

# DRUG TESTING MYTHS

**Randy Saager, B.S.**

**Vice President of Laboratory Operations**

©2020 Cordant Health Solutions®. All rights reserved. Do not distribute without written permission from Cordant Health Solutions.

©2022 Cordant Health Solutions®. All rights reserved. Do not distribute without written permission from Cordant Health Solutions.

**Cordant**  
Health Solutions®

## **TAKE-AWAYS**

- **Screening vs. Confirmation – What Each One Can and Can't Tell You**
- **Common Myths and Misconceptions in Drug Testing**
- **Most Frequently Asked Questions Received by Our Toxicologists**



# WHAT DO WE NEED TO KNOW ABOUT SCREENING?

# PRESUMPTIVE SCREENING – IMMUNOASSAY



## POC Screening

- Instant screening results – Subjective
- Limited panel of drugs
- Urine, very limited oral fluid

**Fast, Cheap,  
Good for eliminating  
negative samples**



## Laboratory Screening

- Calibrated and quality-controlled assays
- Wider variety of tests than POC cups
- Urine, oral fluid, serum, hair

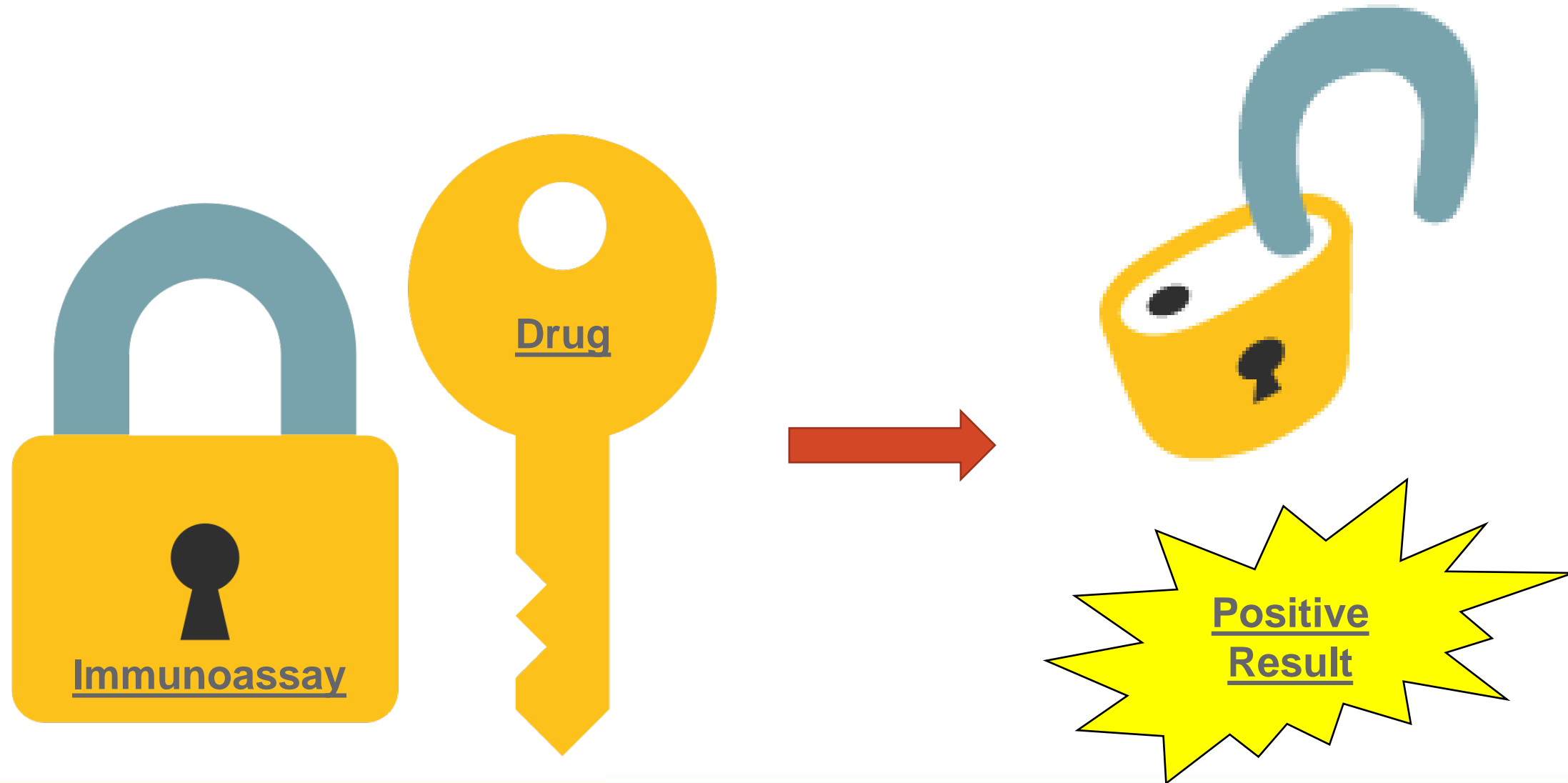
## All Immunoassays

- Drug class specific
- Cutoffs generally higher than confirmation testing
- Qualitative results (some semi-quant exceptions available)
- Do not differentiate parent drug from metabolites
- Prone to Cross-reactivity – when an unwanted substance causes an unintended reaction

**Subject to false positive & false negative results**

## IMMUNOASSAY CROSS REACTIVITY

Immunoassays can be visualized as a lock and key



## COMMON EXAMPLES OF CROSS-REACTIVITY\*

Assay	Cross-reacting Interference
Amphetamines	Bupropion, OTC decongestants
Methadone	Tapentadol
Benzodiazepine	Sertraline
Phencyclidine (PCP)	Dextromethorphan, Diphenhydramine, Venlafaxine
Fentanyl	Trazodone metabolite, Methamphetamine
Opiates	Oxycodone, Oxymorphone in very high levels

\*This list represents a handful of common cross-reacting compounds. Many others exist and have been well characterized.

# WHAT A SCREEN CAN AND CAN NOT TELL YOU



## CAN

- Whether any drugs might be present
- Which drug class might be present
- Separate out negative results to focus on potential positives

## CAN NOT

- Whether a specific drug was detected
- How much of the drug was detected
- Provide legally defensible results
- Whether a drug was prescribed or not
- When the drug was taken specifically
- What dose of the drug was taken



