

# The nexus between toxicological possibility and alternative medical explanation

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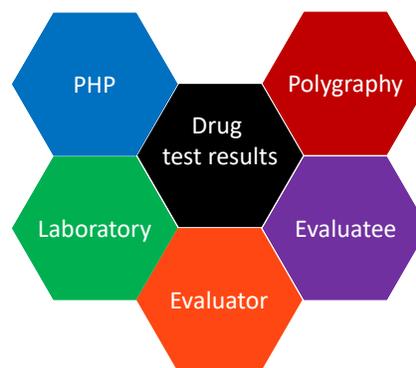
## Disclosure Information

NOTHING

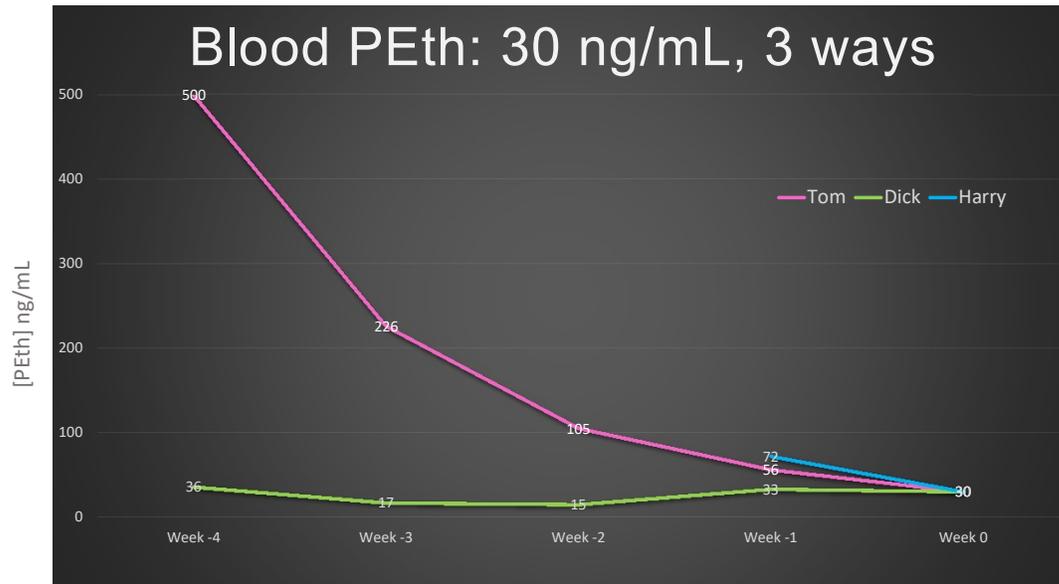
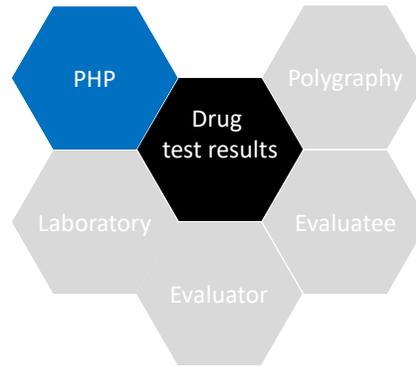
## Objectives

- Describe how evaluators can employ best practices to optimize the drug testing process.
- Describe how laboratories and laboratory scientists can contribute to the effectiveness of the drug testing process.
- Describe how PHPs can improve the effectiveness of the drug testing process.

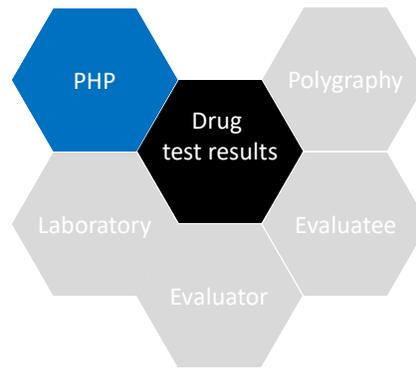
## Evaluation components



## Evaluation components

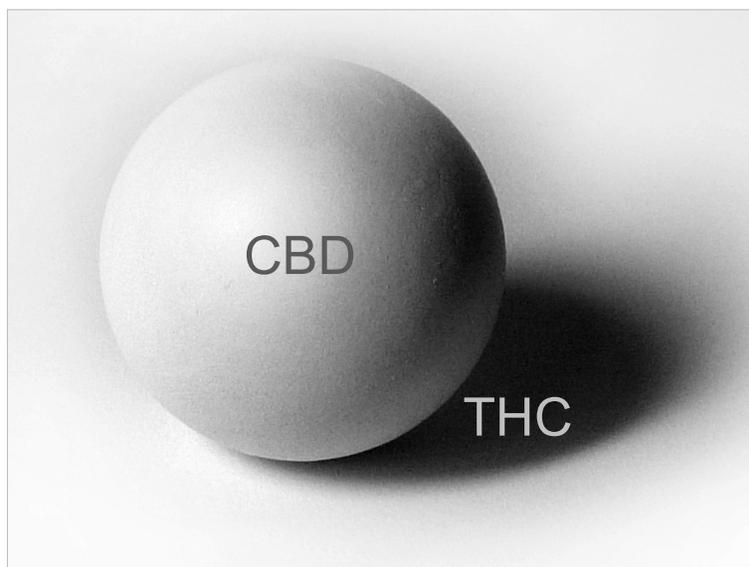


## Evaluation components



## The New York Times

In the last two and a half years, six of the 21 kombucha samples the New York State Department of Agriculture and Markets examined were above the 0.5 percent alcohol by volume threshold, according to the department. ~~Three~~ were above 1 percent A.B.V.; two of those hit 7 percent. (On average, the A.B.V. for beer is 4.5 percent.) Similarly, the United States Department of the Treasury's Alcohol and Tobacco Tax and Trade Bureau, which oversees the beverage alcohol industry, found nine out of 13 kombucha producers whose products it examined in 2015 to be noncompliant; and in 2010, that number was 20 out of 24. "Some of them didn't just drift," said Thomas Hogue, a tax and trade bureau spokesman, of past test results. "Some of them got really close to some of the beer ranges."

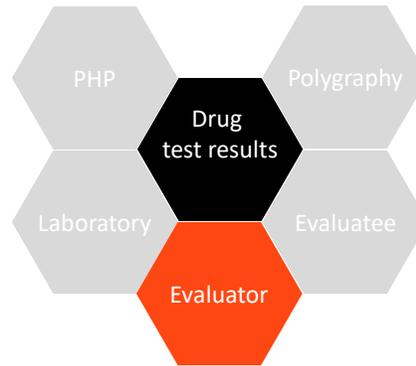


**Table 2. Observed Cannabinoid Concentration of 84 Tested Extract Products Sold Online**

Cannabinoid	Average Observed Concentration Across Tests, mg/mL	
	Mean (SD)	Median (Range)
Cannabidiol <sup>a</sup>	30.96 (80.86)	9.45 (0.10-655.27)
Cannabidiolic acid	1.35 (6.74)	0 (0-55.73)
Cannabigerol	0.08 (0.55)	0 (0-4.67)
Cannabinol	0	0
<b>Δ-9-Tetrahydrocannabinol</b>	<b>0.45 (1.18)</b>	<b>0 (0-6.43)</b>
Δ-9-Tetrahydrocannabibolic acid	0	0

**JAMA** November 7, 2017 Volume 318, Number 17

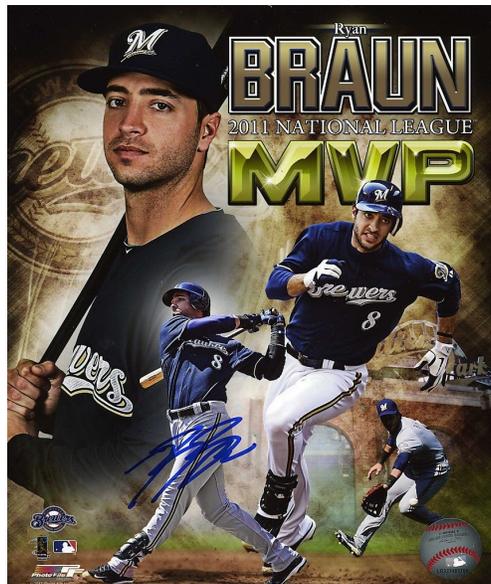
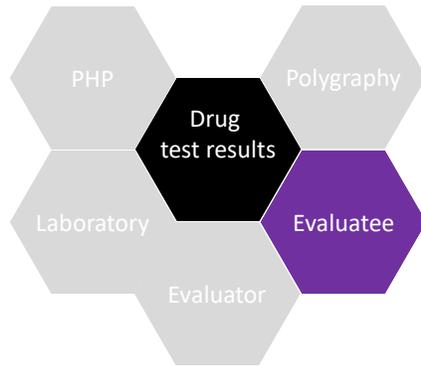
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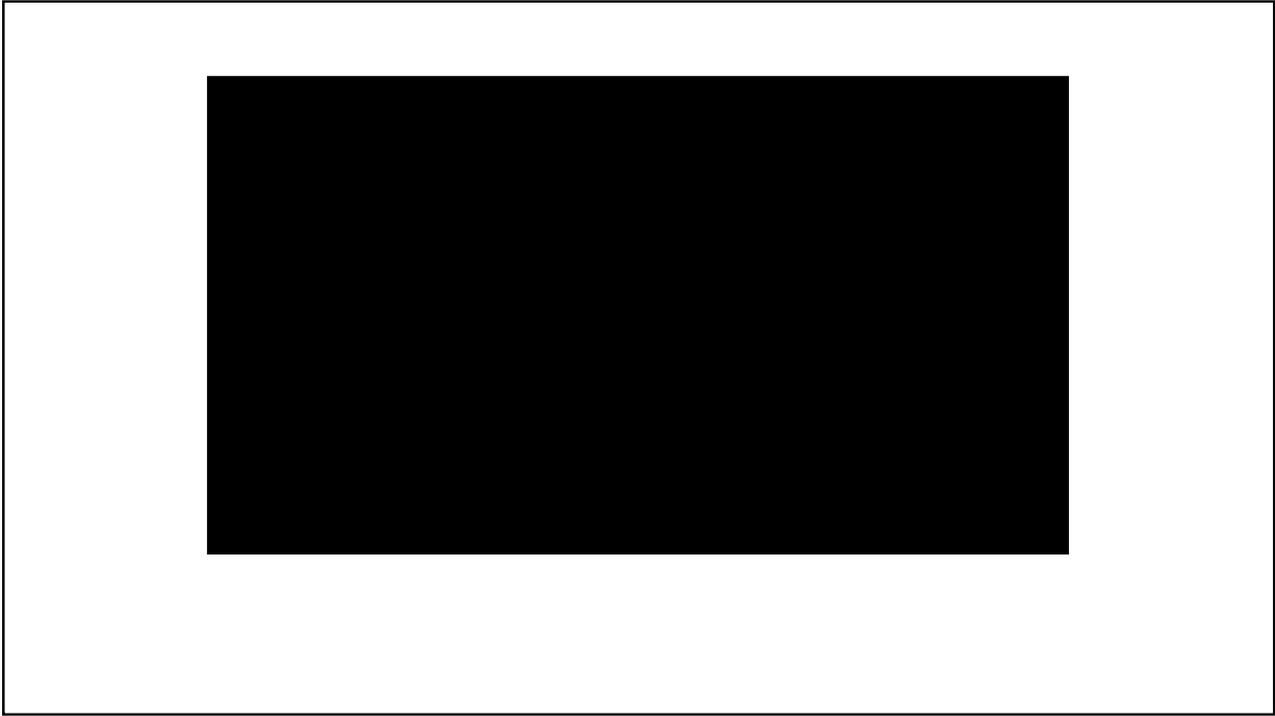


## Evaluator drug history guidance

- Be prepared for the interview
- Begin with complete drug history for type/quantity/frequency/chronicity/recency of drug administration.
- Don't telegraph: Integrate questions about potential environmental exposures into the course of the social history:
  - Who in your household who uses drugs?
  - What are your drug exposures at work?
- Do not disclose details about your test selection and the analytical capabilities of various matrices unless it is done tactically.

