



FORENSIC TOXICOLOGY & Drug Impaired Driving

2025 Texas Impaired Driving Forum
March 5, 2025
Hilton Austin Airport – Austin, TX



Hello!

I am Joseph Jones



- PH.D. – Oklahoma State University
 - Forensic Sciences - Human Performance Toxicology
- M.S. Philadelphia College of Osteopathic Medicine
 - Forensic Medicine
- B.S. – Baylor University
 - Forensic Science/Chemistry/Biology
- Adjunct Instructor for the Ohio, Indiana, Oklahoma, Louisiana, and Georgia DEC Programs







The NSC Alcohol, Drugs and Impairment Division tackles substance abuse and prescription drug issues and makes recommendations to combat the drinking and driving problem through legislation, education and other countermeasures.

The Division also offers plenty of opportunities for safety-focused networking with others in your field.



North La
Criminalistics
Laboratory
@NLCL.ORG



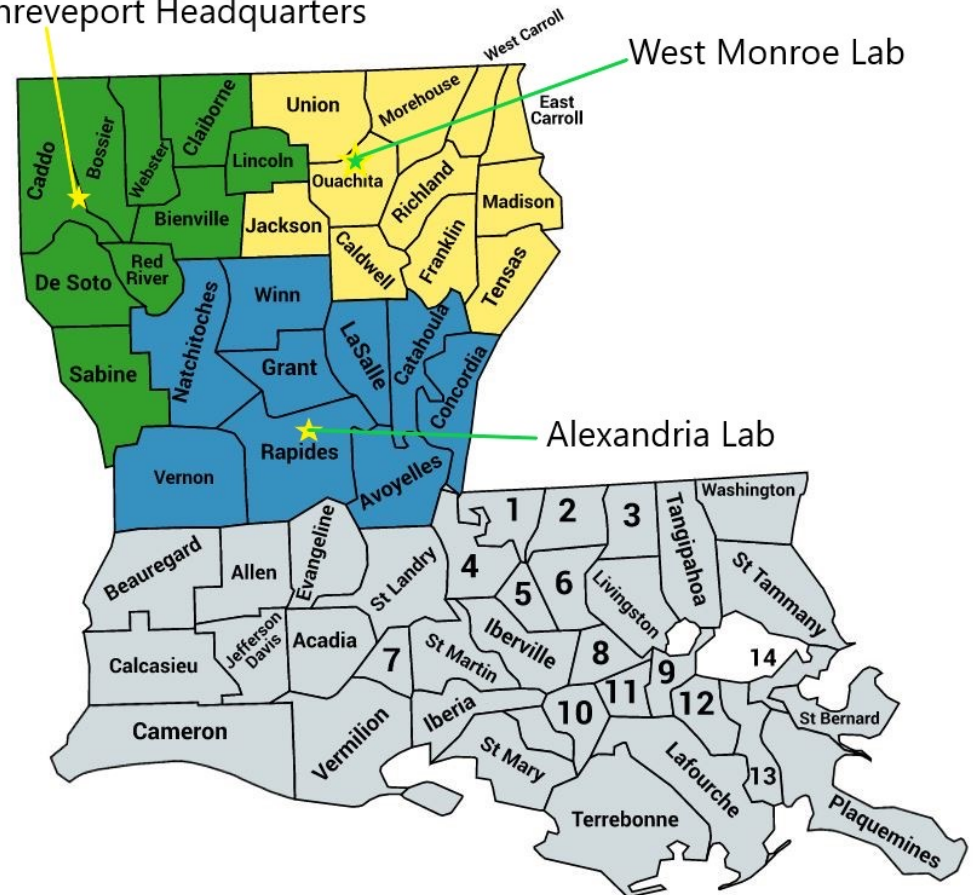
NORTHLACRIMELAB

www.nlcl.org

Shreveport Headquarters

West Monroe Lab

Alexandria Lab





- DUI & DUID Current Landscape
- A Closer Look at Methamphetamine in Impaired Driving
- Addressing methods of ingestion in DUID
- Delta-8 THC
- Therapeutic Concentrations



Top 10 Toxicology Analytes Reported

Total Requests
5,579

Year

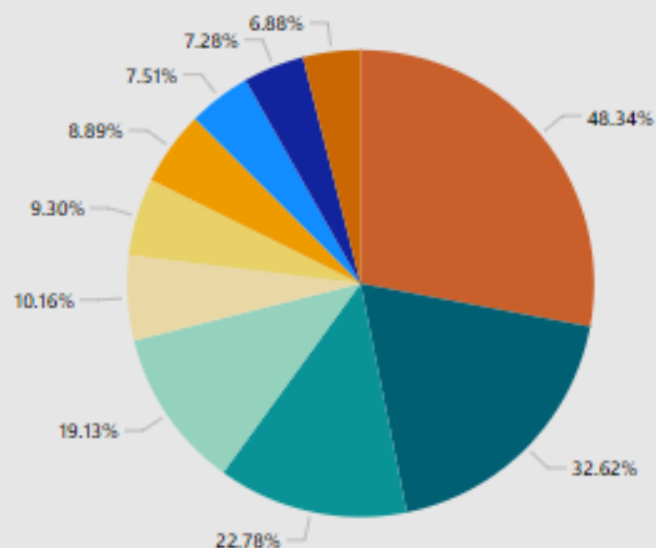
All

Month

All

Top 10% Toxicology Analytes Details

- THC-COOH
- THC
- Methamphetamine
- Amphetamine
- Fentanyl
- Gabapentin
- Alprazolam
- Cotinine
- Benzoylcegonine
- Norfentanyl



*Request count does not include requests where no analyte was detected.