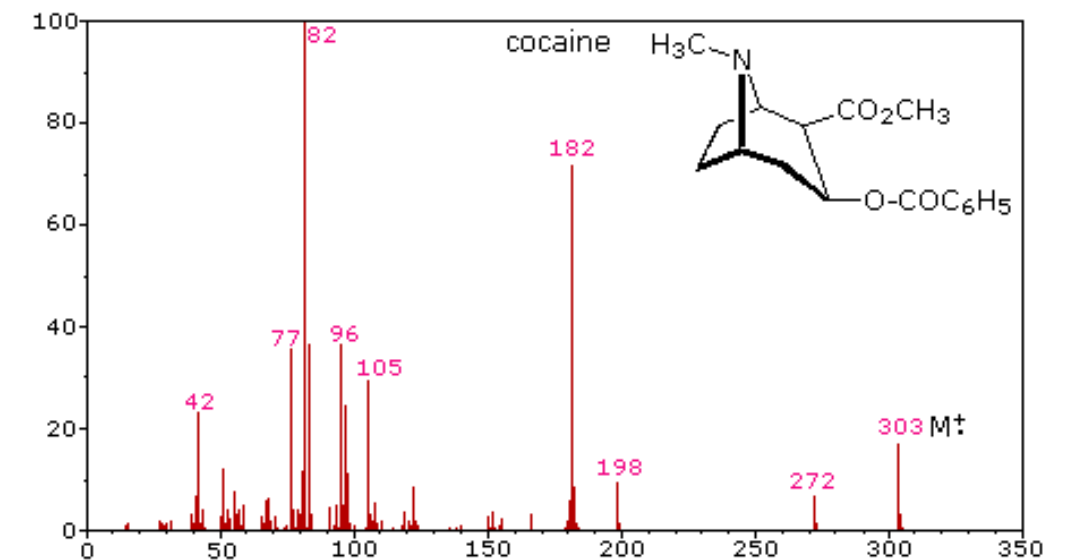
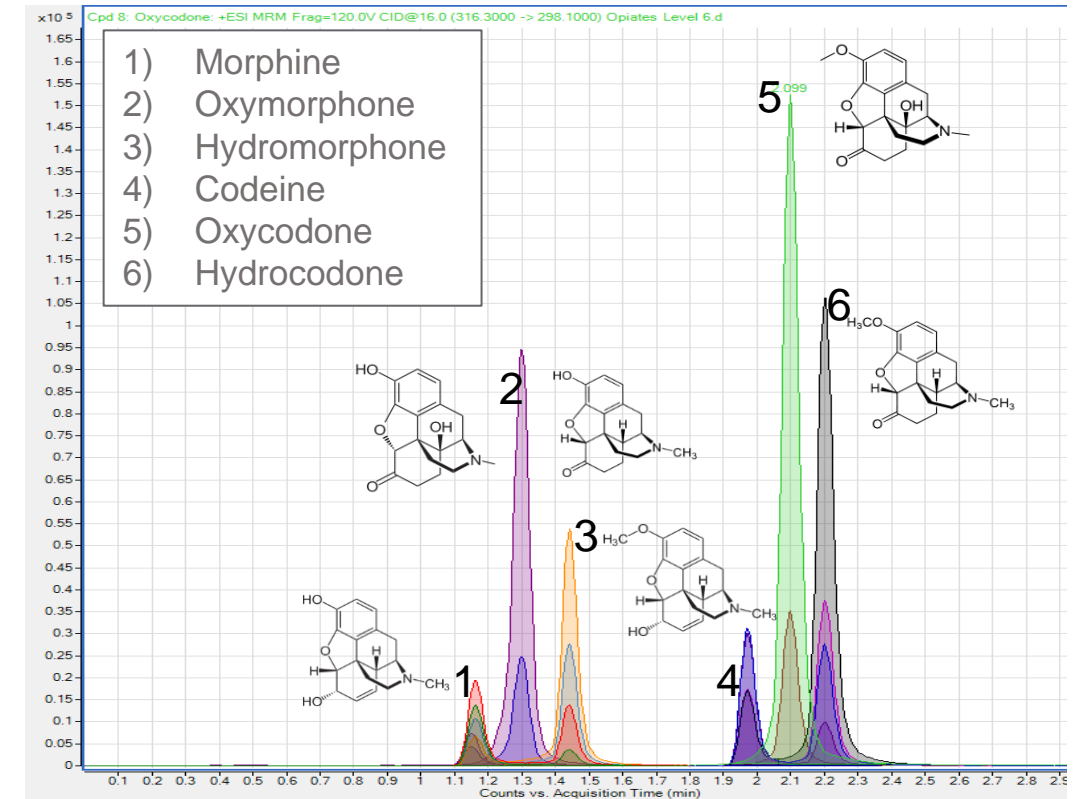
# WHAT DO WE NEED TO KNOW ABOUT CONFIRMATIONS?



# DEFINITIVE CONFIRMATIONS

## LC-MS/MS\* Confirmation

- “Platinum standard”
- Drug (analyte) specific
  - Drug separation by chromatography
- Provides a “molecular fingerprint”
  - Drug identification by mass spectrometry
- Most extensive testing menu
- Urine, oral fluid, hair, blood, etc. – All sample types
- Cutoffs lower than screening tests
- Identification of parent drugs and metabolites
- Definitive quantitative results



# WHAT A CONFIRMATION CAN AND CAN NOT TELL YOU



## CAN

- Whether a drug WAS ingested
- Which drug(s) were ingested
- Whether the drug was metabolized (processed through the body, certain drug classes)
- Provide legally defensible results
- Eliminate the possibility of a false positive from unknown contributions

## CAN NOT

- How much of the drug a person ingested (dose)
- Whether a drug was prescribed or not
- When a person specifically ingested the drug
- If the ingestion was intentional or not



# **COMMON MYTHS, MISUNDERSTANDINGS, AND QUESTIONS AROUND DRUG TESTING**

# MYTH: DRUG DETOX PRODUCTS FOUND IN THE MARKET CAN HELP YOU PASS A DRUG TEST

## FALSE

There are no known detoxifying methods or products that can eliminate the presence of drugs in the body once they are consumed.

Typically, these products instruct the user to consume large amounts of liquids during the “detox” period, resulting in a dilute sample in order to achieve a negative result below the cutoff.



# MYTH: YOU CAN GET A POSITIVE DRUG TEST FROM JUST BEING AROUND SOMEONE DOING A DRUG

## POSSIBLY but USUALLY FALSE

Certain criteria must be met for inhalation: poor ventilation for an extended period of time.

Drug testing cutoffs should be appropriately determined to differentiate secondhand exposure from intended ingestion.

**Important Note:** Children are often at particular risk from hand-to-mouth exposure from drugs contaminating surfaces like tables and floors



# MYTH: ETG CAN BE FORMED IN URINE AFTER COLLECTION

## TRUE

There is potential for post collection formation of ethyl glucuronide (EtG) as well as parent ethanol in the urine sample when certain unique scenarios occur in combination with each other

ETG is subject to both degradation and synthesis post collection

ETS is NOT subject to this same phenomenon. Always use ETS as an indicator of alcohol use