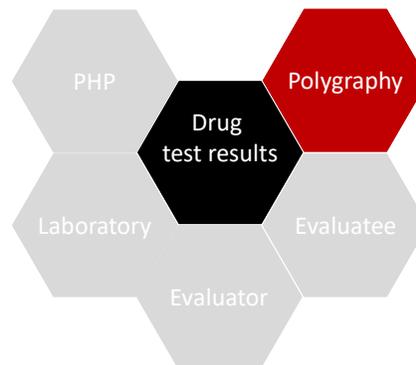
# Evaluation components





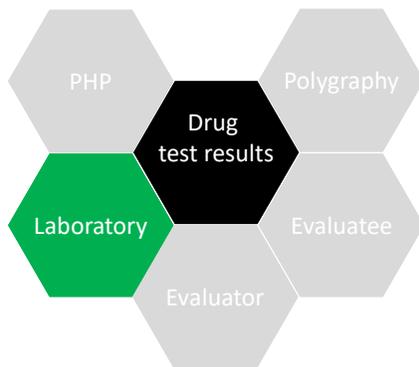


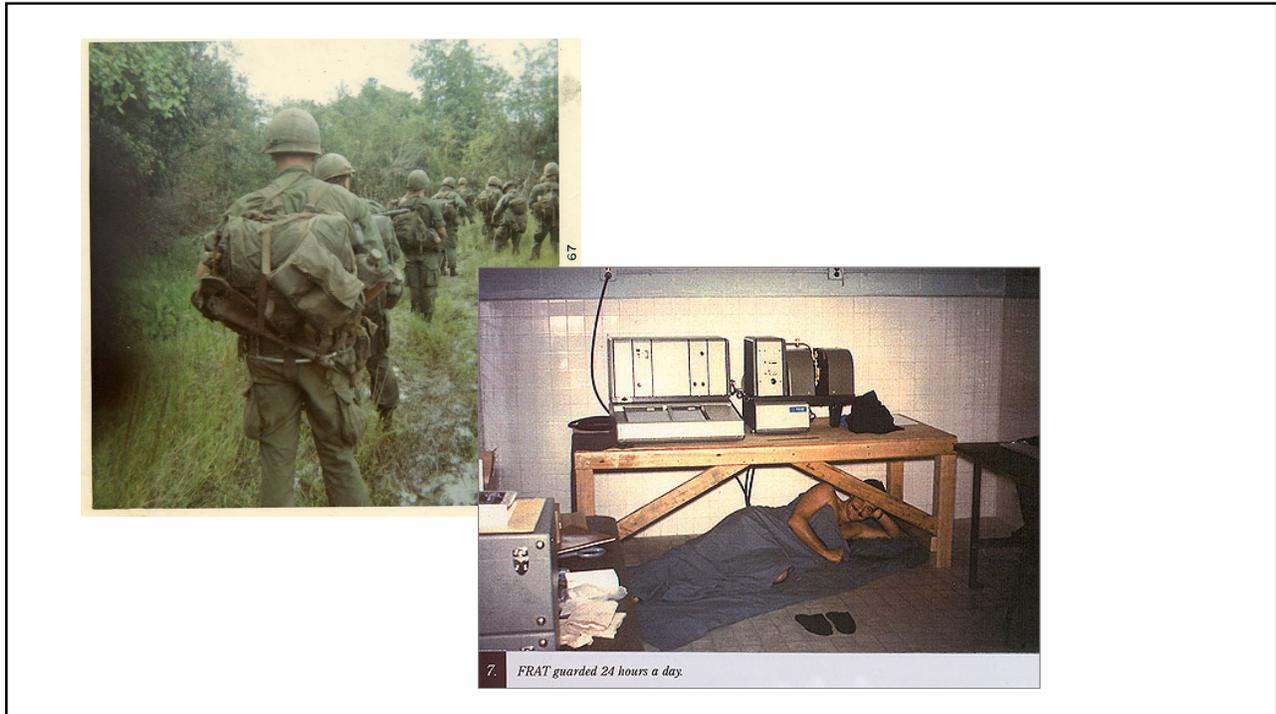
## Evaluation components





## Evaluation components





## DRUG FREE FEDERAL WORKPLACE

- Amphetamine/Methamphetamine
- Cocaine
- Opiates (codeine, morphine, heroin)
- Phencyclidine
- Marijuana



## Changing Drug Use Patterns

- Opiates
  - Codeine
  - Morphine
  - Hydrocodone
  - Hydromorphone
  - 6-MAM
  - Oxymorphone
  - Oxycodone
  - Buprenorphine
  - Methadone
  - Meperidine
  - Propoxyphene
  - Tramadol
- Cocaine
- Marijuana
- PCP
- Barbiturates
  - Butabital
  - Amobarb
  - Pentobarbital
  - Secobarb
  - Phenobarbital
- Amphetamines
  - Amphetamine
  - Methamphetamine
  - MDA
  - MDMA
  - MDEA
- Benzodiazepines
  - Oxazepam
  - Nordiazepam
  - Temazepam
  - Lorazepam
  - Flurazepam
  - Nitrazepam
  - Triazolam
  - Alprazolam
  - Flunitrazepam
  - Midazolam
  - Clonazepam
- Syn Canns
- Phentermine
- Propofol
- Ketamine
- Sevoflurane
- Gabapentin
- Fentanyl
- Sufentanil
- Soma
- Zolpidem
- Dextromethorphan
- Methylphenidate
- Ethyl glucuronide
- Bath Salts

## Sophisticated and Knowledgeable



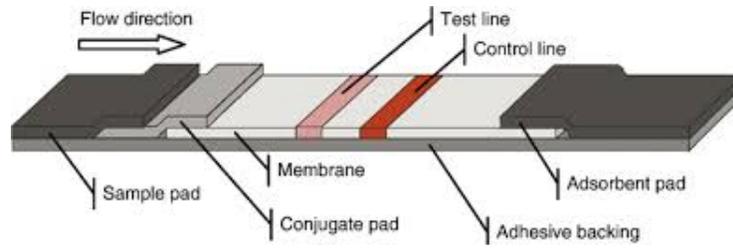
## The Right Test, Right Technology

## Instant Urine Drug Test Kits

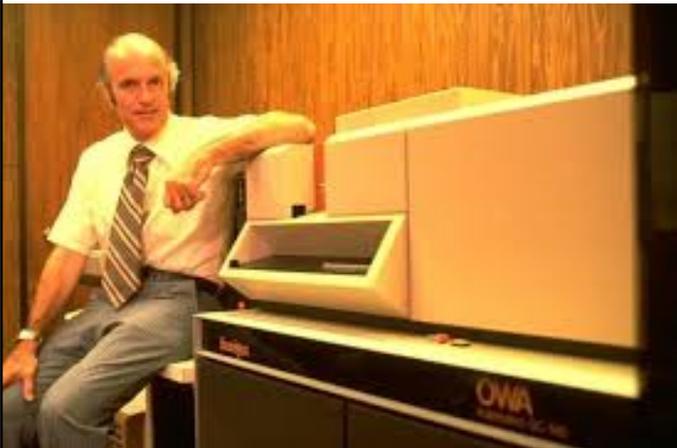
- > 70 KITS ON MARKET
- Not all CLIA Waived
- Not all have similar tests
- Not all have similar cutoffs
- Not all standard manufacturing
- Not all perform consistently
- Not all have validity tests
- False negatives, positives



## Laminar Flow Immunoassay



## Early Technology



## Chromatography Column Technology



## Gas Chromatography Mass Spectrometers



## Liquid Chromatography Tandem Mass Spec



Liquid  
Chromatography  
Tandem Mass  
Spectrometry

## Oral Fluid Drug Testing

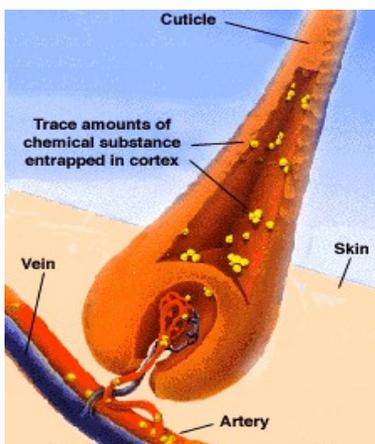


Illustration of Human Hair

**Hair Drug Testing**  
**Detection window =  
up to 3 months**

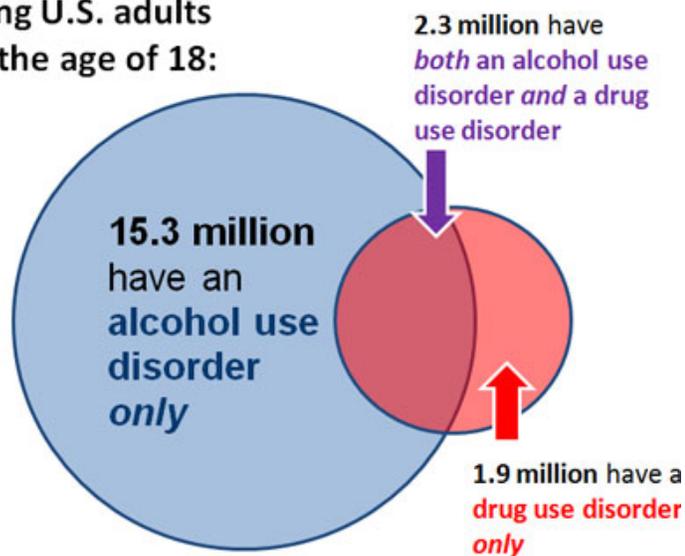


## Nail Drug Testing

Detection Window  
up to 6 month

## ALCOHOL

Among U.S. adults  
over the age of 18:



## ALCOHOL TESTING



### Standard Technology

- Breath – Hours/Drink
- Saliva - Hours/Drink
- Blood – Hours/Drink
- Urine – Hours/Drink

### Recovery Technology: 3 x 3 x 3

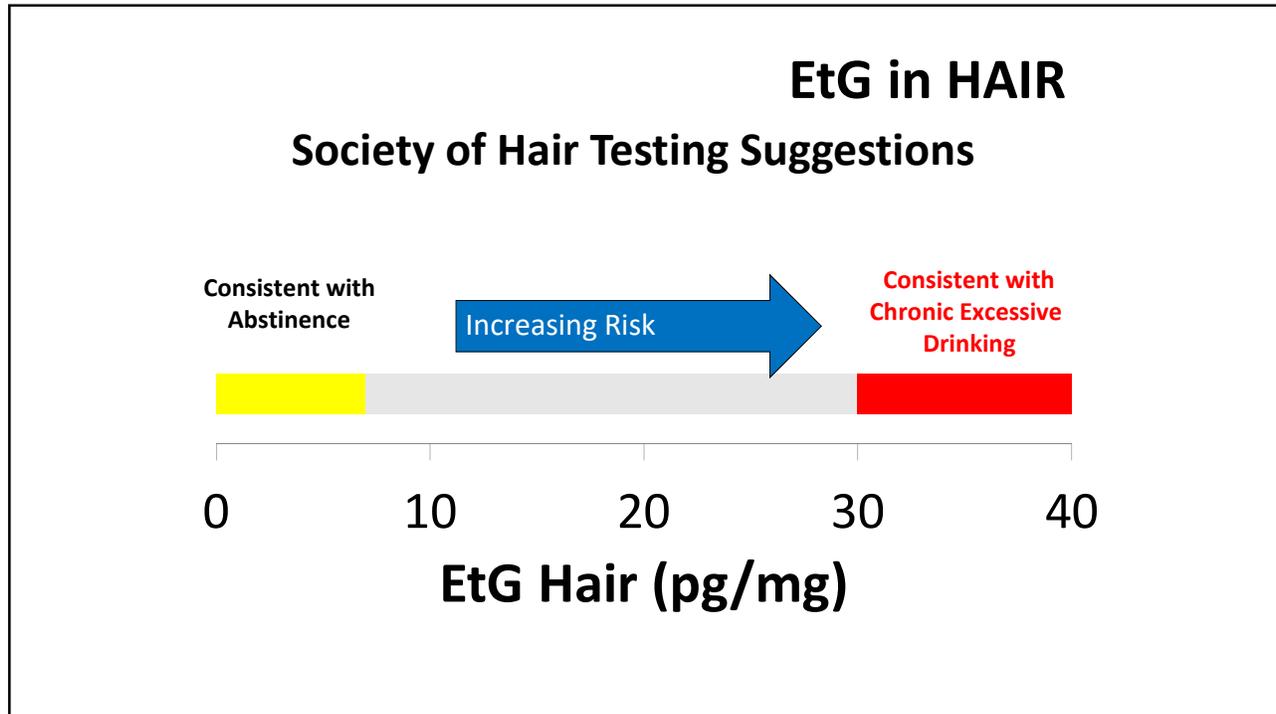
- 1) Urine Ethyl Glucuronide(EtG) - **3 Days binge**
- 2) Phosphatidylethanol(Peth)- **3 weeks binge**
- 3) Hair/Nails EtG – **3 months binge**

## EtG in URINE

### Ethyl glucuronide

### Direct Metabolite of Alcohol

- In standard use since 2000
- Cutoff for recovery 100 ng/ml
- Affected by bacteria
- Abstinence monitoring
- Detection 2-3 days



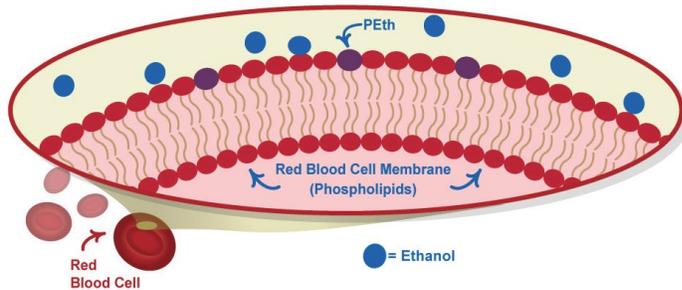
## EtG in NAILS

- **First Reported 2011**
- **Grant 1 R44 AA016463-02**
- **606 matched hair/nail pairs**
- **UW-Milwaukee**
- **Self Reports**

**NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM**

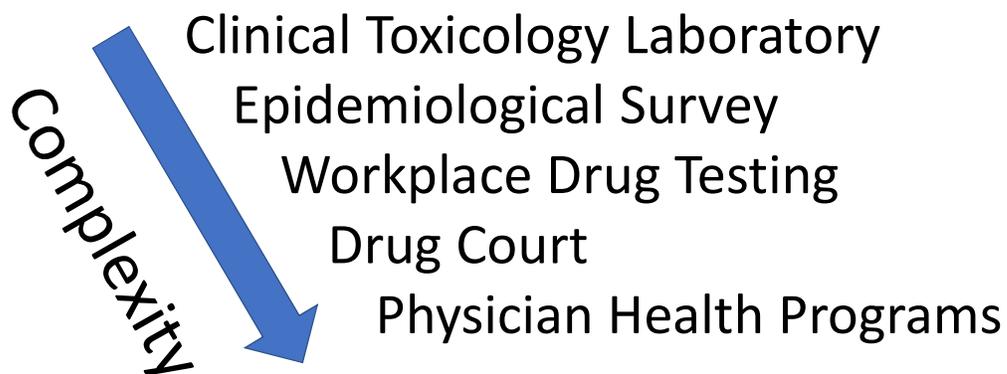
National Institutes of Health

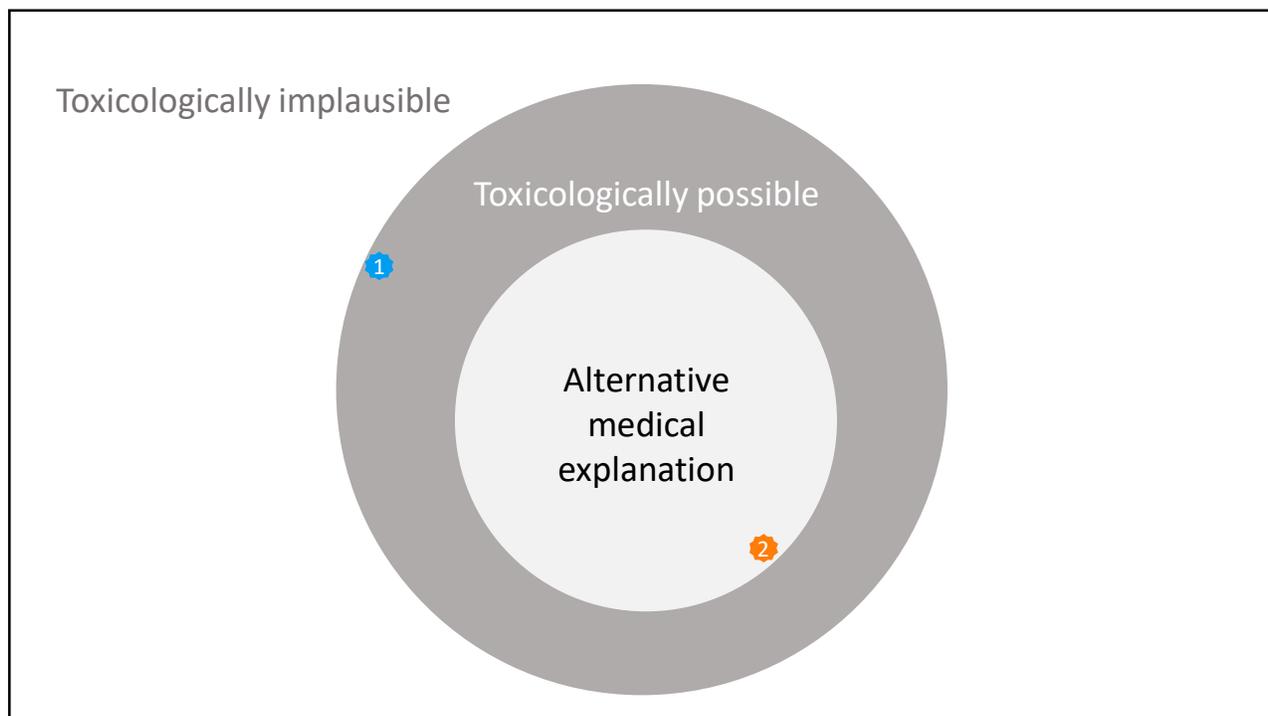
## PHOSPHATIDYLETHANOL (PEth)



- PEth forms in red blood cells as a component of the cellular membrane.
- PEth is a direct alcohol biomarker, meaning that ethanol is incorporated into the final product.

## Role of the Laboratory Over the Years





Journal of Analytical Toxicology, Vol. 30, January/February 2006

## Evidence of Morphine Metabolism to Hydromorphone in Pain Patients Chronically Treated with Morphine

Edward J. Cone<sup>1</sup>, Howard A. Heit<sup>2</sup>, Yale H. Caplan<sup>3</sup>, and Douglas Gourlay<sup>4</sup>

<sup>1</sup>Johns Hopkins School of Medicine, Department of Psychiatry and Behavioral Sciences, Baltimore, Maryland 21224; <sup>2</sup>8316 Arlington Boulevard, Suite 232, Fairfax, Virginia, 22031; <sup>3</sup>National Scientific Services, 3411 Phillips Drive, Baltimore, Maryland 21208; and <sup>4</sup>Pain and Chemical Dependency Division, Wasser Pain Management Centre, Mount Sinai Hospital, Centre for Addiction and Mental Health, Toronto, Ontario, Canada