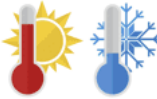




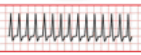








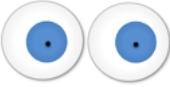






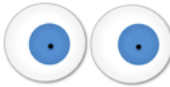



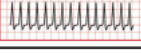






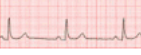







**EtOH +
0.043 g%**














- Amphetamine 17 ng/mL
- Methamphetamine 240 ng/mL
- Fentanyl 6.3 ng/mL
- NorFentanyl 7.1 ng/mL
- Clonazepam 13 ng/mL
- Gabapentin 17,360 ng/mL
- Buprenorphine 1.2 ng/mL
- Norbuprenorphine 2.6 ng/mL
- Tramadol 66 ng/mL
- Acetone + 0.022 g%





	HR & BP 	Resp. 	Temperature 	Pupils 	Bowel Sounds 	Diaphoresis 
Anticholinergic Anticholinergics – Atropine, scopolamine, glycopyrrolate, benztrapine, trihexyphenidyl Antihistamines – Chlorpheniramine, Cyproheptadine, Doxylamine, Hydroxyzine, Dimenhydrinate, Diphenhydramine, Meclizine, Promethazine	 	No change 		Dilated 		
Cholinergic Organic Phosphorous Compounds: Carbamates • Arecholine, Pilocarpine, Urecholine (Betanecol), Carbachol, Choline, Metacholine, Mushrooms	No change 	No change 	No change 	Pinpoint 		
Opioid Morphine • Codeine • Tramadol • Heroin • Meperidine • Diphenoxylate • Hydromorphone • Fentanyl • Methadone • Propoxyphene • Pentazocine • DXM • Oxycodone • Hydrocodone	 			Pinpoint 		
Sympathomimetic Caffeine, cocaine, amphetamines, methamphetamines, Ritalin, LSD, Theophylline, MDMA	 			Dilated 		
Sedative-Hypnotic anti-anxiety agents, muscle relaxants, antiepileptics and preanesthetic medications – Barbituates – Benzodiazepines	 			No change 		

Toxidrome: Sympathomimetics

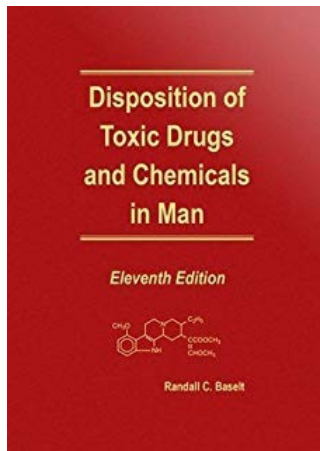
	HR & BP	Resp.	Temperature	Pupils	Bowel Sounds	Diaphoresis
						
Sympathomimetic Caffeine, cocaine, amphetamines, methamphetamines, Ritalin, LSD, Theophylline, MDMA	 			Dilated 		

- DRE CNS Stimulants:
 - HGN – None
 - VGN – None
 - LOC – None
 - Reaction to Light - Slow

Blood results – What do they mean?

BASELT

- 30 NG/ML



WINEK

- 10-50 NG/ML

Winek's Drug & Chemical Blood-Level Data 2001

Prepared by: Charles L. Winek, Ph.D., Wagdy W. Wahba, Ph.D.,
Charles L. Winek, Jr., B.S. (Pharm.), M.S., and Tracey Winek Balzer
B.S. (Pharm.), M.S.

We have gathered the data in the table from the literature

Units

Drugs and
mg% and μ

MITLER, ET AL.

- 100 NG/ML
AFTER DOSING 60
MG
- 20 NG/ML AFTER
DOSING 10 MG

[Sleep](#), 1993 Jun;16(4):306-17.

Treatment of narcolepsy with methamphetamine.

Mitler MM¹, Hajdukovic R, Erman MK.

