid
Unknown	Online	I know what pot makes me feel like and this wasn't it	Synthetic Cannabinoid
CBD for Anxiety	Online	I've not left my apartment for 4 days	Synthetic Cannabinoid



DELTA-8



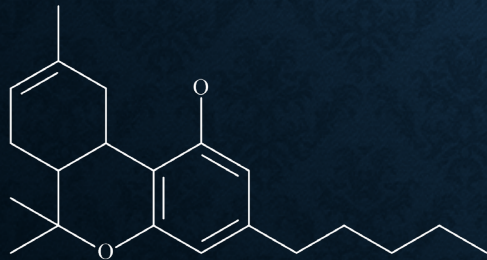
DELTA-10



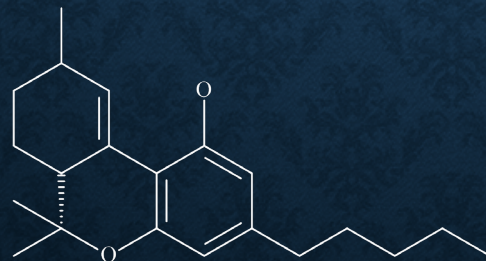
THC-O



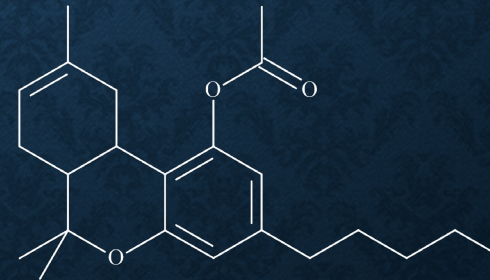
THC-P



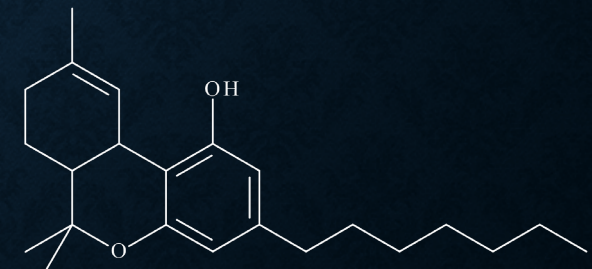
Delta-8-THC



Delta-10-THC



Delta-8-THC-O



THC-P

THC Analogs

Isomers vs. Derivatives

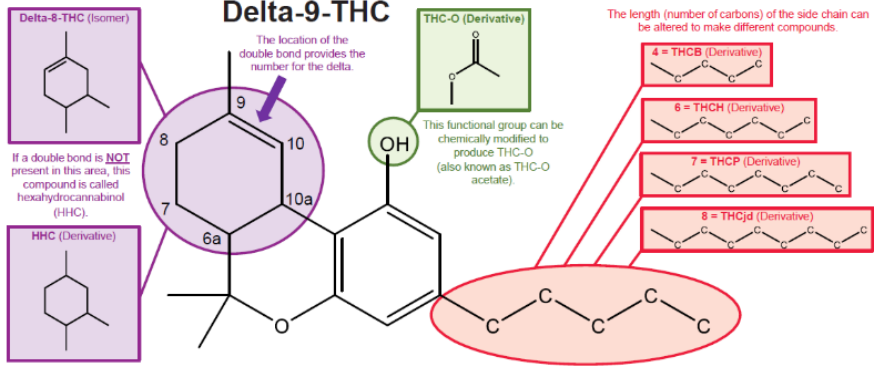
Analogue A compound having a similar structure to another compound; includes both isomers and derivatives

Isomer

Same number of carbons, hydrogens, and oxygens, but rearranged. For example: Delta-8 vs. Delta-9 vs. Delta-10

