

Drug Testing



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Objectives

- Review brief history of drug testing
- Discuss various type of drug testing modalities
- Review pros and cons of presumptive vs. confirmatory tests
- Discuss how drug testing is utilized to guide clinical decision making

“Drug testing serves as a primary prevention, diagnostic, and monitoring tool to identify the presence or absence of drugs of abuse or therapeutic agents related to addiction management in multiple settings.”

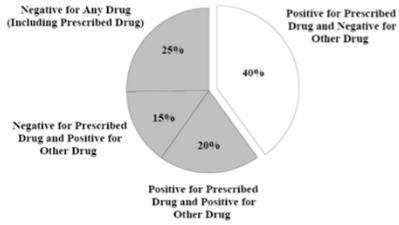
Drug Testing + Addiction Treatment History

- 1950s - Diagnose overdoses in the ER (mainly blood)
- 1960s - Urine testing available
- 1970s - Routine in methadone maintenance treatment
- 1971 - Military drug testing in Vietnam (heroin use)
- 1986 – Reagan mandates drug testing for federal workers
 - SAMHSA-5 (cocaine, amphetamine, opiates, PCP, marijuana)

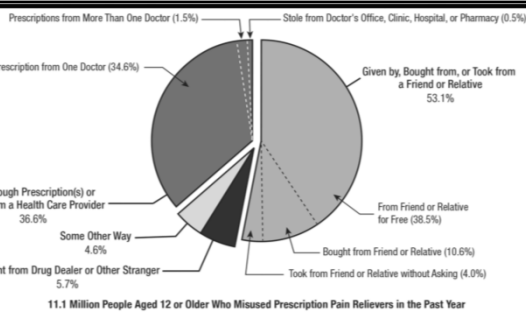


Why drug test?

Figure 4. Percentage of Patients Referred to Quest Diagnostics Laboratories for Drug Testing by Their Physicians Testing Positive and Negative for Drugs Prescribed for Them, 2012.¹⁰²



Center for Substance Abuse Research, 2013



Source Where Pain Relievers Were Obtained for Most Recent Misuse among People Aged 12 or Older Who Misused Prescription Pain Relievers in the Past Year: Percentages, 2017



What does a drug test tell you?

- Drug tests measure if a **particular drug** is in the patient's **sample** (urine, blood, saliva, etc.) at a **specific point in time**.

Drug tests **CANNOT**:

- Prove that a substance *hasn't* been taken
- Identify every substance that may have been taken
- Detect if the patient is intoxicated/impaired
- Rule out or diagnosis a Substance Use Disorder



Loperamide-Related Deaths in North Carolina

Sandra C. Bishop-Freeman*, Marc S. Feaster, Jennifer Beal, Alison Miller, Robert L. Hargrove, Justin O. Brower, and Ruth E. Winecker




Drug Testing Trivia #1

- True or False: Poppy seeds can lead to a positive urine drug screen for opiates?

Answer: **True** (roll vs. raw poppy seed resulted in urinary morphine concentrations below 2,000 ng/mL)



Drug testing in different contexts

Context	Question
	Is the individual violating their parole? Did the individual drive while intoxicated?
	Was the employee intoxicated? Is the employer financially responsible for the worker's injury?
	Has the patient recently used these <i>specific</i> substances (drugs or medications)? Which clinical approach is most likely to help the patient?

Forensic Drug Testing

- Purpose of being used in legal proceedings "scientifically sound and legally defensible"
- Drug testing is a "search" under the 4th Amendment
- Parole/Probation – does NOT follow rigorous federal standards for workplace drug testing programs, NOT forensic in nature

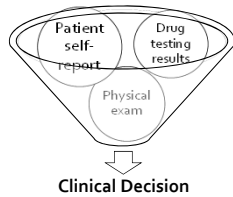


Clinical Drug Testing



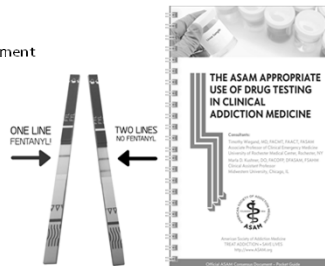
- Diagnosis and treatment
- Does not represent a search, can refuse to cooperate with a drug test
- There is no universal standard today in clinical drug testing for medication monitoring or for drug testing in addiction treatment
- Perform medically necessary and accurate testing for drugs that are most likely to impact clinical decisions.