Author information

1 Sleep Disorders Center, Scripps Clinic and Research Foundation, La Jolla, California 92037.

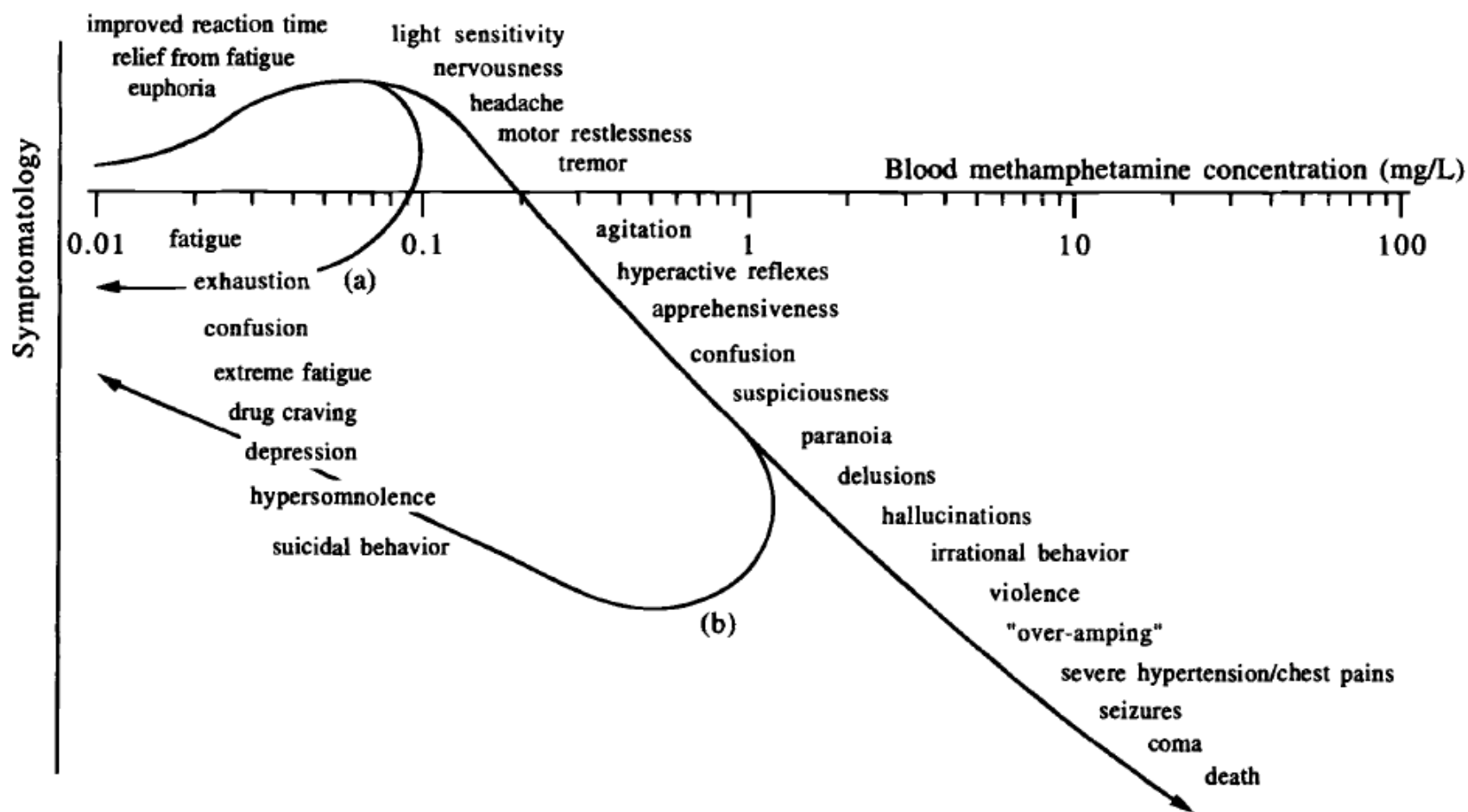


FIG. 1—Hysteresis plot showing effects of methamphetamine that impact driving performance with respect to blood methamphetamine concentration (mg/L). The figure shows examples of withdrawal effects from (a) low dose and (b) high dose drug use.

	Acute	Downside
HGN	None	None
VGN	None	None
LOC	None	None
Pupil Size	Dilated	Normal/Constricted
Rxn to Light	Slow	Slow
Pulse Rate	Up	Normal to Slow
BP	Up	Normal
Body Temp.	Up	Normal



	Acute	Downside	Narc. Analgesic
HGN	None	None	None
VGN	None	None	None
LOC	None	None	None
Pupil Size	Dilated	Normal/Constricted	Constricted
Rxn to Light	Slow	Slow	Little/None
Pule Rate	Up	Normal to Slow	Down
BP	Up	Normal	Down
Body Temp.	Up	Normal	Down