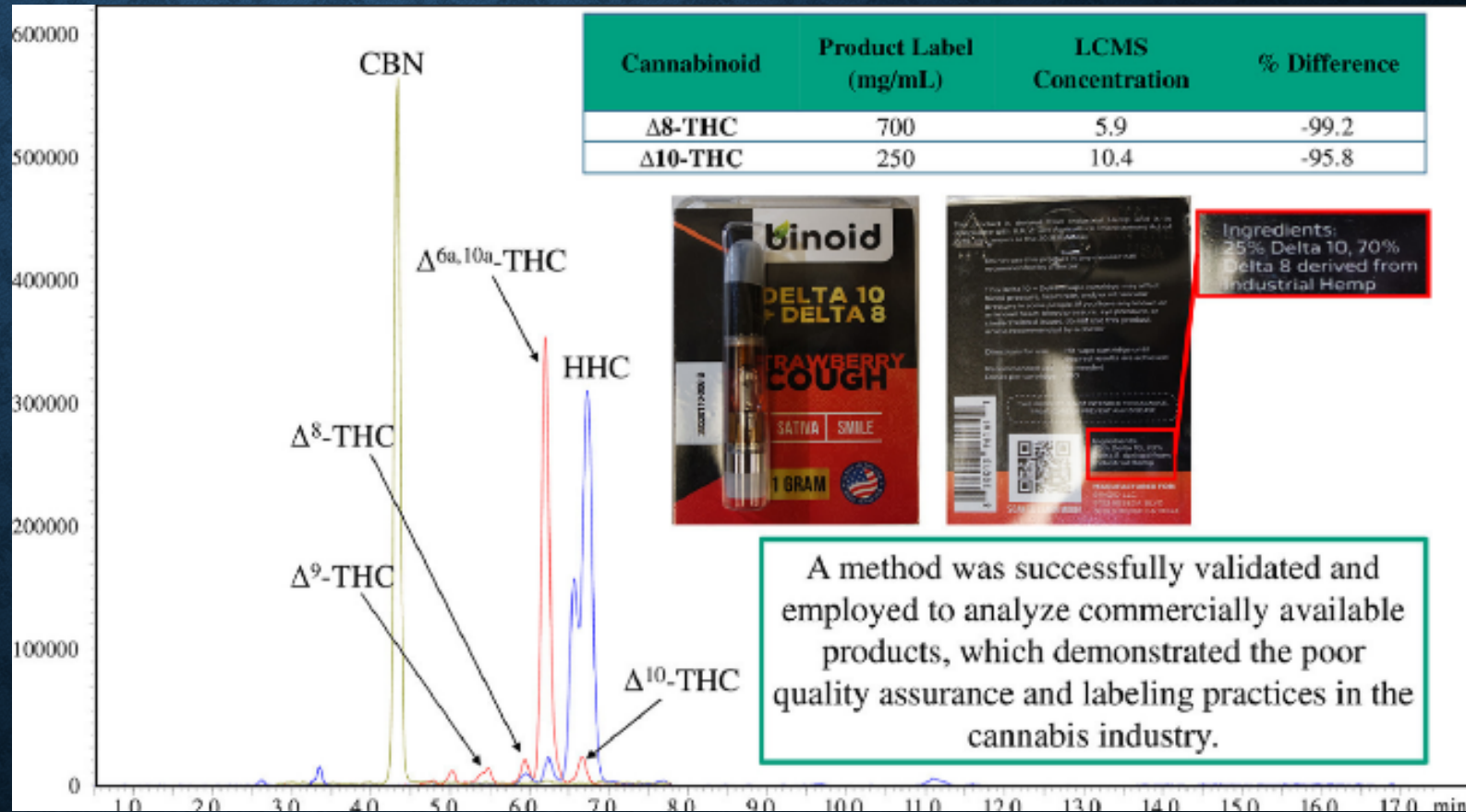
Derivative

Looks like Delta-9-THC, but has a different number of carbons, hydrogens and oxygens. For example: HHC, THC-O, or THC-P