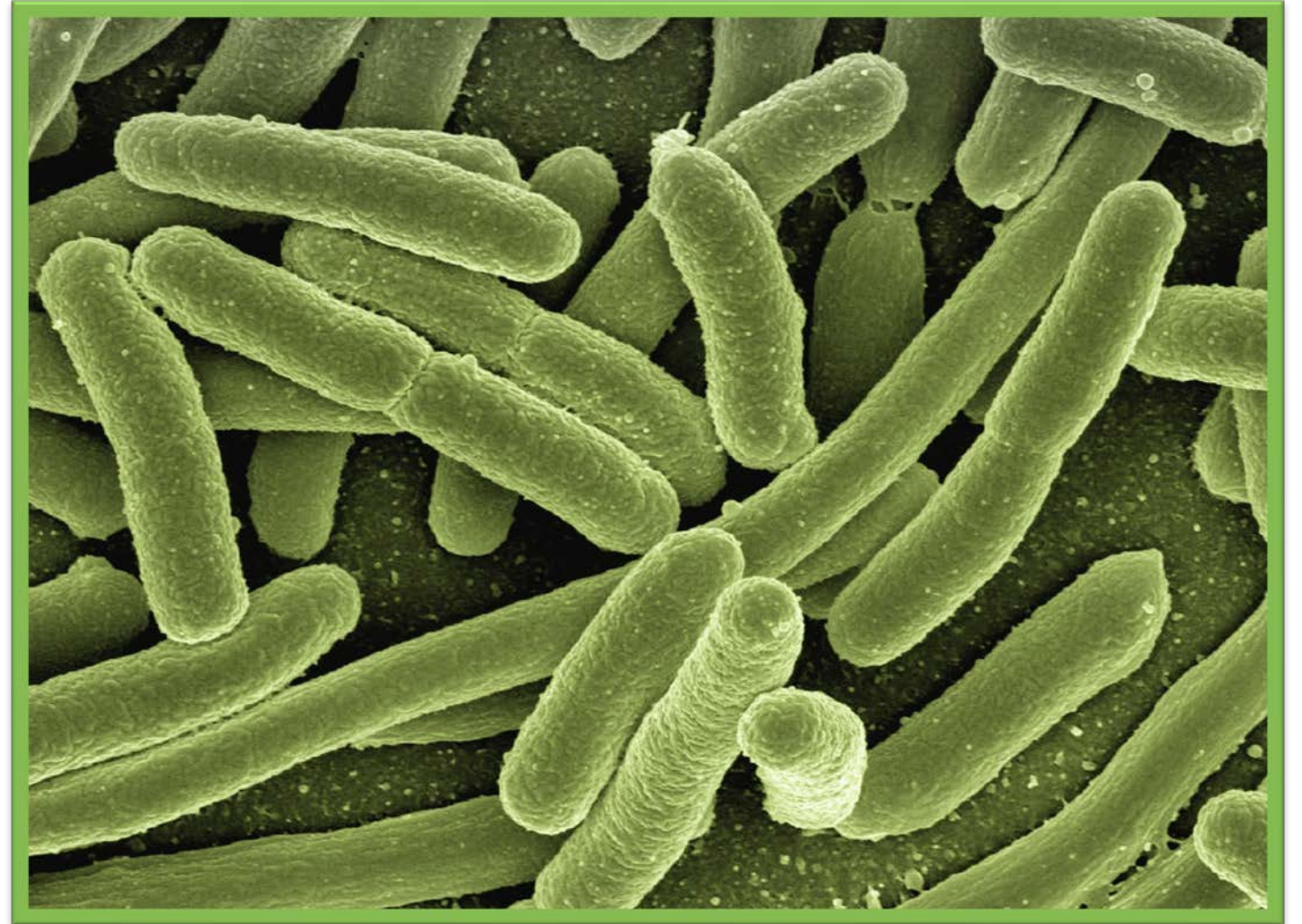
Specimen Final Outcome - Screen and Confirmation Results					
Test	Result	Outcome	Method	Cutoff	Notes
ETG/ETS					
Ethyl glucuronide	843 ng/mL	<b>POSITIVE</b>	LCMSMS	500 ng/mL	A positive EtG result with no reportable ETS may be caused by post collection formation of EtG and may not be consistent with consumption of ethanol (alcohol).
Ethyl sulfate	-	NEGATIVE	LCMSMS	500 ng/mL	

# ETHYL GLUCURONIDE

## Post Collection Synthesis of EtG and ethanol

- Uncontrolled diabetic → Excess glucose in urine → Ferments alcohol in sample (by microbial growth)
- Bacteria present (e.g., a urinary tract infection) → E. coli in sample

**E. coli + Alcohol = EtG  
(Metabolizes)**



# ETHYL GLUCURONIDE

*If screen only ETG or ethanol was run, the use of a glucose test will help understand the possibility of post collection synthesis.*

- A sample positive for glucose may have ethanol fermentation after the sample was collected.

Ethyl Sulfate does **NOT** have this same phenomenon.

- ETS is not formed post-collection in these scenarios
- Remember, the **ONLY** way to get an ethyl sulfate result is through a confirmation.





# MYTH: HAND SANITIZER CAN CAUSE A POSITIVE ETG RESULT

## FALSE

Current peer reviewed literature defines an appropriate ETG testing cut off as 500 ng/mL, the well-established threshold eliminating potential for environmental exposures.

- Including normal use of hand sanitizer

ETG levels below 500 ng/mL could indeed be from environmental exposure or the end stage metabolism of alcohol ingestion.

**Important Note:** Certain job settings, such as in the health care industry, health professionals may have additional exposure beyond “normal use” which may be able to achieve ETG levels above the 500 ng/mL threshold



# ETHYL GLUCURONIDE / SULFATE

## Extreme Hand Sanitizer Use

- 62% alcohol
- Applied every 5 minutes
- For 10 hours straight
- For 3 days

Study suggests ETS levels above 100 ng/mL are NOT from hand sanitizer

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)
EtG (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)
ETS (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)

\* Excluding the pre-study specimens.

<https://academic.oup.com/jat/article/35/2/85/773167>

Reminder: ETS levels can only be obtained through confirmatory testing

# MYTH: POPPY SEEDS CAN CAUSE A POSITIVE OPIATE RESULT

## TRUE

Current guidance (SAMHSA) establishes any level of morphine below 2000 ng/mL could be from poppy seed ingestion.

The seeds of the poppy seed plant (*Papaver somniferum*) contain low levels of both morphine and codeine.

- Typically, morphine levels are higher than codeine in most strains found in the U.S.

Understand timeline:

- Urine: Did the ingestion happen within the last 24 hours?
- Oral fluid: Did the ingestion happen within the last 2 hours?



# THE POPPY SEED DEFENSE

## Concentrations of Morphine and Codeine in Paired Oral Fluid and Urine Specimens Following Ingestion of a Poppy Seed Roll and Raw Poppy Seeds

Kimberly L. Samano\*, Randal E. Clouette, Barbara J. Rowland and R.H. Barry Sample

Quest Diagnostics Incorporated, Employer Solutions, 10101 Renner Boulevard, Lenexa, KS 66219, USA

Journal of Analytical Toxicology 2015;39:655–661

**Table I**

Urine and Neat OF Concentrations (ng/mL) of Morphine and Codeine after a Single Serving of Raw Poppy Seeds or Baked in a Roll

Time (h)	Morphine	Codeine
	Roll	Roll
Urine		
2	<b>539</b> (188–1,408), 343, <i>n</i> = 12	162, <i>n</i> = 1
4	<b>697</b> (258–1,356), 302, <i>n</i> = 12	<b>167</b> (140–194), 38, <i>n</i> = 12
6	<b>461</b> (155–954), 222, <i>n</i> = 12	ND, <i>n</i> = 11
20	<b>348</b> (183–471), 121, <i>n</i> = 10	ND, <i>n</i> = 12
OF		
0.25	<b>35</b> (7–143), 37, <i>n</i> = 11	<b>18</b> (9–28), 13, <i>n</i> = 2
0.5	<b>18</b> (12–37), 12, <i>n</i> = 4	8, <i>n</i> = 1
1	<b>11</b> (8–18), 4, <i>n</i> = 4	ND, <i>n</i> = 12
1.5	<b>16</b> (8–25), 12, <i>n</i> = 2	8, <i>n</i> = 1
2	ND, <i>n</i> = 12	ND, <i>n</i> = 12
3	ND, <i>n</i> = 12	ND, <i>n</i> = 12



## Q: IS ORAL FLUID TESTING AS GOOD AS URINE TESTING?

**YES**

Oral fluid testing is as sensitive and accurate as urine drug testing

Additional benefits over urine:

- Gender-neutral observed collection every time
  - No specialized facilities required
- Difficult to adulterate when compared to urine
- Not affected by dilution
- Very recent drug use
- Good for populations that can not easily provide urine samples
  - Medical conditions, shy bladder, etc.