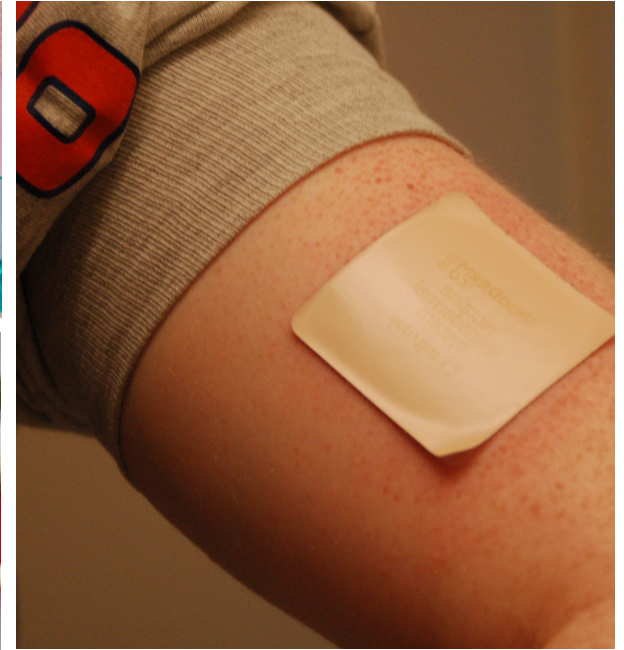






TOXICOLOGY

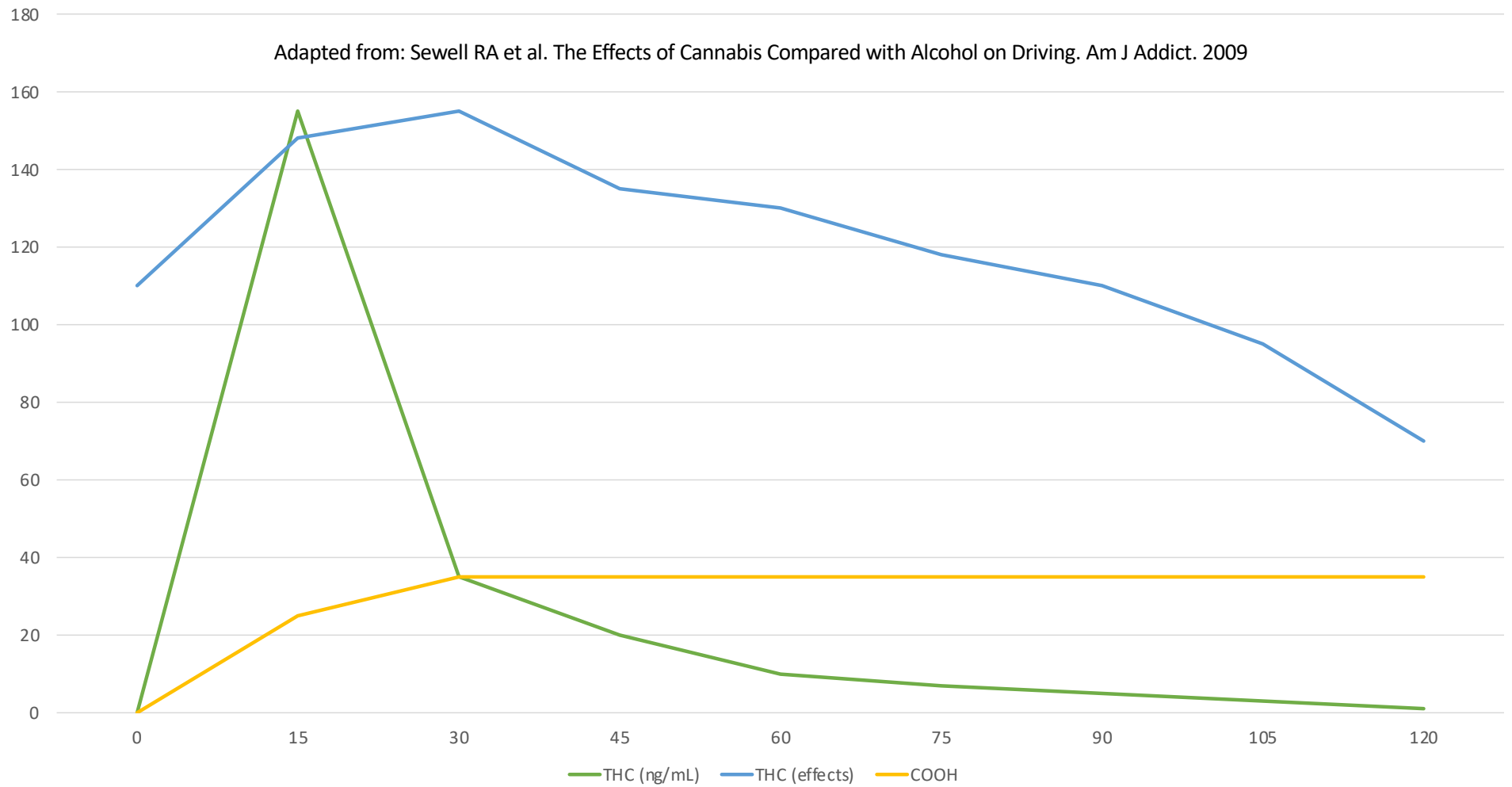
TEST



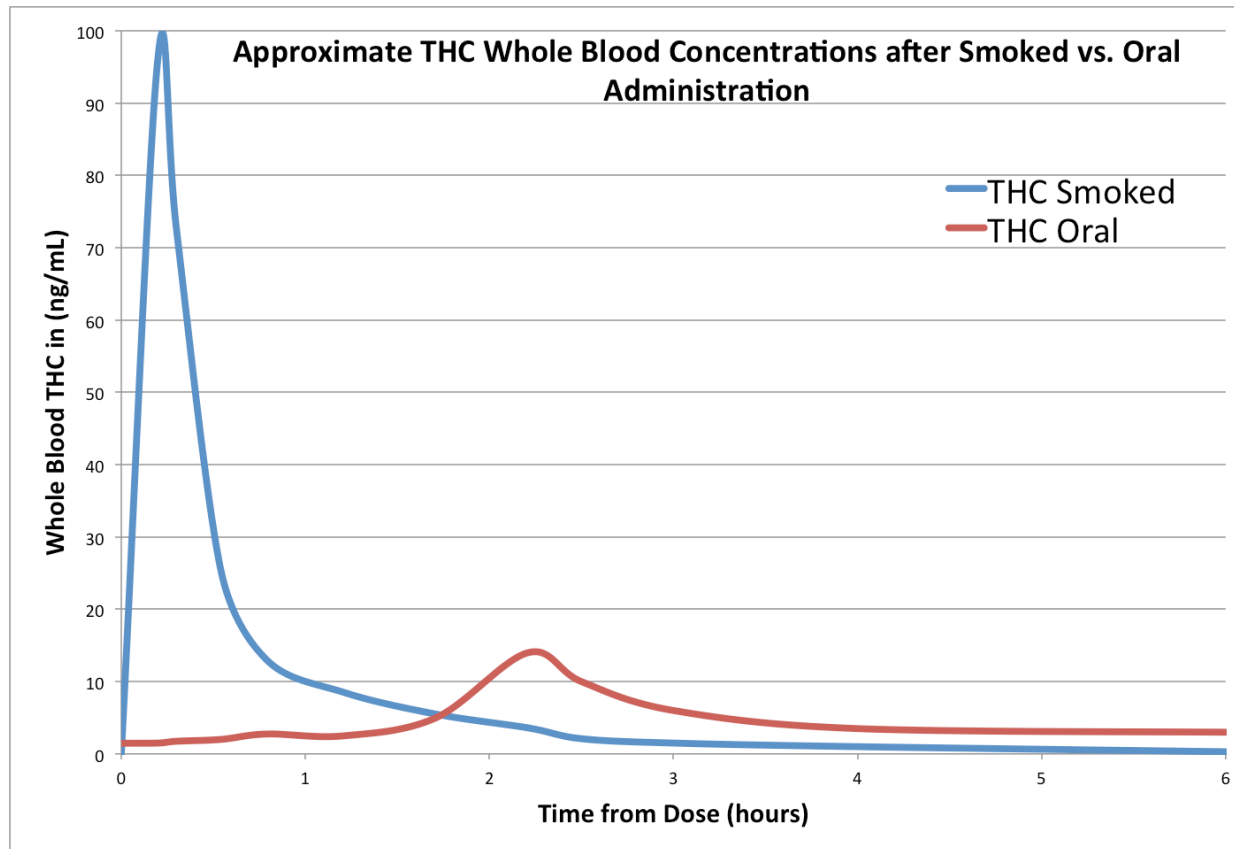
How was the Drug Administered??

THC Blood Levels & Subjective Effects

Adapted from: Sewell RA et al. The Effects of Cannabis Compared with Alcohol on Driving. Am J Addict. 2009



THC Levels in Whole Blood – Smoked vs. Oral



Journal of Analytical Toxicology, Vol. 28. September 2004 Relationship of Delta 9-Tetrahydrocannabinol Concentrations