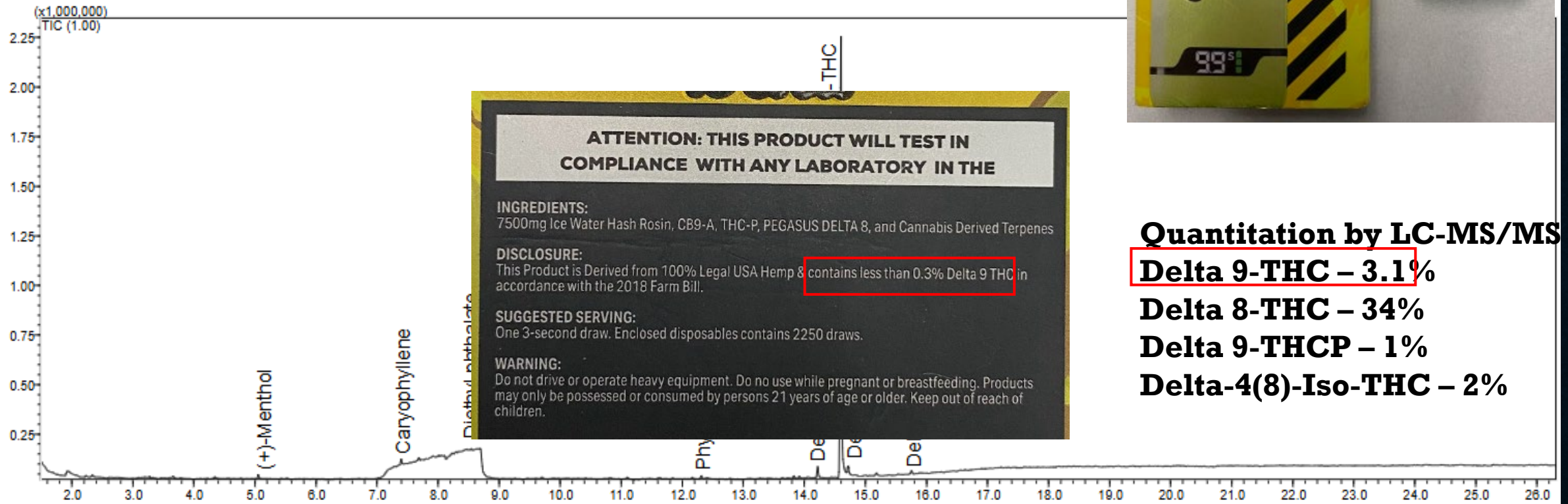
Any combination of these changes are possible, producing molecules that look similar to Delta-9-THC with unknown effects and safety. Thousands of THC-like compounds can be formed (e.g., HHC-O, Delta-10-THCH, Delta-8-THCP-O).

Alcohol, Drugs, and Impairment Division of the National Safety Council (NSC-ADID) | To contact the NSC-ADID, see: <https://www.nsc.org/health/behavioral-health/divisions/alcohol-drugs-impairment-adid>