# ORAL FLUID DRUG TESTING

## AS SENSITIVE AND ACCURATE AS URINE TESTING

- New technologies, better extraction techniques, better understanding of the complexity of this matrix
- Lower cutoffs necessary because lower levels of drug are found in oral fluid in comparison to urine—we know more now!
- Exact same screen to confirm technology, process, quality control criteria, accreditation expectation






## POPULAR ALTERNATIVE TO URINE

- Treatment, medication-assisted treatment (MAT), courts, therapeutic drug monitoring, workers' compensation, federally regulated workplace drug testing (SAMHSA)

**ACCEPTED INTO EVIDENCE ACROSS THE COUNTRY – LEGALLY DEFENSIBLE**

# A QUICK SAMPLE TYPE COMPARISON

Sample Type	Detection Window	Important to Know	Example Scenarios of Use
 URINE	Within hours and up to 3-5 days	<ul style="list-style-type: none"> <li>• Prone to adulteration/dilution</li> <li>• 3-5 days max detection window</li> <li>• Not good for “under the influence” testing</li> <li>• Requires monitored and/or observed collection</li> </ul>	Randomized testing for a court ordered testing schedule
 ORAL FLUID	Immediately and up to 1-3 days	<ul style="list-style-type: none"> <li>• Very recent use</li> <li>• More effectively shows current toxicity</li> <li>• Difficult to adulterate, no dilution effect</li> <li>• Non-invasive, always observed</li> <li>• Primarily parent drugs present</li> </ul>	Assessing very recent use
 HAIR	7 days and up to 90 days	<ul style="list-style-type: none"> <li>• Multiple moderate doses necessary to receive positive result</li> <li>• Best for detection of heavy long-term use</li> <li>• Indication of a person’s lifestyle choices</li> </ul>	Evaluating habitual lifestyle choices

# QUESTION: CAN CBD CAUSE A POSITIVE DELTA-9 THC TEST RESULT?

## YES and NO

Standard THC screening tests and confirmation tests do not cross-react with or specifically identify CBD.

So, CBD ALONE will NOT cause a positive Delta-9 THC result.

However, CBD products and their production are unregulated and can contain Delta-9 THC, which may produce a positive result in urine testing.

Some individuals may receive POSITIVE Delta-9 THC results even at legal levels <0.3% Delta-9 THC.





# QUESTION: CAN DELTA-8 THC CAUSE A POSITIVE DELTA-9 THC TEST RESULT?

## YES and NO

**Screening** techniques look for cannabinoids as an entire drug class, including Delta-8 THC, so could easily result in presumptive positive screens for cannabinoids.

**Confirmation** techniques traditionally only look for Delta-9 THC, resulting in a negative confirmation.

**Important Note:** Delta-8 THC can cause interferences in the confirmation method, potentially preventing the reporting of Delta-9 THC.

Most labs recognize the limitation and either have developed or are developing methods to distinguish Delta-8 from Delta-9.



# MYTH: CONSUMING EXTRA LIQUIDS BEFORE MY DRUG TEST CAN HELP ME PASS

## TRUE

Diluting a sample (intentionally or otherwise) decreases ALL compounds in the urine including drugs and metabolites of interest with the hopes to receive a negative result below the cutoff.

### So HOW do we BEAT IT?

By measuring creatinine concentration, we can measure urine concentration and understand an individual's hydration status, often alerting us to the dilution event.



# MYTH: DRINKING ENERGY DRINKS WILL MAKE ME FAIL MY DRUG TEST

## FALSE

Energy drinks sold on the market do not contain any ingredients that will cause a positive confirmed drug test result.

- Common Ingredients: caffeine, taurine, B vitamins, ginkgo biloba, guarana, glucuronolactone, l-carnitine

**Important Note:** Energy drink products can contribute to a dilute sample if consumed in excess, just like any other liquid.



# MYTH: NOVOCAINE CAUSED MY POSITIVE COCAINE (BENZOYLECGONINE) RESULT

## FALSE:

NO other drug or supplement will cause a positive cocaine result besides cocaine, including:

- Novocaine, Procaine, Lidocaine and Tetracaine

Other potential sources:

- Used in nasal surgeries (rare)
- Coca leaves
  - Sale, growth and use of the coca leaf is illegal in the U.S. if it contains cocaine.
  - Decocainized leaves may be found but will not contain cocaine and therefore would not cause a positive result.



# QUESTION: MY CLIENT INSISTS THEY DIDN'T TAKE FENTANYL. IT'S NOT THEIR DRUG OF CHOICE. WHY IS IT THERE?

Clients indeed may or may not know they have ingested fentanyl or other fentanyl analogs

- Expanding number of poly drug combinations on the market
  - Illicitly manufactured fentanyl is being used to replace or adulterate other drugs of abuse
  - Often found in cocaine, heroin, and methamphetamine
  - Counterfeit pain pills such as oxycodone



<https://www.poison.org/articles/opioid-epidemic-history-and-prescribing-patterns-182>

# FENTANYL & DESIGNER OPIOIDS

## Fentanyl Derivatives

- 1970's California – Synthetic fentanyl overdoses spiked in Orange County
  - $\alpha$ -methylfentanyl, 3-methylfentanyl,  $\alpha$ -methylacetylfentanyl
  - “China White”
- Today
  - Furanyl fentanyl, Acetyl fentanyl, Butyryl fentanyl, Carfentanil

## Designer Opioids / Research Chemicals

- U-47700, AH-7921, others
  - Investigated as legitimate pharmaceuticals
  - Obtained primarily from internet websites

In Cordant extended designer panel, standard fentanyl is still found in the majority of samples that contain these analogs.

3-Methylfentanyl  
Acetyl Fentanyl  
Acetyl Norfentanyl  
AH-7921  
Butryl Fentanyl  
Carfentanil  
Fentanyl  
Furanyl Fentanyl  
Isobutyryl Fentanyl  
MT-45  
Norfentanyl  
Ocfentanil  
para-Fluorobutyrylfentanyl [FBF]  
para-Fluorofentanyl  
para-Fluoroisobutyrylfentanyl [FIBF]  
Sufentanil  
U-47700  
U-50488  
Valeryl Fentanyl


# QUESTION: DID MY CLIENT INGEST MARIJUANA AGAIN?

## Let's Discuss

THC can persist in the urine long after use

- ~2-5 days for the occasional user
- ~6 weeks for the chronic user

THC is lipophilic and likes to retain in the fat cells

- the more you take, the longer you take it, the higher the doses  the longer it takes to leave the body