in Oral Fluid and Plasma after Controlled Administration of Smoked Cannabis. Marilyn Huestis, Edward Cone.

Clinical Chemistry 55:12 2180–2189 (2009) Delta 9-Tetrahydrocannabinol (THC), 11-Hydroxy-THC, and 11-Nor-9-carboxy-THC Plasma Pharmacokinetics during and after Continuous High-Dose Oral THC. Eugene W. Schiwilke, David M. Schwoppe, Erin L. Karschner, et. al.

Subjective Effects?

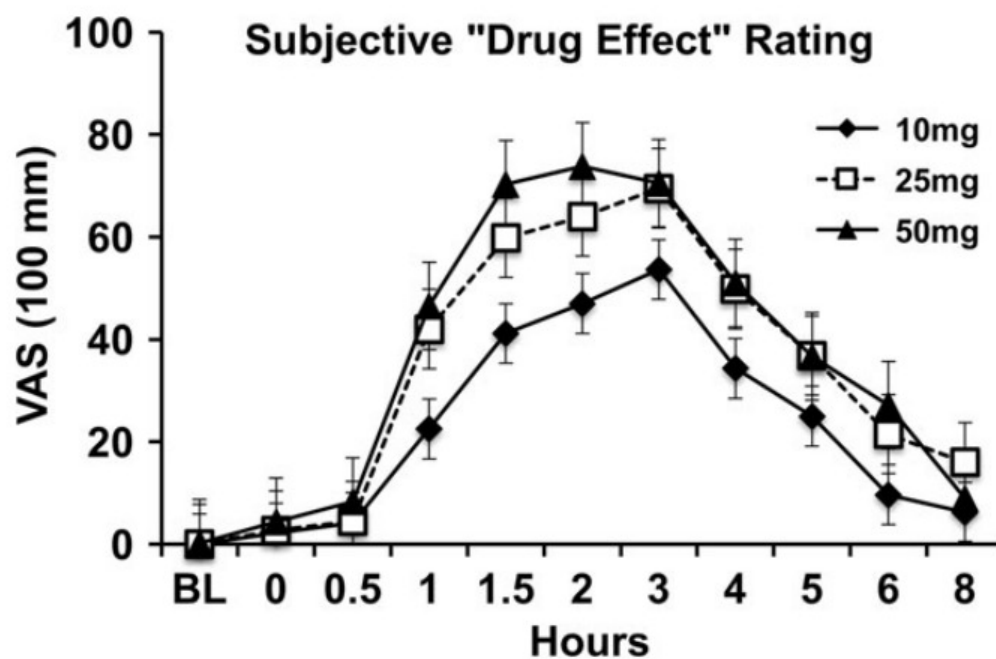


Figure 5. Subjective rated "Drug Effect" by dose.