Drug Testing Results Are Just One Component Used in Clinical Decision Making



Drug Testing in Addiction Treatment

- Screening and diagnostic evaluation
- Long-term monitoring after initial treatment
- Harm Reduction (identify fentanyl)
- *PHPs (Physician Health Programs)



Two General Categories of Drug Testing

	"Point of Care" or "Presumptive" testing	"Confirmatory" or "Definitive" testing
Timing of collection	Performed in clinic at time of visit	Performed by outside lab after patient visit
Timing of results	Results available at time of patient visit	Results available 2-30 days after patient visit
Specimen	Sample collected in clinic	Sample may be collected in clinic or at lab site
Results	Positive or negative results, no quantities	Results can be reported as quantities
Accuracy	Some substance or drugs can cross-react leading to "false pos" and "false neg"	Very rare false positives or false negatives
Cost	\$	\$\$\$

Point of Care (Presumptive) Test Interpretation

- Substances can trigger a **positive result** for Methamphetamines or Amphetamines
 - Over the counter cold/allergy or heartburn meds
 - Some antidepressants (Prozac, Wellbutrin)
- Some benzodiazepines may not be detected unless they are at high levels
 - Clonazepam (Klonopin), Lorazepam (Ativan)
- Some opioids will not be detected with a general opioid screen, requiring specific tests
 - Buprenorphine, Methadone, Oxycodone, Fentanyl

Routine testing for other substances?

- Loperamide (Imodium®)
- Mitragynine (Kratom)
- Synthetic Cannabinoids (K2, Spice)
- Synthetic Cathinones (Bath Salts)

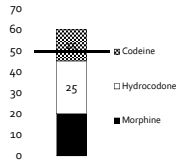


1. Barbiturates (BAR)
2. Benzodiazepines (BZO)
3. Methadone (MTD)
4. Methamphetamine (MAMF)
5. Ecstasy (MDMA)
6. Propoxyphene (PPX)
7. Oxycodone (OXY)
8. Marijuana (THC)
9. Cocaine (COC)
10. Opiates (OPI)
11. Amphetamines (AMP)
12. Phencyclidine (PCP)
13. Buprenorphine (BUP)
14. Tricyclic Antidepressants (TCA)

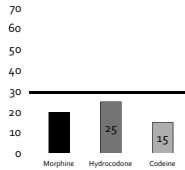
UNCH Urine Tox Screen
d-Amphetamine
Secobarbital
Lormetazepam?
Bup and Nbup (Conf)
11-nor-delta9-THC-9 COOH
Benzoylcegonine
Methadone
Morphine
Oxycod, Oxymorph (Conf)

Positive Screening Test Results NOT confirmed

ELISA "cut-off" at 50 ng/ml – test is POSITIVE



The GC/MS limit of detection at 30 ng/ml means that none of the drugs are identified.



Urine

- Easy to collect, but requires a bathroom
- May be observed or unobserved
 - Observed does not necessarily prevent tampering
 - Observed urine collection may be distressing for some patients with a history of trauma (sexual trauma)
 - If using an observer, choose staff member of same gender
- Prone to tampering
 - Dilution
 - Addition of interfering substance
 - Substitution with another person's urine
- Options for testing for sample integrity
 - Temperature
 - pH
 - Specific gravity
- Standardized collection protocol



Window of Detection

- Depends on drug, type of specimen (urine, blood, hair, etc.)
- Urine

Substance	Days
Heroin	1-2
Cocaine	2-4 (low use) 10-22 (heavy use)
Marijuana	1-3 (low use) up to 30 (heavy use)
Benzodiazepines	1-3 (short acting) up to 6 weeks (long acting)
Methamphetamines	1-2