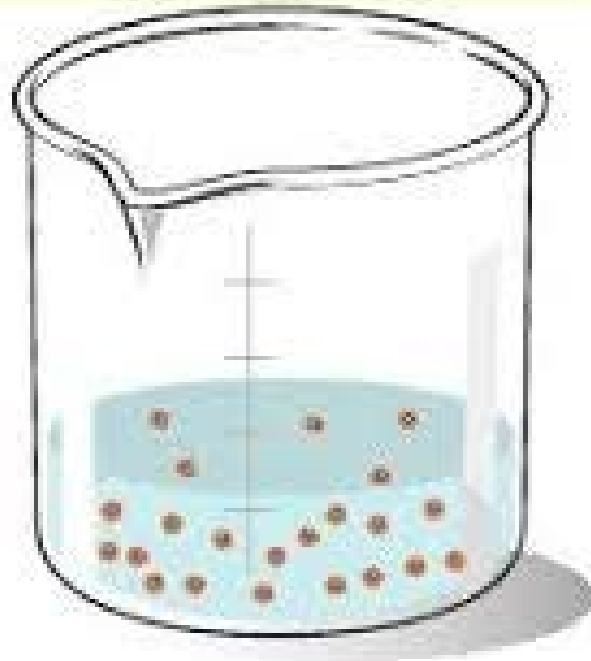
Levels of drugs in urine are largely dependent on how hydrated the person is

- For drugs like THC (that can stick around a while), we need to account for day-to-day variability in hydration, in order to assess new use vs residual use

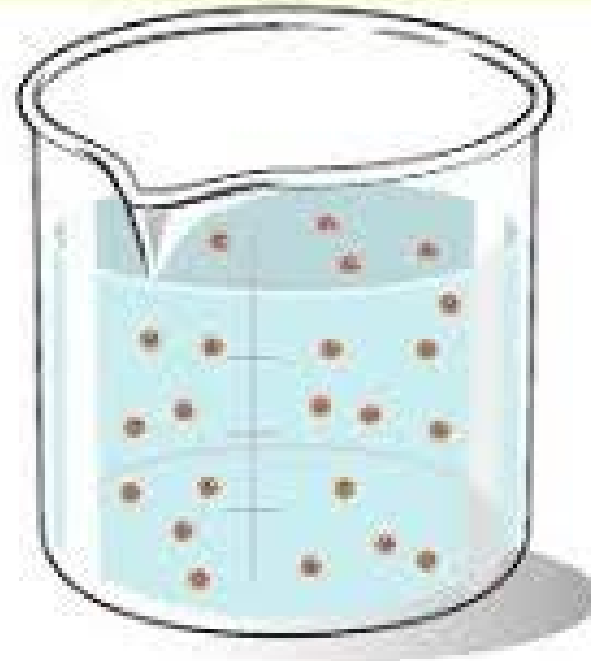


# SPECIMEN DRUG CONCENTRATION – THC NORMALIZATION

Both contain the same amount of drug



Less Hydrated



More Hydrated

- Measuring creatinine tells us how hydrated the person is
- Creatinine – Chemical waste molecule from muscle metabolism through the kidneys
- Highly dependent on the person's hydration status
- Used to “normalize” for the dilution (hydration) effect that would also affect any drugs or metabolites if present in the urine

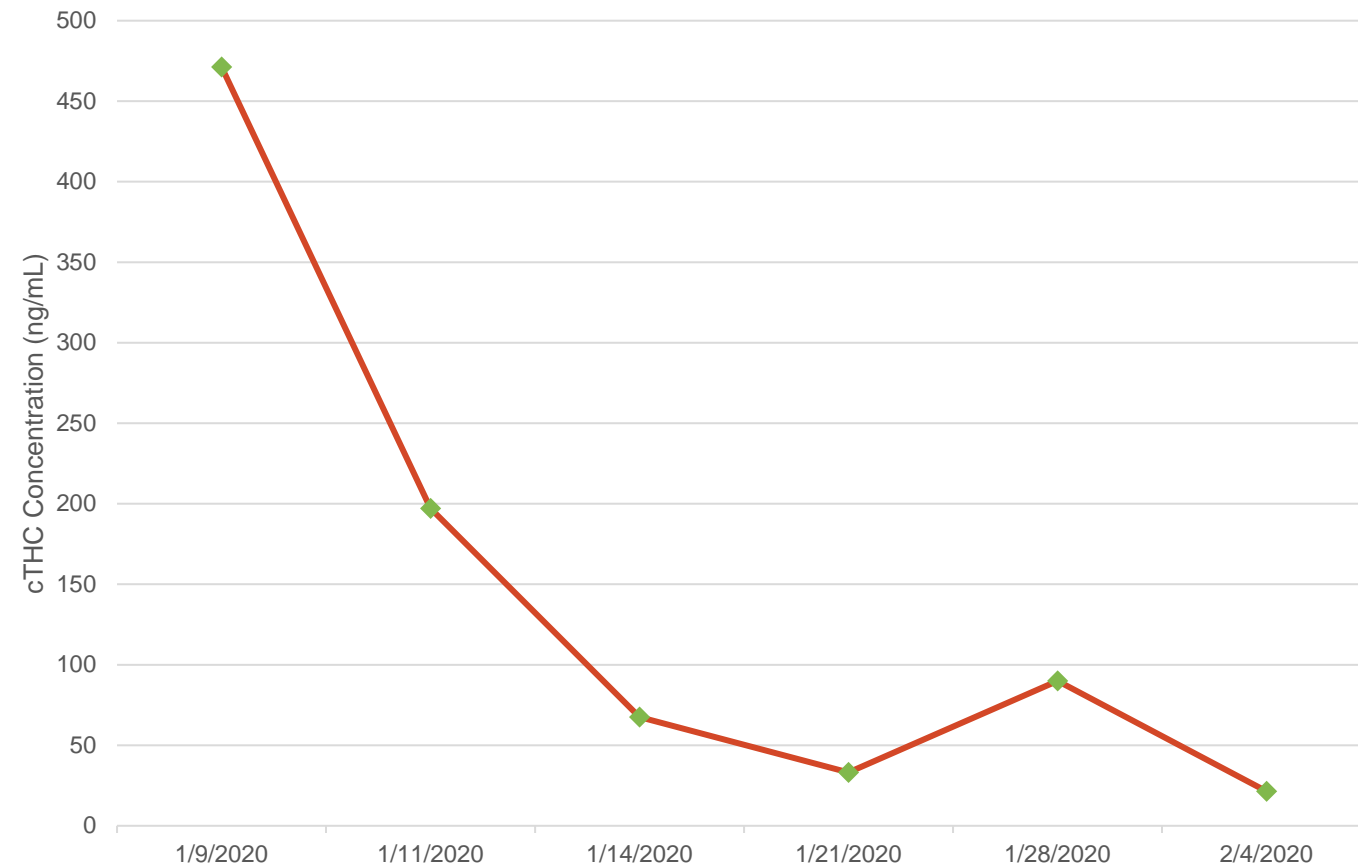


# THC – NEW USE OR OLD USE

Has my client ingested marijuana again?