Article

Pharmacokinetic Profile of Oral Cannabis in Humans: Blood and Oral Fluid Disposition and Relation to Pharmacodynamic Outcomes

William Vandrey^{1,*}, Evan S. Herrmann², John M. Mitchell³,
George E. Bigelow¹, Ronald Flegel⁴, Charles LoDico⁴, and Edward J. Cone¹

- Onset of Effects
 - 30-60 min
- Peak Effects
 - 90-180 min
- Gradual Return to Baseline
 - 6-8 hours



Routes of Administration

THC Analogs

Isomers vs. Derivatives

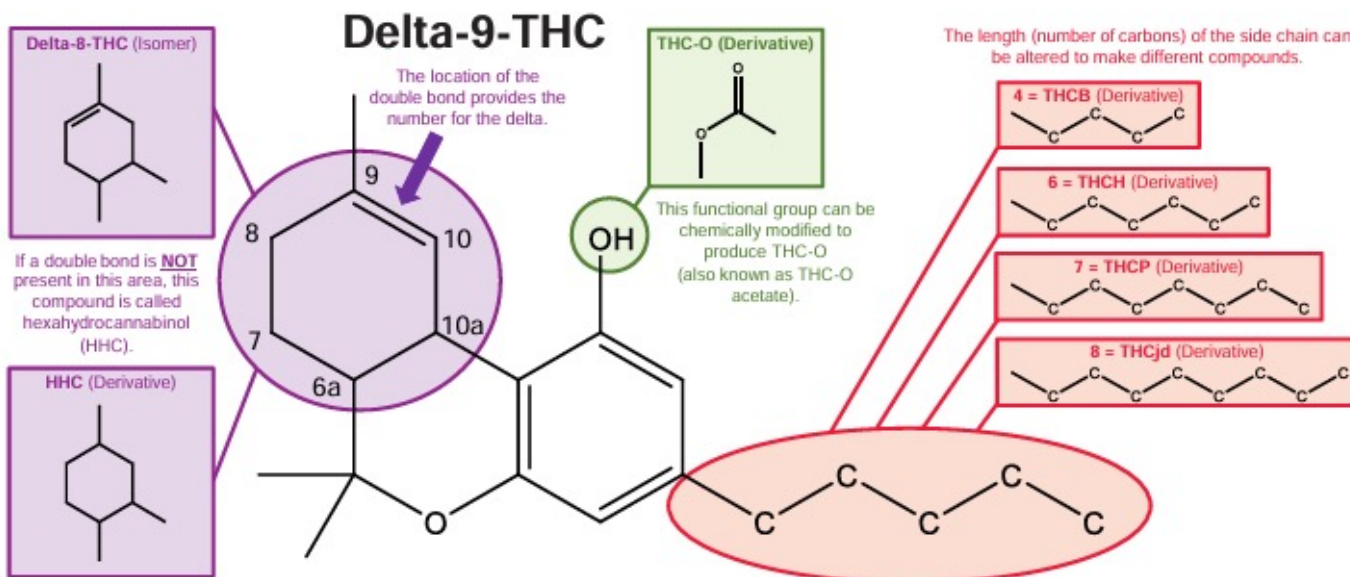
Analog A compound having a similar structure to another compound; includes both isomers and derivatives