## Alternative medical explanations

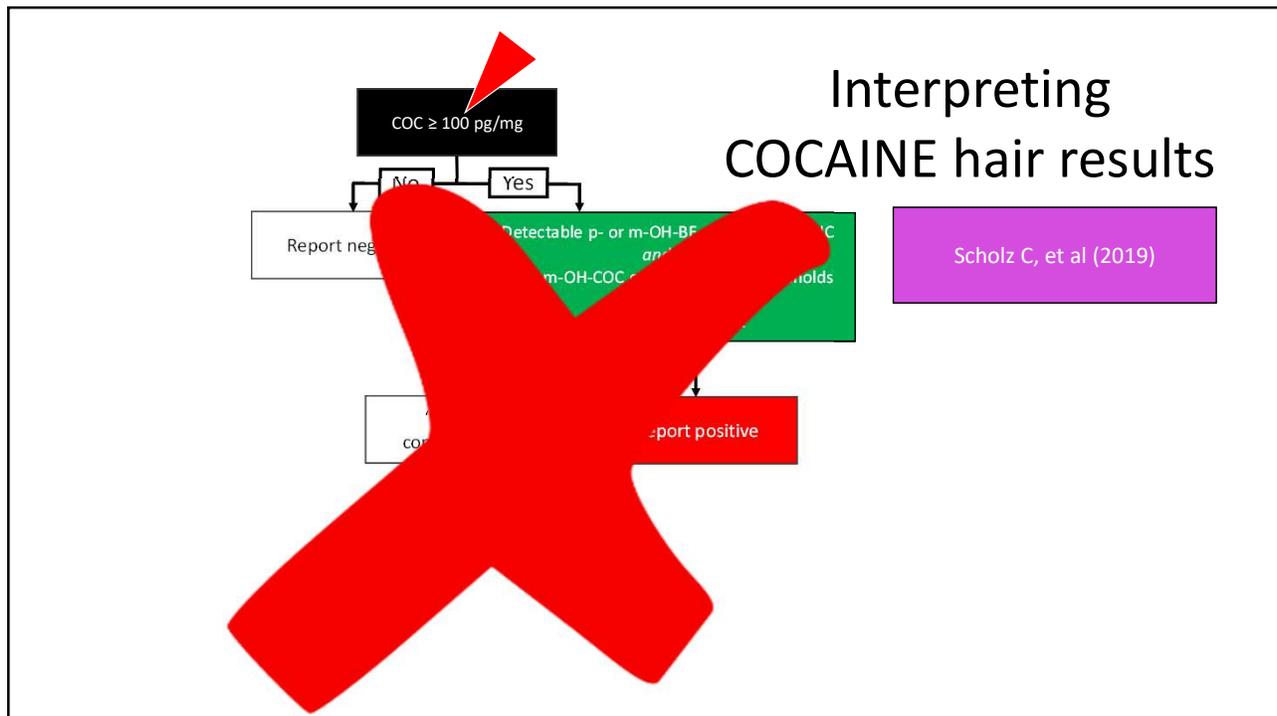
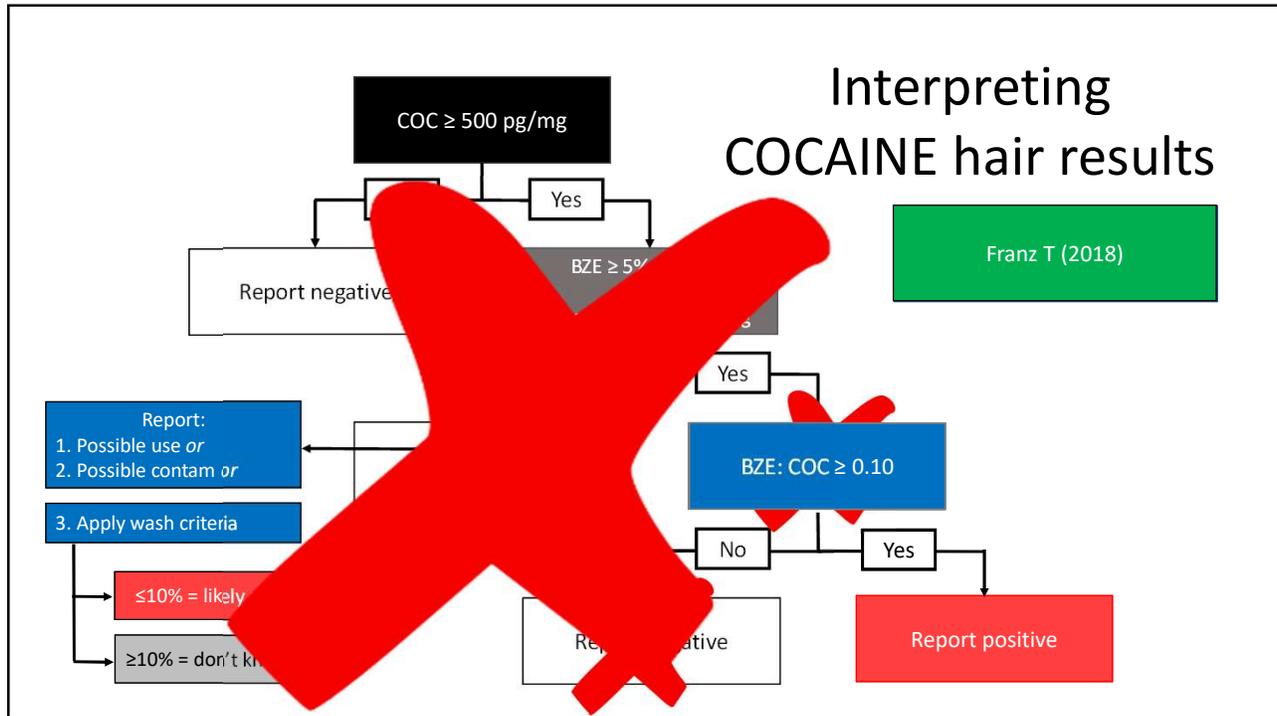
The important point here is that to a lay person and often for individuals in a drug testing program, the term “alternative medical explanation” is often misunderstood. It sounds as though it includes anything that is technically possible. It does not. Alternative medical explanations are carefully described in policy. Accidental or unknowing ingestion of a drug is possible, but it is not an acceptable alternative medical explanation.

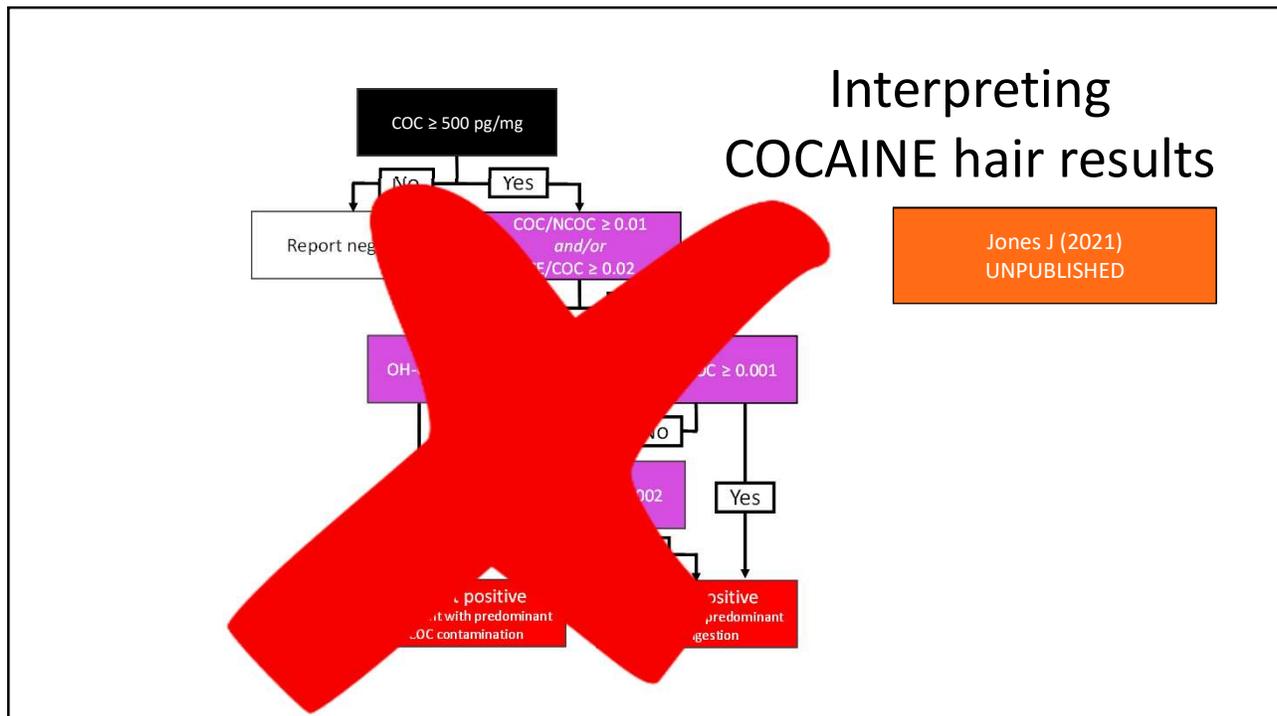
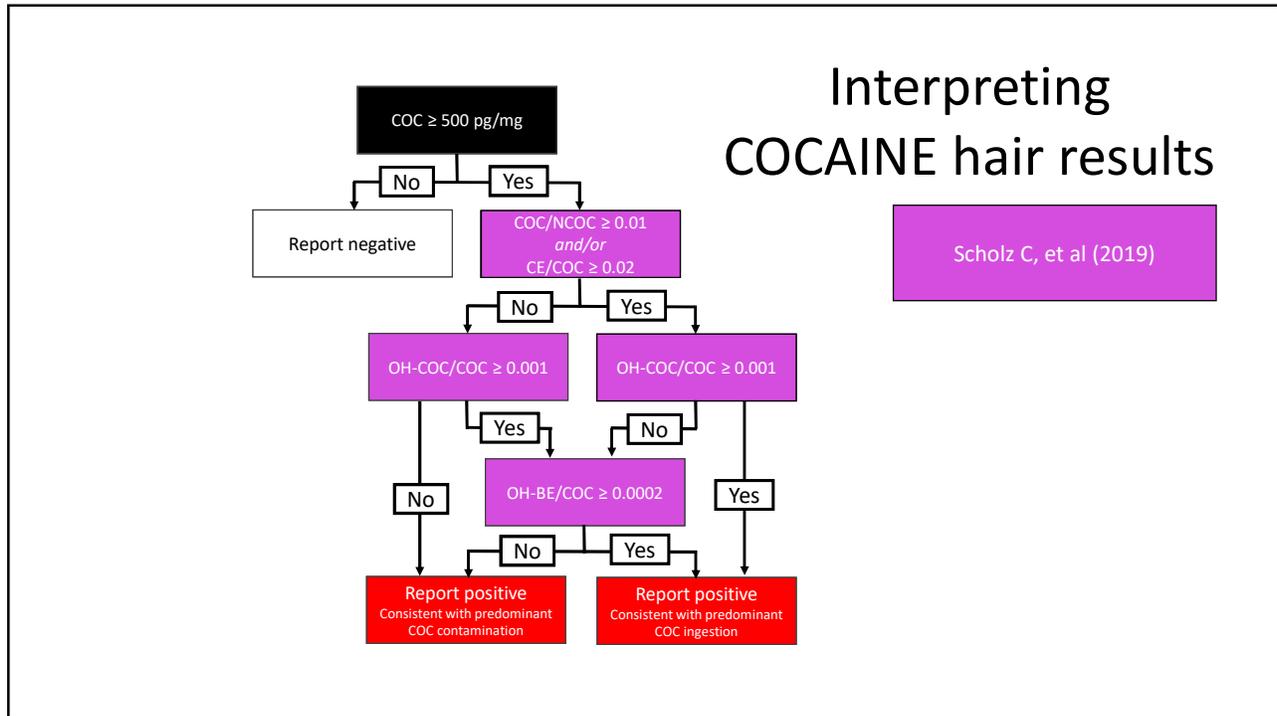
Shults TF. Medical Review Officer Handbook (10<sup>th</sup> ed). Research Triangle Park, NC: AAMRO;

p 13

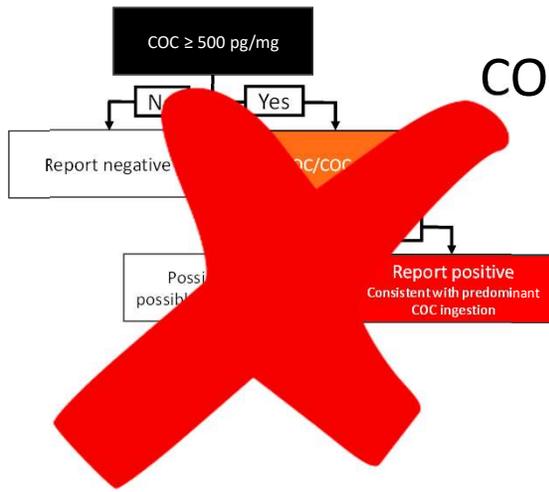
It is important for all employers and safety-sensitive employees to know:

1. The Department of Transportation requires testing for marijuana and not CBD.
2. The labeling of many CBD products may be misleading because the products could contain higher levels of THC than what the product label states. The Food and Drug Administration (FDA) does not currently certify the levels of THC in CBD products, so there is no Federal oversight to ensure that the labels are accurate. The FDA has cautioned the public that: “Consumers should beware purchasing and using any [CBD] products.” The FDA has stated: “It is currently illegal to market CBD by adding it to a food or labeling it as a dietary supplement.” Also, the FDA has issued several warning letters to companies because their products contained more CBD than indicated on the product label.”
3. The Department of Transportation’s Drug and Alcohol Testing Regulation, Part 40, does not authorize use of Schedule I drugs, including marijuana, for any reason. Furthermore, CBD use is not a legitimate medical explanation for a laboratory-confirmed marijuana positive result. Therefore, Medical Review Officers will verify a drug test confirmed at the appropriate cutoffs as positive, even if an employee claims they only used a CBD product.





# Interpreting COCAINE hair results



Jones J (2021)  
UNPUBLISHED



1

2017

46-year-old surgeon referred by FL DOH, consequent to a complaint by the sheriff's office that, during a response to a domestic disturbance, it was suspected that he had been smoking crack cocaine.

He denied ever cocaine use, but stated that he learned that his recent, but former, girlfriend was a heavy crack cocaine user and used it in the house, especially when he was asleep.

He endorsed no DSM-5 criteria for cocaine use disorder.

Hair drug test result:

- Cocaine 67,116 pg/mg
- Norcocaine 1,146 pg/mg
- Benzoyllecgonine 12,139 pg/mg

Recommendation:

- "Diagnostic monitoring contract"
- Able to practice as a surgeon with reasonable skill and safety

1

2019

The surgeon returned for evaluation due to multiple reports of interpersonal conflicts at work; scheduling surgeries for the middle of the night; poor surgical decision-making; lack of adequate post-operative care; and delinquent medical records.

He denied ever cocaine use, but stated that, approximately 6 months previously he ran into his old girlfriend, who approached him with a mouthful of crack cocaine and blew it into his mouth.

His body hair was shaved and his finger- and toenails were trimmed short because he was "training for a marathon." He was instructed to grown his fingernails and returned in 25 days.

Nail drug test result:

- Cocaine 16,070 pg/mg
- Norcocaine 154 pg/mg
- Benzoyllecgonine 18,731 pg/mg

Recommendation:

- Cocaine use disorder, provisional
- Substance use disorder treatment at residential or PHP (with housing) level of care.

2

35-year-old female nurse referred for opioid diversion from the workplace. She states that she is a former cannabis smoker, but has not smoked in 11 months. She lives with her 3 children, ages 16, 15, and 9 – none of whom are known drug users. She has a boyfriend who drinks socially but does not use drugs. She goes “clubbing” approximately once a week and states that cannabis smoke is in the air. She wears a wig.

**Urine:** Negative

**Bloodspot PETH:** Negative

**Hair:** THC-COOH: 4.62 pg/mg (cutoff: 0.05 pg/mg)

3

65-year-old male being monitored in PHP for several years was referred for multiple THC-COOH-positive urine drug test results. He has a history of cannabis use disorder.

Date	Urine THC-COOH (ng/mL)	Creatinine (mg/dL)	Comments
04/08/2019	19	21.1	Attributed test result to CBD oil for chronic pain
04/16/2019			Test result reported. Instructed to D/C CBD oil
04/30/2019	“Positive”		Attributed test result to “better” CBD oil for chronic pain
05/10/2019			Test result reported. Instructed to D/C CBD oil
06/03/2019	58	316.4	Sent for independent medical evaluation

Date	Urine THC-COOH (ng/mL)	Creatinine (mg/dL)	Hair THC-COOH (pg/mg)
07/08/2019	N.D.	57.1	0.47 pg/mg

3

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Contents lists available at ScienceDirect

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journal homepage: [www.elsevier.com/locate/forsciint](http://www.elsevier.com/locate/forsciint)

Case Report

Determination of cannabinoids in urine, oral fluid and hair samples after repeated intake of CBD-rich cannabis by smoking

Enrico Gerace<sup>a,\*</sup>, Snezhana Petrova Bakanova<sup>b</sup>, Daniele Di Corcia<sup>a</sup>, Alberto Salomone<sup>a,b</sup>, Marco Vincenti<sup>a,b</sup>

<sup>a</sup> Centro Regionale Antidoping e di Tossicologia "A. Bertinaria", Regione Gonzole 10/1, 10043 Orbasano, Turin, Italy  
<sup>b</sup> Dipartimento di Chimica, Università degli Studi di Torino, via P. Giuria 7, 10125 Turin, Italy

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 Drug testing  
 Workplace

ABSTRACT

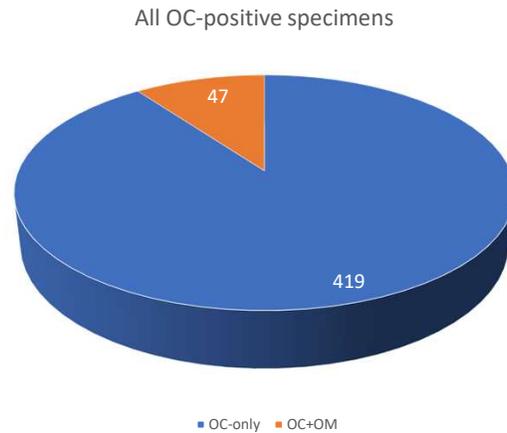
Cannabidiol prevalent (CBD-rich) cannabis derivatives are increasingly popular and widely available on the market as replacement of THC, tobacco substitutes or therapeutics for various health conditions. In this paper, we evaluate the impact of a repeated CBD-rich cannabis intake on levels of cannabinoids in biological samples. Urine, oral fluid and hair (pubic and head) samples were obtained from a naive user during a 26-day smoking period of one 250-mg CBD-rich cannabis joint/day containing 6.0% cannabidiol (CBD; 15 mg) and 0.2% delta-9-tetrahydrocannabinol (THC; 0.5 mg). In total, 35 urine, 8 oral fluid and 4 hair sample were collected. Cannabinoids concentrations were quantified by a UHPLC/MS<sup>n</sup> technique. The results suggested that the repeated exposure to CBD-rich cannabis (containing small amounts of THC) can generate positive results in biological samples. Urinary concentrations of 11-nor-9-carboxy-delta-9-tetrahydrocannabinol (THC-COOH) were quantitatively detected after 8 days from the smoking start and exceeded the 15 ng/mL cut-off limit on day-15 even in the urine sample collected 12 h after the last intake. In the oral fluid collected on day-26, no cannabinoids were found before the cannabis intake, thus excluding accumulation, while THC was detectable up to 3 h after the cannabis intake, at concentrations progressively decreasing from about 18 to 6 ng/mL. Hair samples collected one week after the end of the study turned out negative for THC and THC-COOH, suggesting that this matrix is suitable to discriminate the chronic consumption of CBD-rich cannabis from THC-prevalent products. The obtained findings are relevant for the interpretations of cannabinoids levels in biological fluids, also in light of the legal implications of a positive result.

4

A pharmacist and PHP participant (alcohol use disorder; sedative-hypnotic disorder) referred for 2<sup>nd</sup> opinion following recommendation for treatment due to hair [oxycodone] 1,078 pg/mg. His explanation was that he had recently performed an opioid inventory; he stated that 1) the absence of the oxymorphone metabolite in his head hair, and 2) absence of oxycodone in his chest hair (by independent testing) proved that he had not ingested the drug.

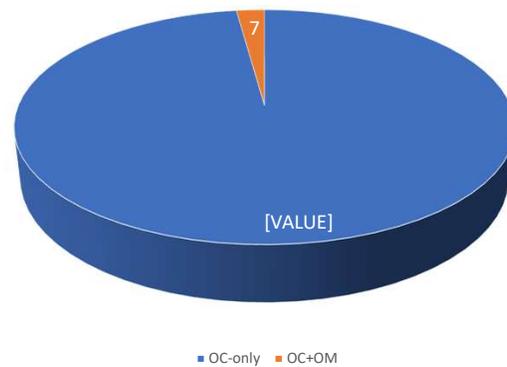
Nine months previously, a random hair test yielded [oxycodone] 186 pg/mg. His alternative medical explanation of environmental exposure was accepted.

#### 4 OC-POS hair specimens, Apr-Jun 2014 ( $n=466$ )



#### 4 OC-POS hair specimens, Apr-Jun 2014 ( $n=466$ )

Specimens for which [OC] < the group mean (2,375 pg/mg)



[oxycodone] 1,078 pg/mg

4

Journal of Analytical Toxicology 2015;39:746–750  
doi:10.1093/jat/bkv076 Advance Access publication July 14, 2015

Case Report

## The Disposition of Oxycodone and Metabolite in Human Hair

Gary M. Reisfield<sup>1\*</sup> and Joseph T. Jones<sup>2</sup>

<sup>1</sup>Divisions of Addiction Medicine, Pain Medicine, University of Florida College of Medicine, Prospect Road, Des Plaines, IL 60018, USA

The disposition of oxycodone (OC) and metabolites in hair remains poorly characterized. We present a case involving a pharmacist in an impaired professionals' monitoring program in whom hair testing yielded OC on two occasions. On both occasions, his hair was negative for the oxymorphone (OM) metabolite at the cutoff concentration of 100 pg/mg. He claimed that, absent the detection of metabolite, the OC necessarily represented external contamination. This prompted a review of the laboratory's OC-positive hair results for the quarter April–June 2014. Overall, 466 specimens contained OC, with a mean (median) concentration of 2,375 (1,060) pg/mg. Of these OC-positive specimens, only 47 (10%) contained detectable OM. When OC was present at or below the mean (median) concentration, only 2.2% (1.3%) of specimens were OM-positive. In the setting of OC administration, the detection of OM in hair is unlikely at a cutoff concentration of 100 pg/mg. More consistent demonstration of OC metabolite(s) in hair will require the validation of methods to detect OM at lower concentrations and/or methods to detect noroxycodone.