Exhibit 2.12. Urine Drug Testing Window of Detection^{64,65}

Drug	Positive Test	Window of Detection*	Comments
Amphetamine; methamphetamine; 3,4-methylenedioxymethamphetamine	Amphetamine	1-2 days	False positives w/ bupropion, chlorpromazine, desipramine, fluoxetine, labelalol, promethazine, ranitidine, pseudoephedrine, trazadone, and other common medications. Confirm unexpected positive results with the lab.
Barbiturates	Barbiturates	Up to 6 weeks	N/A
Benzodiazepines	Benzodiazepines	1-3 days; up to 6 weeks w/ heavy use of long-acting benzodiazepines	Immunoassays may not be sensitive to therapeutic doses, and most immunoassays have low sensitivity to clonazepam and lorazepam. Check with your laboratory regarding sensitivity and cutoffs. False positives with sertraline or escitalopram.
Buprenorphine	Buprenorphine	3-4 days	Will screen negative on opiate screen. Tramadol can cause false positives. Can be tested for specifically.
Cocaine	Cocaine, benzoylcegonine	2-4 days; 10-22 days w/ heavy use	N/A
Codeine	Morphine, codeine, high-dose hydrocodone	1-2 days	Will screen positive on opiate immunoassay.

Exhibit 2.12. Urine Drug Testing Window of Detection^{64,65}

Drug	Positive Test	Window of Detection*	Comments
Fentanyl	Fentanyl	1-2 days	Will screen negative on opiate screen. Can be tested for specifically. May not detect all fentanyl-like substances. ⁶⁵
Heroin	Morphine, codeine	1-2 days	Will screen positive on opiate immunoassay. 6-monoacetylmorphine, a unique metabolite of heroin, is present in urine for about 6 hours. Can be tested for specifically to distinguish morphine from heroin, but this is rarely clinically useful.
Hydrocodone	Hydrocodone, hydromorphone	2 days	May screen negative on opiate immunoassay. Can be tested for specifically.
Hydromorphone	May not be detected	1-2 days	May screen negative on opiate immunoassay. Can be tested for specifically.
Marijuana	Tetrahydrocannabinol	Infrequent use of 1-3 days; chronic use of up to 30 days	False positives possible with efavirenz, ibuprofen, and pantoprazole.
Methadone	Methadone	2-11 days	Will screen negative on opiate screen. Can be tested for specifically.
Morphine	Morphine, Hydromorphone	1-2 days	Will screen positive on opiate immunoassay. Ingestion of poppy plant/seed may screen positive.
Oxycodone	Oxymorphone	1-1.5 days	Typically screens negative on opiate immunoassay. Can be tested for specifically.

*Detection time may vary depending on the cutoff.

Other Types of Samples

- Blood
- Sweat
- Oral fluid
- Hair

Exhibit 2-1. Window of Detection for Various Matrices

Matrix	Time*					
	Minutes	Hours	Days	Weeks	Months	Years
Breath	█					
Blood	█	█				
Oral Fluid	█	█	█			
Urine	█	█	█	█		
Sweat		█	█	█	█	
Hair				█	█	█
Meconium				█	█	█

*Many blood estimates that also depend on the substance, the amount and frequency of the substance taken, and other factors previously listed.
 15-30 days in the patch is worn, usually 7 days.
 12-10 days after use to the time passed to grow the length of hair, but may be limited to a month's hair growth. However, most laboratories analyze the amount of hair equivalent to 3 months of growth.
 Source: Adapted from Coker (1997); Daigraia (2008).

Each sample type has its own limitations and benefits; consult with a clinical pathologist or toxicologist to determine the best testing for your needs

Alcohol

- Breath testing – ease of testing
- Blood testing – blood alcohol concentration (BAC) –6 hrs
- Urine testing – ethyl glucuronide (EtG) and ethyl sulfate (ETs)
 - Detect alcohol – 72 hrs, false (+)
 - DO NOT determine level of drinking or severity of disease
 - DO detect recent use in settings where use is prohibited

Approximate Blood Alcohol Content (BAC) in One Hour
Based on National Institute on Drug Abuse Information