Isomer

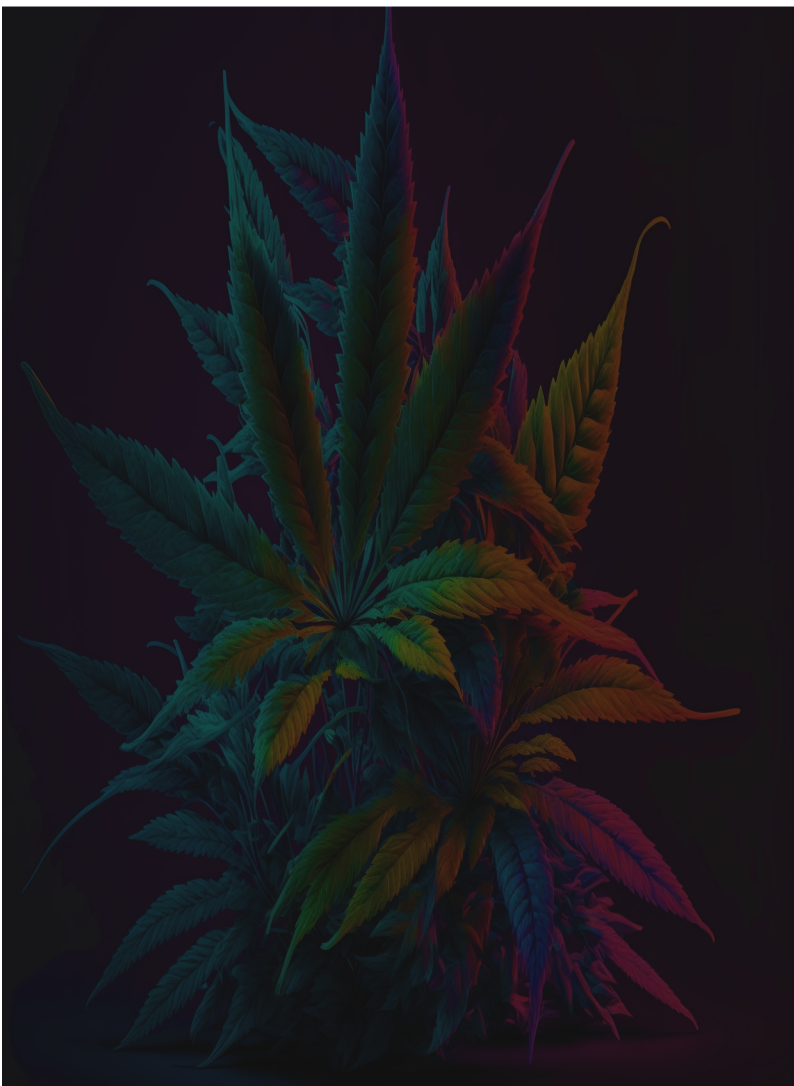
Same number of carbons, hydrogens, and oxygens, but rearranged. **For example:** Delta-8 vs. Delta-9 vs. Delta-10

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).



Delta-8-THC: A "Hemp-Derived" Analog



Synthetic Derivation

Derived synthetically from CBD.



Impairing Effects

Similar to Delta-9-THC (50-70% potency).



Regulatory Challenges

Contamination risks and regulatory issues.

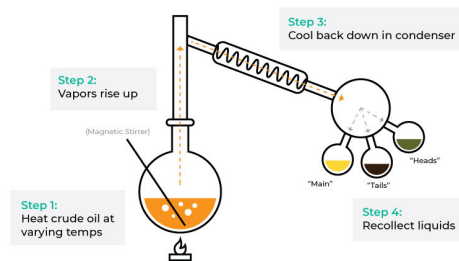
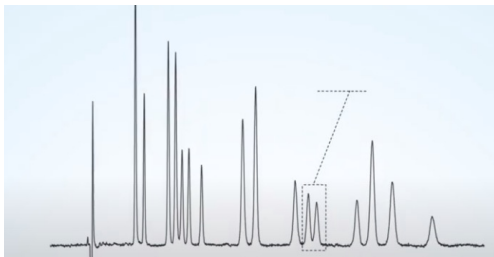
Delta-8-THC is less potent than Delta-9 but can still cause euphoria and impairment. Unregulated products often contain contaminants and high concentrations of Delta-9-THC. Mislabeling as "hemp-derived" creates enforcement difficulties.

**HOW DO
I MAKE IT?**

Summary: The Basic Process For Converting CBD to Delta 8 THC

CBD + Acid + Time = Δ8 THC

- 1 Catalyze CBD with an acid
- 2 Neutralize or remove the acid & solvent
- 3 Purify the final product
- 4 Test for purity



Shopping List

Short Path Distillation Kit

Steel Wool

Heating Mantle

Vacuum Pump

CBD Extract or Isolate

T41 Bleaching Clay

T-41 ACID ACTIVATED BLEACHING CLAY

SKU: T1038-500g

\$100.00

Acid-activated bentonite clay (or activated bleaching clay) is an excellent filtration media.

The clay is rich in carbon, and it has a low pH. This product is most commonly used during oil purification, distillation preparation, pesticide removal, and product improvement (odor removal).

Size *

2kg	500g	5kg
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Premium CBD Isolate Powder

\$174.99

Size	Quantity
10 Grams	1



VEVOR 5L Distillation Apparatus Max.380°C, Short Path Distillation with Cold Trap, Heating Mantle Short Path Distillation Kit, Lab Distillation Glassware Apparatus (5L)

Visit the VEVOR Store
★★★★★ 7 ratings

Price: \$299.99

Size: 5L

2L \$500.99	5L \$299.99
----------------	----------------

- **[PRODUCT DETAILS]** - This professional liquid distillation apparatus includes a heating mantle, cold trap, thermometer, support stand, lab jack stand, and heating glassware kit. It provides the whole set to convenient your work.
- **[HEATING MANTLE]** - The distillation apparatus kit has a liquid heating mantle used to heat. Anti-corrosive, heating area of the container up to > 65%. The heating temperature is settable, max. 380°C/716°F.
- **[EXTENSIVE USE]** - Short path distillation kit is the ideal tool for distillation, liquid heating, chemical industry, purification in new oil, sanitary field, biochemistry, experimental analysis, education, and research



\$299.99

FREE delivery: June 1 - 4

Deliver to Joseph - Stonewall
71078

In Stock.