<sup>2</sup>Florida Recovery Center, Gainesville, FL 32609, USA  
Gainesville, FL 32609, USA

5



45-year-old surgeon referred for I.M.E. by a state department of health.

5/30/12: Search warrant of home “trash pulls” revealed empty vials of meperidine and bloody syringes and gauze pads.

6/09/12: Search warrant of residence revealed empty vials of meperidine and other drugs; bloody syringes and gauze pads; tourniquets; sharps containers. The surgeon and her significant other had needle marks in their antecubital fossae.

06/20/12: Search warrant of office revealed scattered bottles of meperidine around the office in unsecured locations and a 173 bottle “discrepancy.”

06/XX/12: The DOH requested a hair drug test.

06/28/12: She received a prescription for meperidine 50 mg (#30)

07/XX/12: Hair drug test was positive for meperidine at  $\geq 4,000$  pg/mg

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At Oct 2012 comprehensive evaluation, she explained that:

1. She administered intravenous meperidine to her fiancé for chronic shoulder pain. She stated that “house calls” are within the standard of care.
2. Her needle marks were attributable to her self-administration of “Myers’ cocktail.”
3. She administered, by prescription, meperidine 50 mg tablets (15-20 dosage units), between late June and mid-July 2012 for “erythema and swelling” related to a 5/23/12 abdominoplasty. She stated that this was her only meperidine exposure. (On collateral, the prescribing physician described her to the evaluator as “drug-seeking.”)

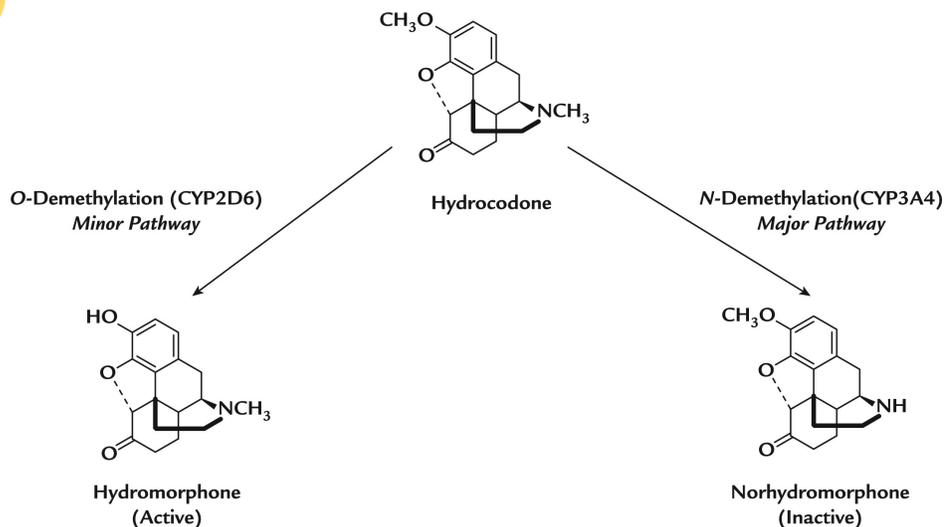
6

33-year-old anesthesiologist referred for comprehensive evaluation. There was a medication discrepancy involving hydromorphone 4 mg. She was administered a urine drug test. She stated that the day before the test she administered hydrocodone 10 mg (for which she had a prescription).

**Urine:**

- Hydrocodone: Not detected (50 ng/mL cutoff)
- Hydromorphone: 2,990 ng/mL

6



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Journal of Analytical Toxicology 2012;36:507–514  
 doi:10.1093/jat/bks058 Advance Access publication July 10, 2012

Article

## Excretion Profile of Hydrocodone, Hydromorphone and Norhydrocodone in Urine Following Single Dose Administration of Hydrocodone to Healthy Volunteers 10 mg

Sandra Valtier<sup>1\*</sup> and Vikhyat S. Bebar<sup>2</sup>

<sup>1</sup>Clinical Research Division, 59th Medical Wing, Lackland AFB, TX 78236-5319, and <sup>2</sup>Emergency Medical Department, 59th Medical Wing, Lackland AFB, TX 78236-5319

**Table II**

Summary of Hydrocodone (HC), Hydromorphone (HM) and Norhydrocodone (NHC) Detection

Subject	HC, HM, NHC first detected (≥ 2.5; 5; 2.5 ng/mL) (h post dose)	HC last detected (≥ 2.5 ng/mL) (h post dose)	HM last detected (≥ 5 ng/mL) (h post dose)	NHC last detected (≥ 2.5 ng/mL) (h post dose)	Maximum concentration HC (ng/mL)	Maximum concentration HM (ng/mL)	Maximum concentration NHC (ng/mL)
1	3:30	51:00	84:00	84:00	919	163	1,440
2	5:40	68:00	68:00	71:30	2,190	342	1,790
3	1:45	49:50	49:50	56:10	1,160	102	1,240
4	7:03	98:00	98:00	102:35	1,390	310	3,460
5	4:45	91:45	91:45	129:40	612	261	811
6	3:15	96:45	59:15	84:15	1,380	329	2,050
7	2:00	46:00	46:00	74:00	947	239	1,420

6

Journal of Analytical Toxicology 2013;37:486-494  
doi:10.1093/jat/bkt066 Advance Access publication August 14, 2013

Special Issue

### Prescription Opioids. II. Metabolism and Excretion Patterns of Hydrocodone in Urine Following Controlled Single-Dose Administration

Edward J. Cone<sup>1\*</sup>  
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<sup>3</sup>Department of Pharmaceutical Sciences  
Research Triangle Park, NC 27709  
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20 mg

R. Flegel<sup>5</sup>  
<sup>5</sup>Roche Research Institute  
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Triangle Park, NC 27709  
Research Administration, Rockville, MD, USA

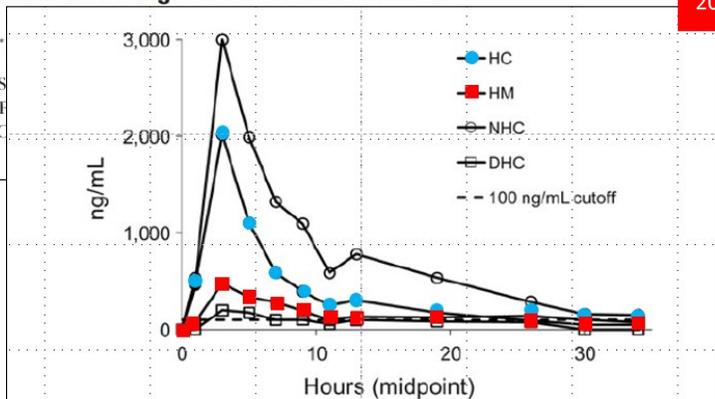


Figure 2. Mean excretion of HC and metabolites in urine (hydrolyzed) following administration of a single 20-mg dose of HC bitartrate to 12 subjects.

7



7

48-year-old nurse referred for comprehensive evaluation. She was on a monitoring contract for opioid and alcohol use disorders. The PHP ordered a blood test for phosphatidylethanol (PEth).

**Blood spot PEth result:** 30 ng/mL

She immediately protested the result, claiming that the collector had “rubbed her thumbs with rubbing alcohol that were not part of the kit and failed to wipe her thumbs with a 2x2 gauze before sticking her thumbs...”

8

**ALCOHOL IS  
THE  
ANESTHESIA  
BY WHICH WE  
ENDURE THE  
OPERATION  
OF LIFE.**

- GEORGE BERNARD SHAW

8

55-year-old anesthesiologist on PHP contract for alcohol, cannabis, cocaine, and opioid use disorders, all in sustained remission by report. He produced the following drug test results:

June 11: **Urine**: Positive for ethanol; negative for EtG and EtS

August 9: **Urine**: Temperature out of range (high)

August 26: **Blood spot PEth**: 110 ng/mL

At evaluation, he endorsed a single binge on August 12. The evaluator concluded that he was forthcoming about his alcohol use.

8

At a comprehensive evaluation one year later, he was confronted about the inconsistency between the PEth result and his stated history, he endorsed having consumed alcohol on multiple days around August 12.

He denied ever having tampered with his urine specimens.

It was decided to administer a polygraph examination.

8

**Polygraph examination:**

Immediately prior to the examination, he disclosed that he had been drinking on and off for the six months prior to the “one day binge” and that he had heated up substituted urine specimens on several occasions.

Question 1: Have you been honest about your recent alcohol relapse?

Response: PASS

Question 2: Have you ever subverted the urine drug testing system?

Response: FAIL

9

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doi: 10.1093/jat/bkaa014  
Advance Access Publication Date: 24 February 2020  
Case Report



Case Report

**Persistent Urinary Ethyl Sulfate in the Absence of Urinary Ethyl Glucuronide in a Patient with Alcohol Use Disorder Who Claimed Abstinence**

Gary M. Reisfield<sup>1,\*</sup>, Scott A. Teitelbaum<sup>2</sup>, and Joseph T. Jones<sup>3</sup>

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<sup>2</sup>University of Florida College of Medicine, Florida Recovery Center, 4001 SW 13th St., Gainesville, FL 32605, USA;

<sup>3</sup>United States Drug Testing Laboratories, Inc., 1700 S. Mt. Prospect Rd, Des Plaines, IL 60018, USA

9

47-year-old nurse was being monitored in a PHP for alcohol- and opioid use disorders. She underwent a fitness-for-duty evaluation because of suspected workplace impairment.

**Urine:** EtG negative; EtS 799 ng/mL (EtS<sub>100</sub> 588 ng/mL)

**Hair:** EtG negative

**Blood:** PEth negative

She admitted to opioid use disorder relapse, but denied past-three-year alcohol use.

9

**Table 1.** Blood PEth and Urine EtG and EtS Concentrations During Treatment Episode

Treatment day	Creatinine mg/dL	EtG ng/mL	EtS ng/mL	EtS per 100 mg cr	Urine ethanol	Blood PEth
1	181	ND	955	528	–	–
8	–	–	–	–	–	Neg
15	226	ND	979	433	–	–
25	100	ND	176	176	–	–
28	–	–	–	–	Neg	–
29	76	ND	466	613	–	–

10

58-year-old physician referred for IME secondary to his request for an early exit from his PHP monitoring contract. He had a history of opioid and alcohol use disorders, both reportedly in sustained remission.

**Urine:** EtG 905 ng/mL (EtG<sub>100</sub> 1,289 ng/mL); EtS 30 ng/mL (EtS<sub>100</sub> 43 ng/mL)

**Blood:** PEth negative

**Hair:** EtG negative

He claimed regular, heavy use of alcohol-containing hand sanitizer, including same day use up until the early-afternoon evaluation.