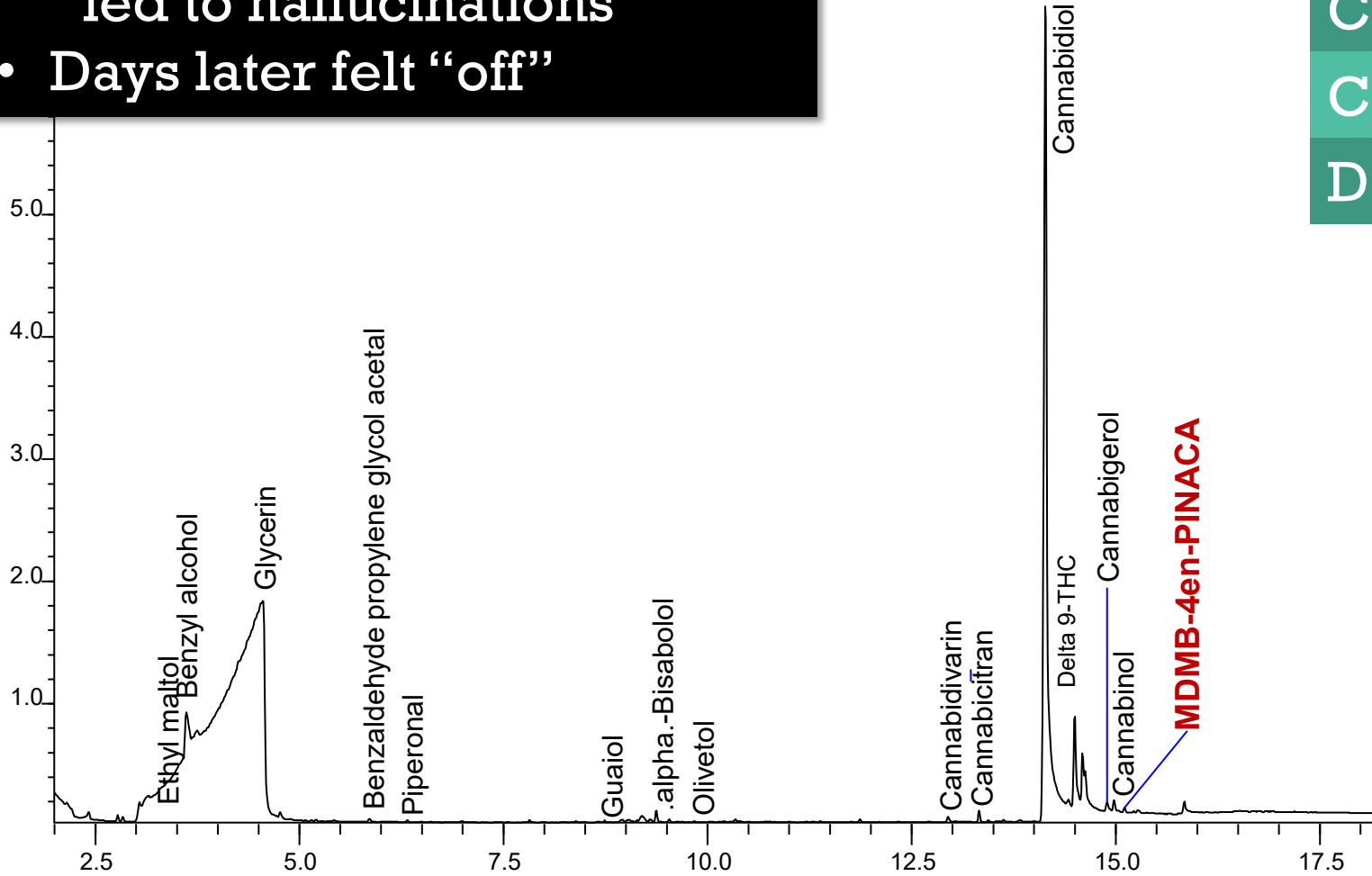


Case Received May 2025

“He would cry, was hypervigilant, and almost catatonic for periods.”



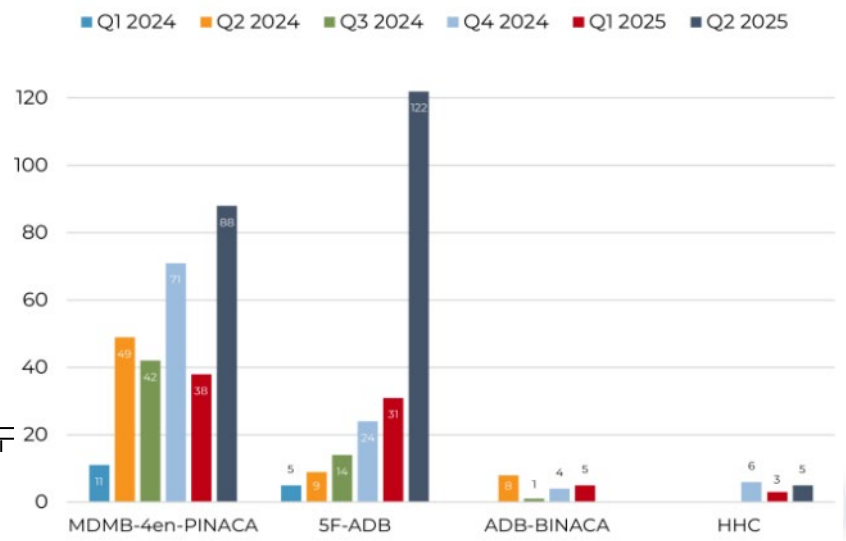
- Took CBD for back pain
- Pain increased and started taking more
- Felt like marijuana that led led to hallucinations
- Days later felt “off”



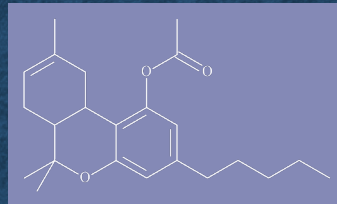
Analyte	%
CBD	25.3
CBN	1.2
CBG	1.4
CBDV	1.4
D9-THC	<LOQ



cfsre | NPS DISCOVERY
TRENDS: Q1 2024 TO Q2 2025



Sample submitted as part of a criminal case



LABELLED TO CONTAIN
10 mg THC-O-A

FOUND TO CONTAIN
0.18-2.4 mg Delta-8-THC-O-A
0.26-4.8 mg Delta-9-THC-O-A
0.11-2.62 mg CBD-di-O-A
0.048-0.18 mg Delta-8-THC
0.015-0.063 mg Delta-9-THC

Individual reported experiencing *visual and auditory hallucinations* precipitating the *commission of a felony* and subsequent *arrest*; post-arrest observations included:

- *irrational thinking,*
- *delusions of influence and reference,*
- *paranoid and grandiose ideations and delusions,*
- *confusion,*
- *fragmented/disjointed speech,*
- *depersonalization and religiosity"*

APRIL 23, 2003

Powell's Mission Impossible



TIME

HOW

**UNREGULATED
CANNABIS**

HAS TURNED
MILLIONS OF
US INTO ...