Date	1/9/2020	1/11/2020	1/14/2020	1/21/2020	1/28/2020	2/4/2020
cTHC concentration (ng/mL)	471	197	68	33	90	21

cTHC Trend



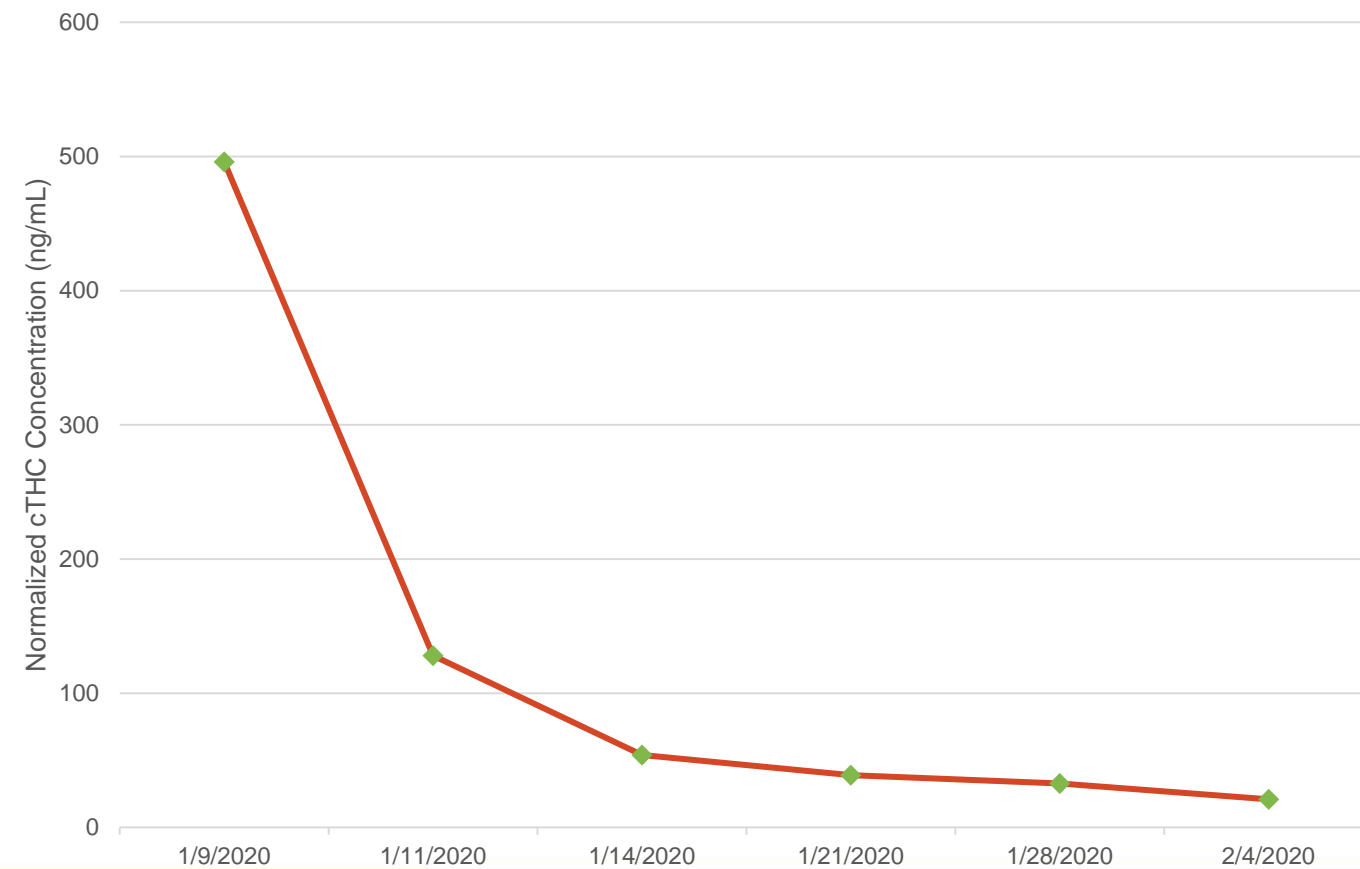
# THC – NEW USE OR OLD USE

Date	01/09/2020	1/11/2020	1/14/2020	1/21/2020	1/28/2020	2/4/2020
THC concentration (ng/mL)	471	197	68	33	90	21
Creatinine concentration (mg/dL)	95.0	154	125	85	275	102

$$\text{Normalized THC Concentration} = \frac{\text{THC Concentration}}{\text{Creatinine Concentration}} \times 100$$

Normalized THC concentration (ng/mL)	496	128	54	39	33	21
--------------------------------------	-----	-----	----	----	----	----

Normalized cTHC Trend



## THC INTERPRETATION

Try to compare at least three test results with >3-5 days in between each test

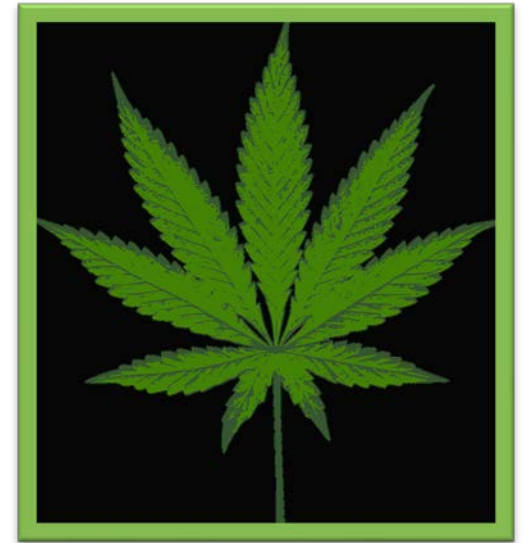
**THC should decrease by ½ every 2-10 days**

- Will decrease much faster for an occasional user

**An increase in the THC/CR ratio of 50-100% or greater is consistent with new use**

- Take caution in low ratios below ~20- “trickling out affect”

THC levels are dependent upon urine concentration-or level of donor hydration – **ALWAYS use THC/CR ratio when comparing multiple results!**



# MYTH: EATING A HIGH PROTEIN DIET OR TAKING CREATINE SUPPLEMENTS WILL HELP ME PASS MY DRUG TEST BY HIDING A DILUTE SAMPLE

## FALSE

### Creatinine $\neq$ Creatine

**Creatinine** is a chemical waste molecule from muscle metabolism through the Kidneys

- **Creatine** is ingested to build muscle
- **Creatinine** is the product created after that formed muscle starts breaking down



# MYTH: EATING A HIGH PROTEIN DIET OR TAKING CREATINE SUPPLEMENTS WILL HELP ME PASS MY DRUG TEST BY HIDING A DILUTE SAMPLE

## FALSE

### Creatinine $\neq$ Creatine

Individuals with higher protein diets and more muscle mass may indeed have higher creatinine levels.

Individuals that have low meat (or no meat) diets, females, elderly and individuals on diuretics tend to have lower creatinine values in general.

**Important Note:** Lower does NOT automatically mean Dilute. Normal urine samples have a creatinine value between 20-350 mg/dL.