10

**Table III. Statistical Summary of Data Obtained for Urine EtG, EtS, and Creatinine**

	Mean (ng/mL) (per g creatinine)	95th Percentile (ng/mL) (per g creatinine)	99th Percentile (ng/mL) (per g creatinine)
<b>EtG</b> (all specimens)*	278 (351)	1037 (1302)	1645 (1692)
End of day 1	493 (546)	993 (1165)	1010 (1189)
End of day 2	601 (823)	1280 (1656)	1419 (1929)
End of day 3	542 (706)	1522 (1454)	1906 (1513)
<b>EtS</b> (all specimens)*	9 (9)	60 (61)	75 (91)
End of day 1	17 (11)	70 (53)	81 (61)
End of day 2	13 (12)	58 (45)	60 (48)
End of day 3	19 (28)	64 (91)	69 (93)

11

28-year-old physician with alcohol use disorder was on a 5-year substance use disorder monitoring contract. Prescribed naloxone 50 mg daily and disulfiram 250 mg daily. He missed 8 urine drug tests over a recent 3-month period and experienced several “mechanical issues” with his breathalyzer.

He was required to undergo a I.M.E.  
A blood PEth test was ordered.

11

## Breath alcohol monitoring



11

## Breath alcohol monitoring and zero order kinetics



11

## TAC Monitoring



Experimental and Clinical Psychopharmacology  
2014, Vol. 22, No. 1, 86–96

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1064-1297/14/\$12.00 DOI: 10.1037/a0034821

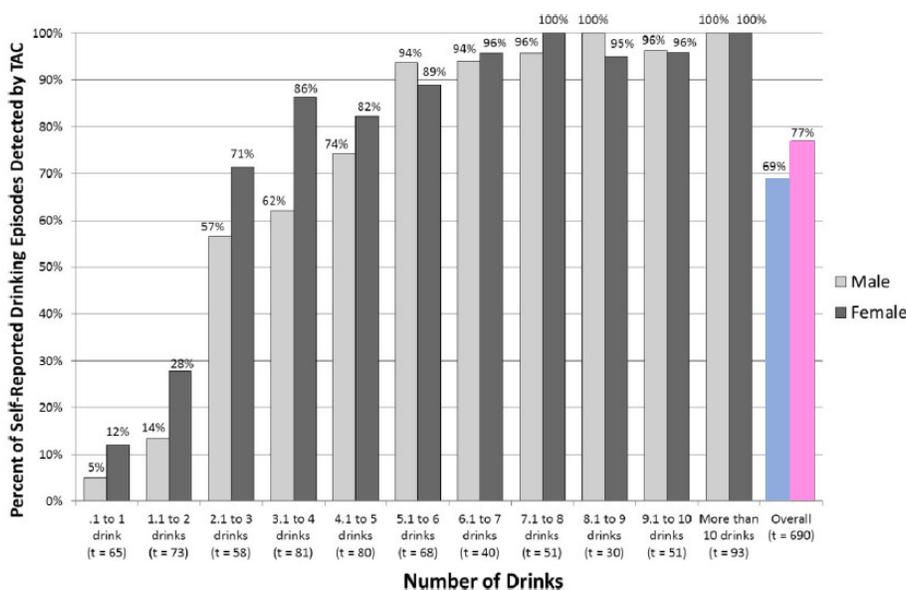
### Predictors of Detection of Alcohol Use Episodes Using a Transdermal Alcohol Sensor

Nancy P. Barnett  
Brown University

E. B. Meade  
University of Delaware

Tiffany R. Glynn  
Brown University

11



11

JOURNAL OF CLINICAL AND EXPERIMENTAL RESEARCH

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## Critical Review

## Wearable Transdermal Alcohol Monitors: A Systematic Review of Detection Validity, and Relationship Between Transdermal and Breath Alcohol Concentration and Influencing Factors

**Conclusions:** Transdermal alcohol monitors offer an opportunity to measure alcohol consumption in a valid and continuous way with mathematical models and software estimating BrAC values improving interpretation of TAC data. However, the SCRAM seems unable to detect low-to-moderate drinking levels using the thresholds and criteria set by the manufacturer. Moreover, the WrisTAS and the Skyn prototype show a high failure rate, raising questions about reliability. Future studies will assess the validity of new-generation wristbands, including the next Skyn generations.

12



12

55-year-old surgeon on a monitoring contract for alcohol use disorder, severe, was referred for an evaluation consequent to a bloodspot PEth result of 56 ng/mL. He initially denied consuming alcohol, but later recalled that he recently consumed Nyquil for an upper respiratory tract infection.



12

	Daily alcohol consumption	
	Grams/day	Drinks/day
Women	16-16.5	1.1-1.2
Men	32-33	2.3-2.4

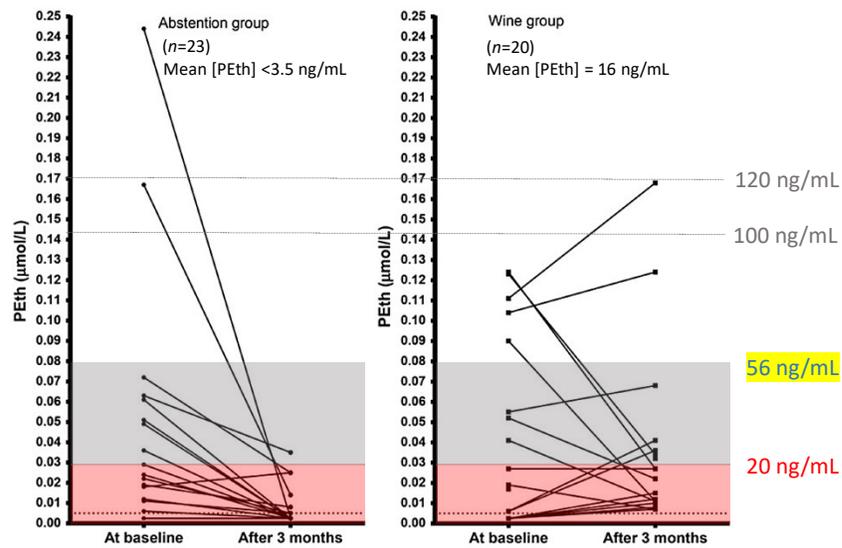
Article

### Phosphatidylethanol Compared with Other Blood Tests as a Biomarker of Moderate Alcohol Consumption in Healthy Volunteers: A Prospective Randomized Study

Stergios Kechagias<sup>1,\*</sup>, Dženeta Nezirević Dernroth<sup>2</sup>, Anders Blomgren<sup>3</sup>, Therese Hansson<sup>3</sup>, Anders Isaksson<sup>3</sup>, Lisa Walther<sup>3</sup>, Robert Kronstrand<sup>1,4</sup>, Bertil Kågedal<sup>5</sup>, and Fredrik H. Nystrom<sup>1</sup>

<sup>1</sup>Department of Medical and Health Sciences, Faculty of Health Sciences, Linköping University, Linköping, Sweden, <sup>2</sup>Division of Clinical Chemistry, Department of Clinical and Experimental Medicine, Faculty of Health Sciences, Linköping University, County Council of Östergötland, Linköping, Sweden, <sup>3</sup>Department of Laboratory Medicine, Division of Clinical Chemistry and Pharmacology, Lund University, Skåne University Hospital, Lund, Sweden, <sup>4</sup>Department of Forensic Genetics and Forensic Toxicology, National Board of Forensic Medicine, Linköping, Sweden, and <sup>5</sup>Division of Clinical Chemistry, Department of Clinical and Experimental Medicine, Linköping University, Linköping, Sweden

12



Kechagias S, et al. *Alcohol and Alcoholism* 2015;50:399-406

13

A 46-year-old neurosurgeon was referred to a PHP for suspicion of workplace impairment.

**Urine:** EtG 905 ng/mL (EtG<sub>100</sub> 1,289 ng/mL); EtS 30 ng/mL (EtS<sub>100</sub> 43 ng/mL)

**Blood:** PEth 354 ng/mL

**Hair:** EtG negative

He claimed social drinking (approx. 1-2 drinks a few nights per week) and regular, heavy use of alcohol-containing hand sanitizer.

*Journal of Analytical Toxicology*, 2021, 00, 1–12  
 DOI: <https://doi.org/10.1093/jat/bkab115>  
 Advance Access Publication Date: 8 November 2021  
 Article

OXFORD

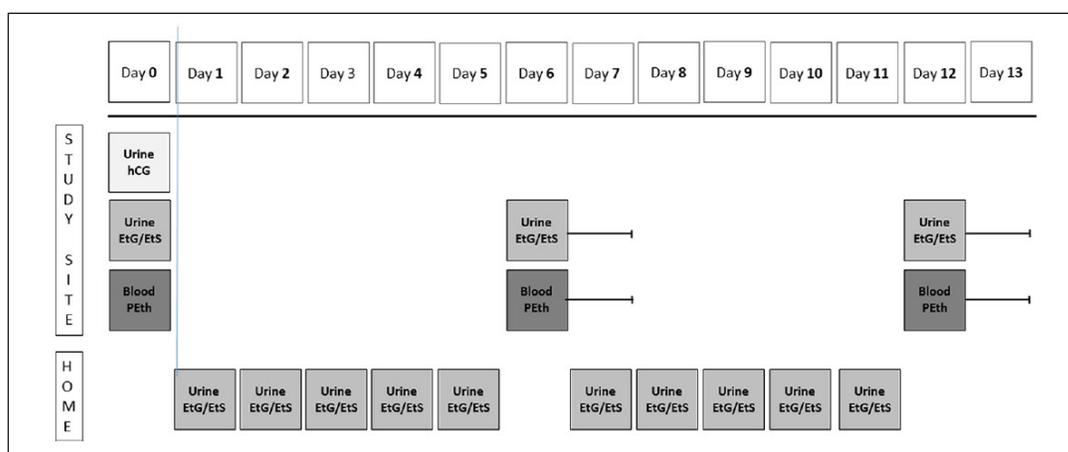
## Blood Phosphatidylethanol (PEth) Concentrations following Intensive Use of an Alcohol-based Hand Sanitizer

Gary M. Reisfield<sup>1,\*</sup>, Scott A. Teitelbaum<sup>2</sup>, Joseph T. Jones<sup>3</sup>, Dana Mason<sup>2</sup>, Max Bleiweis<sup>2</sup> and Ben Lewis<sup>2</sup>

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<sup>2</sup>University of Florida College of Medicine, 1600 Sw Archer Road, Gainesville, FL 32610, USA

<sup>3</sup>United States Drug Testing Laboratories, Inc., 1700 S Mount Prospect Road, Des Plaines, IL 60018, USA



**Table III.** PEth Concentrations by Participant

Participant #	Day 0	Day 6 ± 1	Day 12 ± 1
1	ND	ND	<LOQ
2	<LOQ	5	6
3	ND	ND	ND
4	5	ND	13
5	ND	ND	5
6	9	6	4
7	ND	ND	ND
8	5	5	ND
9	ND	<LOQ	ND
10	ND	6	6
11	4	6	6
12	10	6	11
13	ND	<LOQ	ND
14	6	ND	7
15	<LOQ	<LOQ	4

**13**

Purell® hand sanitizer (70%) x 12 days

Participant #	PEth concentration (ng/mL)		
	Day 0	Day 6±1	Day 12±1
1	<LOQ	<LOQ	<LOQ
2	<LOQ	<LOQ	<LOQ
3			
4	<LOQ	<LOQ	<LOQ
5			
6	<LOQ	<LOQ	13
7	<LOQ	<LOQ	<LOQ
8	9	<LOQ	<LOQ
9	<LOQ	<LOQ	<LOQ
10	<LOQ	<LOQ	<LOQ
11	<LOQ	<LOQ	<LOQ
12	<LOQ	<LOQ	<LOQ
13	<LOQ	11	OUT (COVID)
14	<LOQ	<LOQ	<LOQ
15	10	<LOQ	11
16	<LOQ	<LOQ	<LOQ
17	<LOQ	<LOQ	<LOQ
18	<LOQ	<LOQ	<LOQ

LOQ = 8 ng/mL

Reisfield GM, Teitelbaum SA, Jones J, Lewis B

14

An 83-year-old psychiatrist, under a PHP monitoring contract for alcohol and benzodiazepine use disorders, was referred for an evaluation consequent to a random bloodspot PEth result of 29 ng/mL.