Qty: 1

Add to Cart
Buy Now

Secure transaction

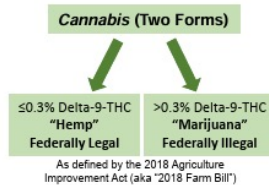
Ships from Geindus
Sold by Geindus

Add to List

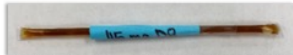
Add to Order Register

What Is Delta-8-Tetrahydrocannabinol? (Delta-8-THC, D8-THC, Δ8-THC)

- Delta-8-THC is a psychoactive compound found in trace amounts (<1%) in *Cannabis*.
- Delta-8-THC (and Delta-9-THC) can be produced from cannabidiol (CBD) by a chemical reaction.
 - CBD is a non-intoxicating compound found in high amounts in the hemp plant.
 - Some manufacturers produce lab-created THC compounds from CBD and call them "hemp-derived."
- Delta-8-THC and Delta-9-THC, whether plant-derived or lab-created, produce similar psychoactive effects.
- Products containing Delta-8-THC include edibles (e.g., cookies, chocolates, gummies), vaping solutions, distillates, and infused hemp flower.
 - Packaging may appeal to children



Real World Example



All photos courtesy of: Dr. Michelle Pearce, Virginia Commonwealth University
Consumer ate 1 honey stick and experienced 4-6 hours of hallucinations. The package said it contained 45 mg of Delta-8-THC, but it contained 631 mg of Delta-8-THC and 204 mg of Delta-9-THC.

- Product was sold as "hemp-derived" to imply that it came from the hemp plant.
- 14 pounds of hemp with 1% Delta-8-THC would be needed to make this honey stick.
- It is likely that the Delta-8-THC in this product was lab-created.

Delta-8-THC Products Are Unregulated and Can Contain:

**Dangerously High
Delta-8-THC Concentrations**

Delta-9-THC or Other THC Analogs

Debris From Unsanitary Production

Dangerous Solvents or Contaminants



Alcohol, Drugs, and Impairment Division of the
National Safety Council (NSC-ADID)

To contact the NSC-ADID, see:
<https://www.nsc.org/adid>

→ nsc.org/workplace/get-involved/divisions/alcohol-drugs-impairment-division?srsId=AfmBOopDgg1A6cwekO13bZn1LaCcSJ0oY1JNn

nsc Training Resources Topics Services Off the Job Get Involved Shop

Dec 16, 2024

ADID & NSC Documents

- [ADID Executive Board Members](#)
- [NSC Alcohol, Drugs & Impairment Division Leaders](#)
- [Alcohol Advertising - NSC #54](#)
- [Alcohol-Impaired Driving Sanctions - NSC #42](#)
- [Alcohol - Low Concentration - NSC #130](#)
- [Caselaw Citations of ADID & Predecessor Committees](#)
- [Chairperson - ADID or Predecessor Committee](#)
- [CAOD - History \(1936-2004\)](#)
- [Cannabis CBD - Fact Sheet](#)
- [Cannabis - Delta-8-THC - Fact Sheet](#)
- [Impairment](#)
- [Lab St](#)
- [Lab St](#)
- [Naloxo](#)
- [NSC P](#)
- [NSC P](#)
- [Preded](#)
- [Older D](#)
- [Operat](#)
- [Pedes](#)



NUMBERS MEAN EVERYTHING
...and nothing

- *What does therapeutic mean to you?*



REFERENCES FOR THERAPEUTIC CONCENTRATIONS

TIAFT
THERAPEUTIC
INDEX
(2005)



MOLINA –
HANDBOOK
OF
FORENSIC
TOXICOLOG
Y FOR
MEDICAL
EXAMINERS

- ***IMPORTANT** Therapeutic for What?*
- **SINGLE DOSE vs. STEADY STATE?**
- **PLASMA/SERUM vs. WHOLE BLOOD?**





Final Thoughts

“It takes more than a toxicologist
to say they were impaired”

Steps Needed to Address DUI/DUID Interpretation

THE DUCK TEST

This step requires looking at the totality of the investigation. Here consider all the elements of the case and determine if the parts start to make sense. While one point alone might not be indicative of impairment, the sum of all parts start to provide clarity.

SFST PERFORMANCE

These tests are considered tests of impairment – meaning they are tests that a normal sober individual can perform without much difficulty. Any cognitive or psychomotor impairment limits the ability of someone to complete the tests.

LOOK INTO THE EYES

The absence or presence of HGN, VGN, and LOC are critical observations. Having pupil measurements help to explain the timeline. Consider the color of the conjunctiva.



BUILD THE TIMELINE

This critical step is often the number one reason why you have negative toxicology results – know it first and build the case from here.

ADDRESS INGESTION

We must know how the drug was taken. Was it orally, smoked, IV, transdermal? This question is key to interpreting toxicology results.

CONSIDER ALCOHOL

When alcohol is present, its importance cannot be ignored. It can be additive to other depressants and increase the absorption of other compounds.

Contact Information

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