# QUESTIONS?

Randy Saager, B.S.  
info@cordanths.com  
844-848-5955

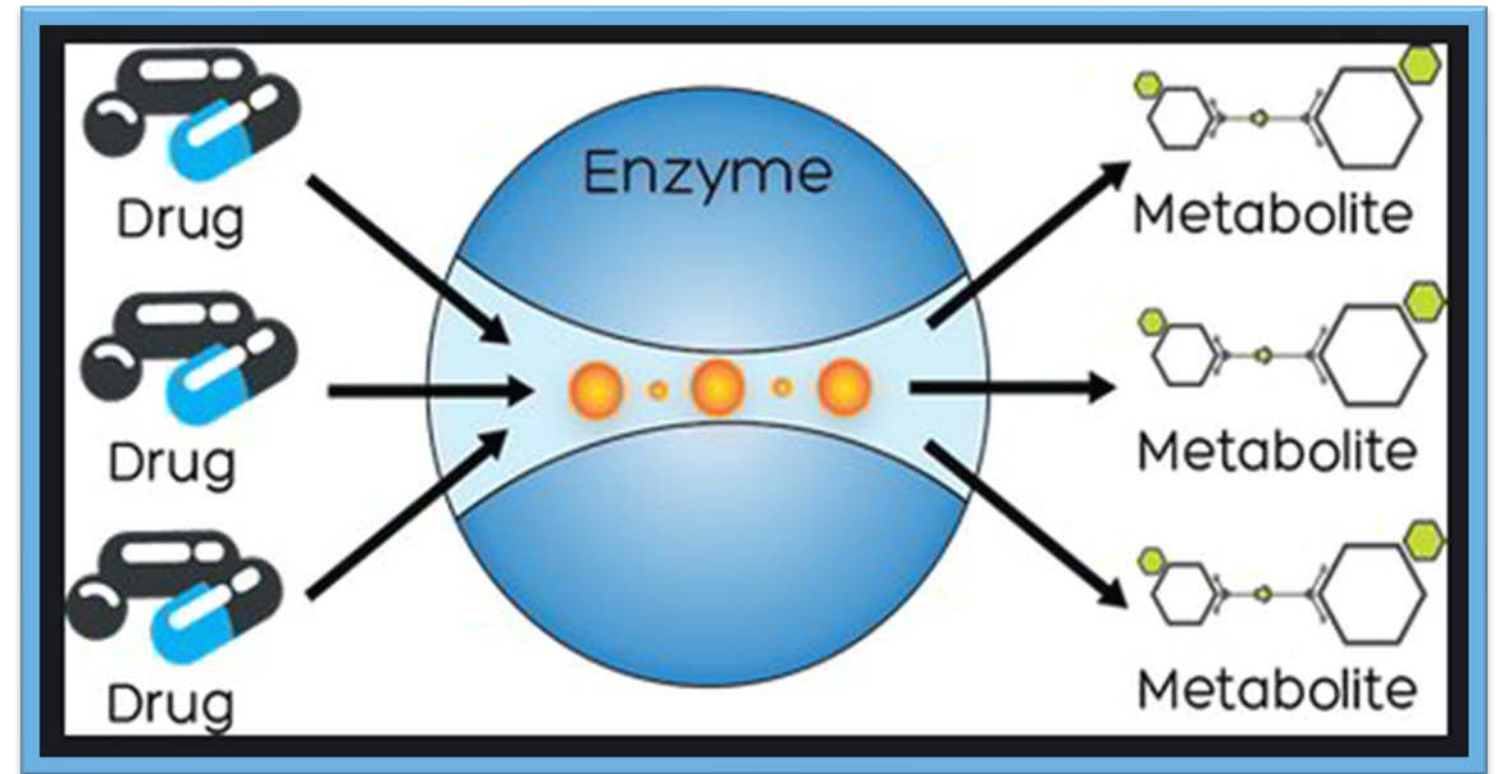


# APPENDIX



# DRUG METABOLISM

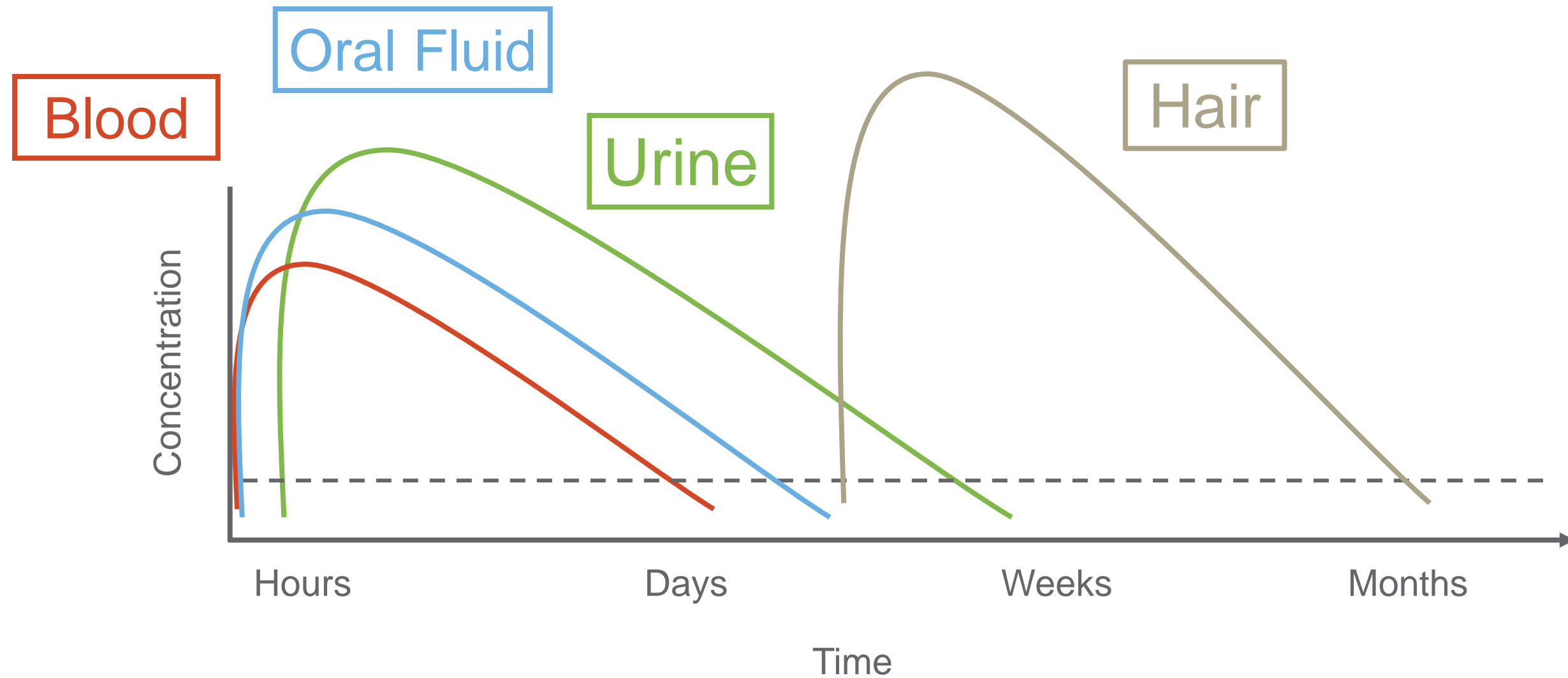
- **WHAT:** Biochemical changes of drugs and other foreign substances in the body
- **WHY:** The main goal is to eliminate the drug from the body
- **HOW:** Some drugs are excreted as unchanged parent drug and some are known to be converted to other products (metabolites)



As a result, you will find both the parent drug ingested as well as the metabolites “excreted” in urine, oral fluid, sweat, breath etc. depending on the drug itself.