**Urine:** EtG negative; EtS negative

**Blood:** PEth negative

**Hair:** EtG negative

The evaluator opined that his PEth result indicated alcohol use disorder “apparent” relapse and recommended individual therapy, enhanced monitoring, and 45 days out of practice.

Approximately 4 months later, he produced a random bloodspot PEth result of 29 ng/mL. He was referred for a comprehensive evaluation.

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At the comprehensive evaluation, he denied alcohol consumption, but suggested that his PEth result may have been due to:

**Urine:** EtG negative; EtS 50 ng/mL

**Blood:** PEth negative

**Hair:** EtG negative



14

*Journal of Analytical Toxicology*, 2022, 46, 979–990  
 DOI: <https://doi.org/10.1093/jat/bkab115>  
 Advance Access Publication Date: 8 November 2021  
 Article



## Blood Phosphatidylethanol (PEth) Concentrations following Intensive Use of an Alcohol-based Hand Sanitizer

Gary M. Reisfield<sup>1,\*</sup>, Scott A. Teitelbaum<sup>2</sup>, Joseph T. Jones<sup>3</sup>, Dana Mason<sup>2</sup>, Max Bleiweis<sup>2</sup> and Ben Lewis<sup>2</sup>

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*Journal of Analytical Toxicology*, 2021;45:950–956  
 doi:<https://doi.org/10.1093/jat/bkaa147>  
 Advance Access Publication Date: 7 October 2020  
 Article



Article

## Blood Phosphatidylethanol Concentrations Following Regular Exposure to an Alcohol-Based Mouthwash

Gary M. Reisfield<sup>1,\*</sup>, Scott A. Teitelbaum<sup>2</sup>, Joseph T. Jones<sup>3</sup>, Dana Mason<sup>1</sup>, Max Bleiweis<sup>1</sup> and Ben Lewis<sup>2</sup>

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14



14

#### **RESULTS AND CONCLUSION FOR [REDACTED]**

After collecting the chart data, and after a complete evaluation utilizing national standardized scoring process. The results are considered to be:

- NO SIGNIFICANT REACTIONS;**
- SIGNIFICANT REACTIONS; NO ADMISSION OF GUILT (post-exam); (There were deceptive markings on one or more of the 3 relevant questions.)**
- SIGNIFICANT REACTIONS; however, upon follow-up to the exam, client now admits that the facts related to the relevant questions are accurate;**
- INCONCLUSIVE to the relevant questions asked.**
- ADMITTED TO CIRCUMSTANCES OF OFFENSE.**
- NO TEST ADMINISTERED; reason being**

15

31 y/o male nurse, on an Intervention Project for Nurses (IPN) abstinence-based\* monitoring contract for alcohol, cannabis, and cocaine use disorders. He produced the following confirmed random urine drug test result:

Analyte	Concentration (ng/mL)
Codeine	808
Morphine	NEGATIVE

As a consequence, he was:

- Refrained from work by IPN and referred for independent medical evaluation
- Terminated from work by his employer

\*No poppy seeds, please!

15

## His story

- He worked the night shift (11:00 pm – 7:00 am), and during his 3:00 am break, he consumed 1.5 bags...
- He presented to the lab for urine drug testing shortly after completing his shift.



15

## His evaluation

- Physical exam: No indicia of drug abuse.
- Labs: Urine and hair negative for all analytes.
- Collateral sources of information: Positive reports.

15



15

**RESULTS AND CONCLUSION FOR [REDACTED]**

After collecting the chart data, and after a complete evaluation utilizing national standardized scoring process. The results are considered to be:

- NO SIGNIFICANT REACTIONS.**  
(There were no signs of deception on any of the 3 relevant questions)
- SIGNIFICANT REACTIONS; NO ADMISSION OF GUILT (post-exam).**  
(There were signs of deception on one or more of the 3 relevant questions)
- SIGNIFICANT REACTIONS; however, upon follow-up to the exam, client now admits that the facts related to the relevant questions are accurate;**
- INCONCLUSIVE to the relevant questions asked.**
- ADMITTED TO CIRCUMSTANCES OF OFFENSE.**
- NO TEST ADMINISTERED; reason being**

15

*Journal of Analytical Toxicology*, 2022, **00**, 1–7  
DOI: <https://doi.org/10.1093/jat/bkac079>  
Advance Access Publication Date: 1 October 2022

Article

OXFORD

## Poppy Seed Consumption May Be Associated with Codeine-Only Urine Drug Test Results

Gary M. Reisfield<sup>1,\*</sup>, Scott A. Teitelbaum<sup>2</sup>, and Joseph T. Jones<sup>3</sup>

<sup>1</sup>University of Florida College of Medicine, UF Health Springhill 1, 4037 NW 86th Terrace, Gainesville, FL 32606, USA

<sup>2</sup>Florida Recovery Center, Department of Psychiatry, University of Florida College of Medicine, 4001 SW 13th Street, Gainesville, FL 32065, USA

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DEPARTMENT OF THE NAVY  
OFFICE OF THE JUDGE ADVOCATE GENERAL  
CRIMINAL LAW DIVISION (CODE 20)  
1254 CHARLES MORRIS STREET SE, SUITE B01  
WASHINGTON, DC 20374-5124

IN REPLY REFER TO:  
5810  
Ser 20/003  
7 Feb 23

MEMORANDUM

From: Director, Criminal Law Division, Office of the Judge Advocate General  
To: Distribution

Subj: BRADY NOTICE – POPPY SEED PRODUCTS AND POSITIVE CODEINE RESULTS

Ref: (a) DoDI 1010.16 dtd 15 Jun 20

Encl: (1) DoD General Counsel ltr dtd 03 Feb 23

1. This information is being released pursuant to *Brady v. Maryland*, 373 U.S. 83 (1983) and Rule for Courts-Martial 701. Please ensure this notice and enclosure are disseminated to all judge advocates in your command or on your staff.

2. The DoD Office of Drug Demand Reduction (ODDR) has determined that the ingestion of certain legally purchased food products could, in some circumstances, result in a positive urinalysis for codeine.

3. On 19 January 2023, ODDR temporarily suspended reporting of codeine results on all urinalyses processed at Department of Defense Forensic Toxicology Drug Testing Laboratories and suspended the destruction of urine specimens previously reported as a codeine positive.

4. ODDR and the Services will identify affected service members with a previously reported positive codeine urinalysis, consistent with poppy seed ingestion, for any appropriate remedial actions.

## Case 16: “Therapeutic” polygraph

- 30 y/o emergency medicine physician, who sought and received treatment 30 d of treatment for AUD near the end of his residency.
- In his application for an E.R. job, he checked the box that he had a history of AUD treatment.
- His state’s PHP required that he undergo an IME.
- The examination was notable for:
  - His assertion of abstinence for the five months preceding the IME
  - Blood PEth 22 ng/mL (He attributed this to “cough syrup”)
  - Dx: AUD, moderate
- He was referred to the Florida Recovery Center for treatment

## His treatment course

- Admission urine, blood, and hair drug test results: NEGATIVE
- All subsequent drug test results: NEGATIVE
- Neuropsychological testing
  - Cognitive function within expectations
  - MMPI-2: Suggestions of defensiveness, denial, minimization
- The team believed that he was being dishonest about his alcohol use, presenting a barrier to therapeutic progress. They elected to administer a polygraph examination for therapeutic purposes.

The relevant questions asked were as follows:

After much discussion, we agreed on the relevant questions and he said that he was confident in answering these questions and was comfortable with the answers.

[REDACTED]

[REDACTED]

[REDACTED]

<b>RESULTS AND CONCLUSION FOR [REDACTED]</b>	
After collecting the chart data, and after a complete evaluation utilizing national standardized scoring process. The results are considered to be:	
<input type="checkbox"/>	<b>NO SIGNIFICANT REACTIONS.</b> (There were no deceptive markings on any of the 3 relevant questions)
<input type="checkbox"/>	<b>SIGNIFICANT REACTIONS; NO ADMISSION OF GUILT (post-exam).</b> (There were deceptive markings on one or more of the 3 relevant questions.)
<input type="checkbox"/>	<b>SIGNIFICANT REACTIONS; however, upon follow-up to the exam, client now admits that the facts related to the relevant questions are accurate;</b>
<input type="checkbox"/>	<b>INCONCLUSIVE to the relevant questions asked.</b>
<input type="checkbox"/>	<b>ADMITTED TO CIRCUMSTANCES OF OFFENSE.</b>
<input type="checkbox"/>	<b>NO TEST ADMINISTERED; reason being</b>

## Case 17: Let's talk

- 38 y/o 4<sup>th</sup> year anesthesiology resident was in treatment for alcohol and ketamine use disorders.
- He produced a dextromethorphan-POS result on a random urine drug test.
- He endorsed brief (unauthorized) use of dextromethorphan for a cough, but the team believed that he was being disingenuous and that this was a barrier to therapeutic progress.
- We discussed with him our plan to proceed with a polygraph examination to further explore his behaviors and intentions regarding his administration of dextromethorphan.

## Guidance for evaluators

- A detailed drug and alcohol history is often indispensable.
  - Drug use: Quantity, frequency, chronicity, and last use
  - Drug exposure: Occupational; recreational; home (ASAM DIMENSION 6)
- Order the appropriate test(s)
- Use the most appropriate matrices
- Know your science; trust your science
  - Know the “known knowns” (study resources; become an MRO). You must do your homework. Do not make the mistake of using the polygraph exam to adjudicate dispositive drug test results.
  - Be aware of the “known unknowns” (and be humble)
- Evaluating is not for the weak