**HUMAN
GUINEA
PIGS**



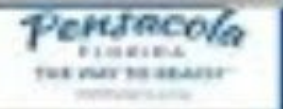


WSMV4 INVESTIGATES

41 DUI ARRESTS MADE BY TROOPER DISMISSED

22 OF THE ARRESTS WERE DISMISSED BECAUSE DRIVER WAS SOBER

6:06 52°



FORECAST

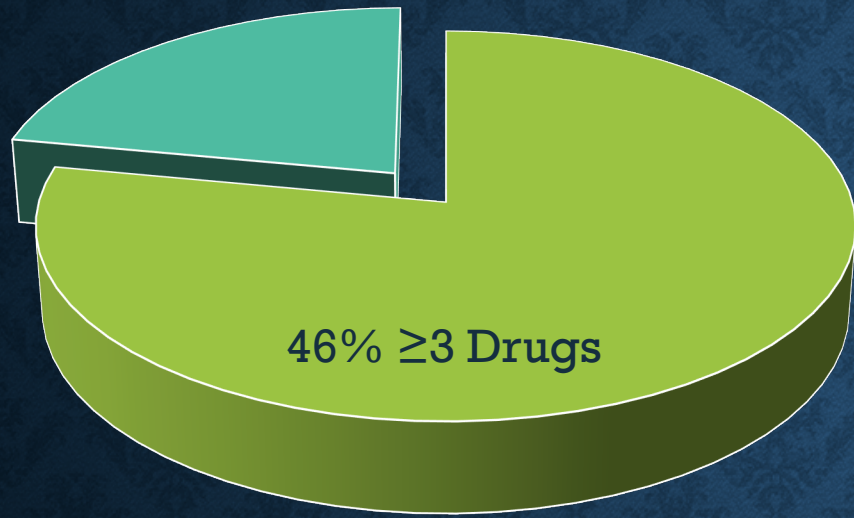
LAFAYETTE

9PM ● 33°

7AM ☀ 31°

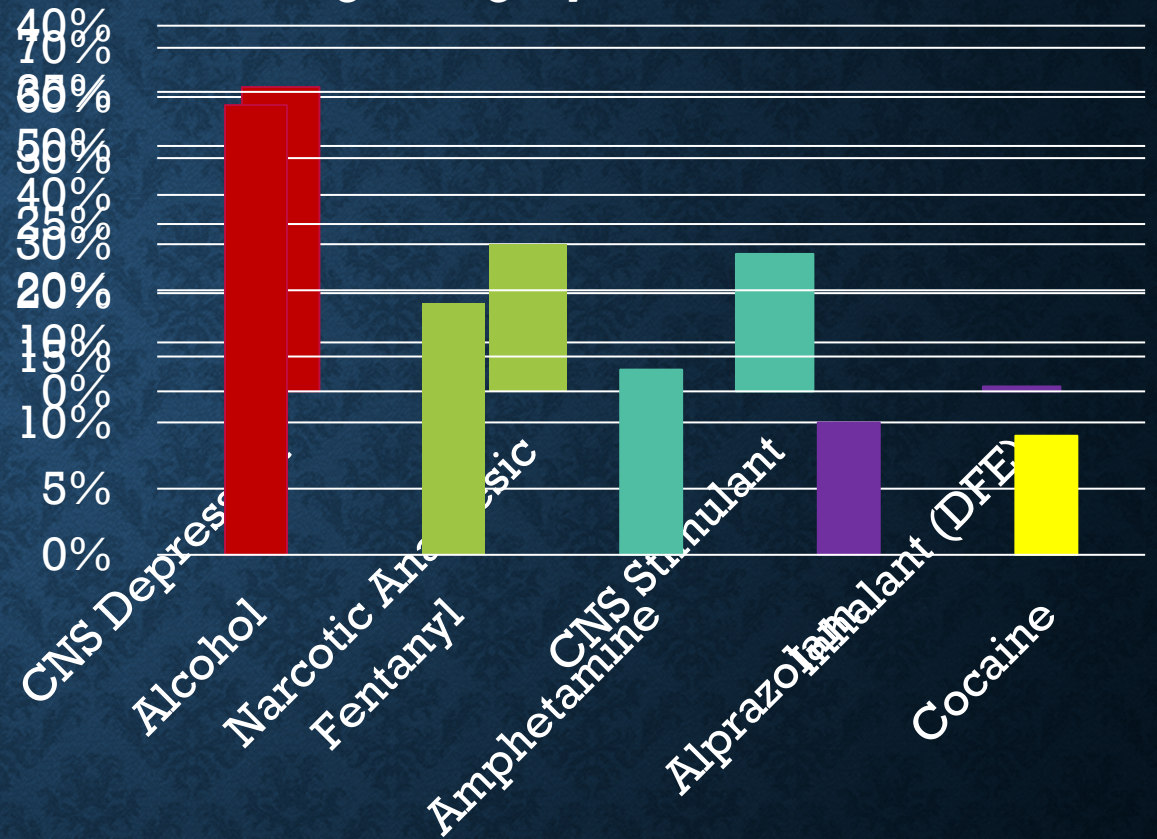
12PM ☀ 53°

THC Cases



■ Polypharmacy ■ Cannabis Only

Drug Combinations Drug Category Combinations



Nicholas B. Tiscione
Palm Beach County Sheriff's Office
Toxicology Unit
TiscioneN@pbso.org

Case 1: Urine DUI

- Breath Alcohol Test
 - None Detected
- Urine drug testing
 - Carboxy D9-THC

RESULTS AND CONCLUSIONS:

Urine drug analysis:
Carboxy-THC

The following methods were used for drug analysis:
Enzyme Linked Immunosorbent Assay (ELISA)
Gas Chromatography with Mass Spectrometry (GC-MS)
Liquid Chromatography with Tandem Mass Spectrometry (LC-MS/MS)



Nicholas B. Tiscione - Toxicology Manager

2020-10-04 03:19:45 -0400
AXON BODY 3 X6039BD9C



Case 2: D9-THC polypharmacy

- 23 yo female
- Multiple crashes at 10a
 - Drove on sidewalk
 - Stuck pedestrians
 - Struck power pole
 - Left scene
- Blood draws at 3p and 7:40p
- Convulsed immediately after crashes, blank stare, combative, delusional



Toxicology:

- 3p
 - Acetone
 - Amphetamine: 68 ng/mL (± 15)
 - D9-THC: 4.5 ng/mL (± 1.4)