Drinks	Body Weight in Pounds	Influenced
1	100 120 140 160 180 200 220 240	Possibly
2	100 120 140 160 180 200 220 240	
3	100 120 140 160 180 200 220 240	
4	100 120 140 160 180 200 220 240	Impaired
5	100 120 140 160 180 200 220 240	
6	100 120 140 160 180 200 220 240	
7	100 120 140 160 180 200 220 240	Likely Impaired
8	100 120 140 160 180 200 220 240	
9	100 120 140 160 180 200 220 240	
10	100 120 140 160 180 200 220 240	

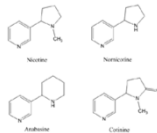


Table 4. Alcohol content (%) of some commercial items

ITEM	USE	ALCOHOL (%)
Listerine Antiseptic Mouthwash	Mouthwash	26.5
Soft Soap Hand Sanitizer - Gel		60 - 85
Dixalid Cough Syrup	Cough suppressant, Analgesic	5
Colgate Mouthwash	Mouthwash/gargle	15.3
Vicks Vapoal	Decongestant, cough	25
Vicks Formula 44M	Cough suppressant	20
Tylenol Adult Liquid Pain Reliever	Analgesic	7
Phenergan Syrup - Plain	Antihistamine	7

Tobacco

- Urine, hair, and oral fluid
- Breath testing (Carbon Monoxide)
 - E-cigarettes and nicotine replacement are NOT (+)
 - (+) for Marijuana
 - Quick and easy to administer
- Nicotine -> Cotinine (present in nicotine replacement products)
- Useful in various clinical scenarios



Drug Testing Trivia #2

- True or False: CBD (cannabidiol) oil results in marijuana (THC) testing to be positive.

Answer: **False**

“Legal” and “accurately” labeled products will not cause a positive screen.



Two arrested as 300 bottles Cannabidiol oil seized in Concord, officials say

Dozens Overdose In Connecticut Park On Tainted Synthetic Marijuana

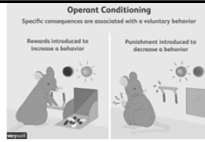
Criminal Justice System

"Old Paradigm"

- Infrequent, usually scheduled drug testing
- Results may not be sent to parole/probation officer for days or weeks
- No meaningful consequences until after repeated infractions

"New Paradigm"

- Frequent, random tests
- Drug use or missed appts lead to swift, meaningful consequences (brief incarceration)
- Significantly reduce drug use, criminal recidivism, and incarceration



Can Urine Drug Testing Determine if a Person was Impaired?

No

Impairment is affected by several factors that are unknown, including:

- How much of the substance was used
- When was it used
- What is the person's tolerance
 - How long have they used it
 - Regular use?
- Combined effects with other drugs
 - There may be drug present that the lab cannot detect
- Daily/hourly variations in the person's health

Drug Testing Trivia #3



- True or False: Breathalyzer testing is readily available to assess drug-impaired driving related to marijuana use.

Answer: **False**
 Technology not currently available



Twin epidemics: The surging rise of methamphetamine use in chronic opioid users
Matthew S. Ellis*, Zachary A. Kasper, Theodore J. Cicero *Drug and Alcohol Dependence 193 (2018) 14-20*
Washington University, Department of Psychiatry, Campus Box 8124, 660 S. Euclid Avenue, St. Louis, MO 63110 USA

- Meth serves as an opioid substitute, providing a *synergistic high* (i.e., the roller coaster effect), and balanced out the effects of opioids so one could function "normally"
- Methamphetamine-related deaths increased by 1178.6% from 2010 to 2018 at NC OCME**
- At NC OCME, 35.6% of fentanyl/analogues-related deaths also involved cocaine in 2017, compared to 30.6% in 2016.**


Take Home-Points about Testing

- Whom to test, what drugs to test for, what matrix to use, and what to do with results
- Ask about any prescribed or over-the-counter medications as well as vitamins and herbal supplements
- Point-of-care (presumptive) tests and Confirmatory (definitive) tests each have pros and cons
- Testing results are just one set of information needed to guide clinical decision making

"Drug testing is done for the patient, not to the patient."

Acknowledgments

Dr. Sandra Bishop-Freeman, PhD
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 919-743-9026 (desk)



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