# GENERAL DRUG DETECTION WINDOWS



# URINE DRUG MONITORING

## OVERVIEW

- Most utilized matrix in toxicology
- Long history of use
- Provides a **3-5 day window** of detection for most drugs
- **Only tells you a drug was used**, not how much, when, impairment or disease

## BENEFITS

- Large volume collected
- Contains high levels of drug and metabolites
- Cost effective
- Long window of detection
- Large test menu

## CONSIDERATIONS

- Special collection issues-same sex observed collections required
- Matrix most subject to adulteration or dilution



**Ideal matrix to detect  
drugs of abuse**

# ORAL FLUID DRUG TESTING

## OVERVIEW

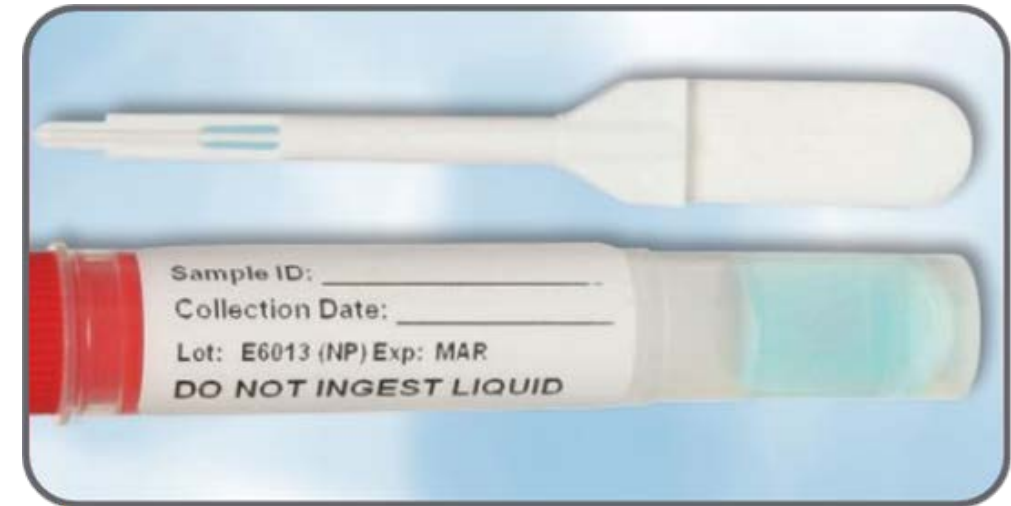
- As sensitive and accurate as urine testing
- Popular alternative to urine
- Direct filtrate of the blood

## BENEFITS

- Non-invasive collections-gender neutral
- Little to no opportunity for adulteration or substitution
- No special facilities required- good for collections in the field and **in leu of observed urine collections**
- Testing protocol randomizer

## CONSIDERATIONS

- **Primarily parent drug detection – no metabolites**
- **Recent drug use (1-36 hours) – Short detection window**
- More expensive than urine testing
- Small specimen volume



**Ideal for high-risk populations  
that dilute or adulterate**

# HAIR ANALYSIS

## OVERVIEW

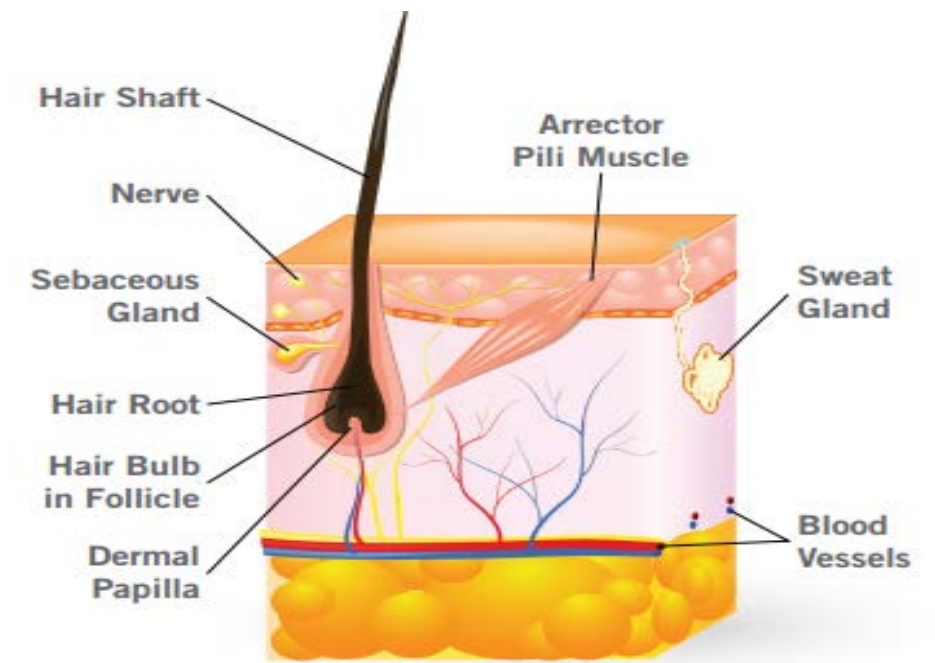
- Access to long term drug use histories
- ~3 month look back – multiple moderate uses

## BENEFITS

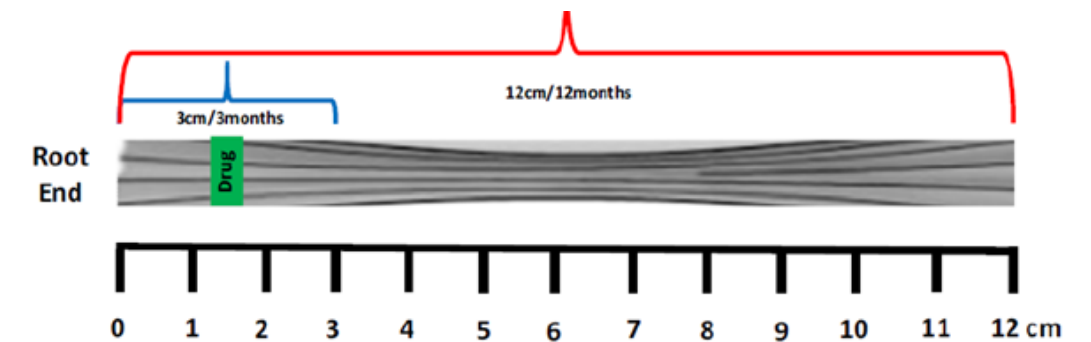
- Larger surveillance window
- Gender neutral collection
- Determines an individual's lifestyle choices
- Large sample volume – repeat sampling possible
- Difficult to adulterate

## CONSIDERATIONS




- Some drugs don't go into hair well – THC
- High costs
- Does not show recent (<7 day) use
- Wash procedures to ensure against external contamination



**Ideal matrix to determine a client's lifestyle choices and baseline testing**



# A QUICK SAMPLE TYPE COMPARISON

Sample Type	Detection Window	Important to Know	Example Scenarios of Use
 URINE	Within hours and up to 3-5 days	<ul style="list-style-type: none"><li>• Prone to adulteration/dilution</li><li>• 3-5 days max detection window</li><li>• Not good for “under the influence” testing</li><li>• Requires monitored and/or observed collection</li></ul>	Randomized testing for a court ordered testing schedule
 ORAL FLUID	Immediately and up to 1-3 days	<ul style="list-style-type: none"><li>• Very recent use</li><li>• More effectively shows current toxicity</li><li>• Difficult to adulterate, no dilution effect</li><li>• Non-invasive, always observed</li><li>• Primarily parent drugs present</li></ul>	Assessing very recent use
 HAIR	7 days and up to 90 days	<ul style="list-style-type: none"><li>• Multiple moderate doses necessary to receive positive result</li><li>• Best for detection of heavy long-term use</li><li>• Indication of a person’s lifestyle choices</li></ul>	Evaluating habitual lifestyle choices