 - Hydroxy-THC: 2.6 ng/mL (± 0.8)
 - Carboxy-THC: 63 ng/mL (± 16)

7:40p

- Acetone
- Amphetamine: 69 ng/mL (± 15)
- D9-THC: 4.0 ng/mL (± 1.2)
- Hydroxy-THC: 2.2 ng/mL (± 0.7)
- Carboxy-THC: 47 ng/mL (± 12)
- Lorazepam: <30ng/mL

Delusional

- "I am God"
- Spoke in tongues
- Combative
 - EMT gave ketamine

Case 3: D8-THC

- 26yo male
- Single vehicular crash, 9p
 - Tree in median
- Blood draw, 11p
- Uncooperative, out of touch with reality

Toxicology:

- Acetone
- IA: + cannabinoids
- Confirm:
 - D8-THC, 1.8 ng/mL

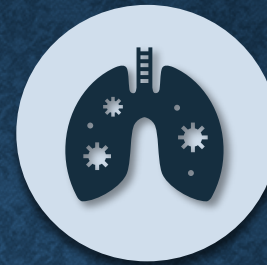


Transported to hospital due to mental state

- Bloodshot eyes, low eyelids
- Overly excited
- Yelling
- “Drunk in the Spirit”
- Stated name as “Holy Spirit”
- Spoke to girlfriend in heaven
- Did not know he was in crash
- Spoke in tongues

Subject called officer after crash

- Stated he bought D8 vape
- Clerk recommended it for anxiety
- Had used it throughout the week and made him feel like he was not in control



Vaping-related lung injury is possible



Observation of deprivation period prior to breath test is critical



Industries constantly evolve to elude regulations



"Research as marketing" degrades public trust



Stop-testing does not fully explain an episode of intoxication



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