Urine Drug Testing Methods[3-5]		
Type of Test	**Logistics**	**Pearls**
Initial Screening Test: Immunoassay	• Inexpensive • Fast • Widely available	• High sensitivity, low specificity (higher potential for false positives) • Opiate screen not sensitive for semisynthetic (e.g. oxycodone) or synthetic opioids (e.g. fentanyl)
Confirmatory Test: Gas chromatography-mass spectrometry (GCMS)[+] or Liquid chromatography-mass spectrometry (LCMS)	• Expensive • Time consuming	• High sensitivity, high specificity • Expensive • Detects medication even if concentration is low

[+] GCMS is considered the criterion standard for confirmatory testing; Immunoassay tests have high predictive values for marijuana and cocaine, but lower predictive values for opiates and amphetamines

Urine Drug Testing Specimen Validity[3-4]	Normal Characteristics of a Urine Sample[3-5]
• Urine samples that are adulterated, substituted, or diluted may avoid detection of drug use[4] • Urine collected in the early morning is most concentrated and most reliable • Excessive water intake and diuretic use can lead to diluted urine samples (Creatinine < 20) [3-4] • THC assays are sensitive to adulterants (e.g. Visine eyedrops)	Temperature within 4 minutes of voiding: 90-100^{0}F pH: 4.5-8.0 Creatinine: > 20 mg/dL Specific gravity: > 1.003 Nitrates: < 500 mcg/dL Volume: ≥ 30 mL

Source: https://www.healthquality.va.gov/guidelines/Pain/cot/VADoDOTCPGProviderSummary022817.pdf

Urine Drug Testing (UDT) Federal Work Place Cut Off Values[3-9]						
			Initial Drug Test Level (immunoassay) (ng/mL)	Confirmatory Drug Test Level (GC–MS) (ng/mL)	Confirmatory Test Analyte[3,7]	Detection Period After Last Dose (Days)*
Extended UDT	Regular UDT	Marijuana Metabolites	50	15	THCA	2-8 single use 20-30 chronic use+
		Cocaine Metabolites	300	150	BEG	1–3
		Opioid Metabolites	2000§	2000§	Codeine, Morphine, 6-MAM	2–3 days opiates 3–5 minutes heroin 12–24 hours 6-MAM
		Oxycodone	N/A	N/A		2–4
		Amphetamines	1000	500	Amphetamine, Methamphetamine MDMA, MDA, MDEA	1–3
		Methamphetamine	Incomplete data	500		3–4
		Benzodiazepines	300	200		3 short-acting 30 long-acting
		Barbiturates	300	200		1 short-acting 21 long-acting
		Methadone	300	200	EDDP	3–6
		Alcohol	N/A	N/A	EtG, EtS	12 hours

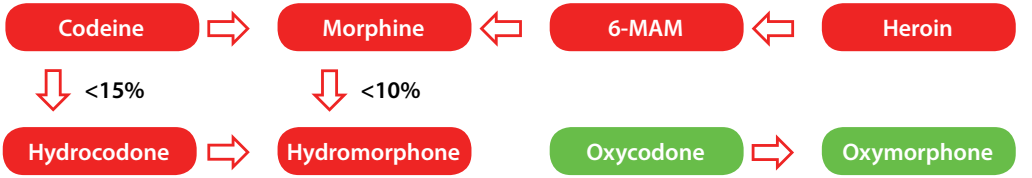
THCA = delta-9-tetrahydrocannabinol-9-carboxylic acid; BEG = benzoylecgonine; 6-MAM = 6-monoacetylmorpine; EDDP = 2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine; EtG = ethyl glucuronide; EtS = ethyl sulfate; * Detection time for most drugs in urine is 1-3 days; + Long-term use of lipid-soluble drugs (THC, diazepam, ketamine) can be detected for a longer period of time; § Testing levels for opiates were raised from 300 ng/mL to 2000 ng/mL to reduce detection from foods containing poppy seeds

Agent	Summary of Agents Potentially Contributing to False Positives[3-8]
Marijuana metabolites	• dronabinol • efavirenz • NSAIDs* • proton pump inhibitors • hemp foods: tea, oil+
Cocaine metabolites	• coca leaf teas • topical anesthetics containing cocaine
Opioid metabolites	• dextromethorphan • flouroquinolones • levofloxacin • ofloxacin • poppy seeds • poppy oil • rifampin • quinine
Amphetamines/ Methamphetamine (high rate of false positives)	• amantadine • benzphetamine • brompheniramine • bupropion • chlorpromazine • desipramine • dextroamphetamine • doxepin • ephedrine • fluoxetine • isometheptene • isoxsuprine • labetalol • l-methamphetamine (OTC nasal inhaler) • methylphenidate • MDMA • phentermine • phenylephrine • phenyl-propanolamine • promethazine • pseudoephedrine • ranitidine • selegiline • thioridazine • trazodone • trimethobenzamide • trimipramine
Benzodiazepines	• oxaprozin • sertraline
Barbiturates	• ibuprofen • naproxen
Methadone	• chlorpromazine • clomipramine • diphenhydramine • doxylamine • ibuprofen • quetiapine • thioridazine • verapamil
Alcohol	• mouthwash • short-chain alcohols • OTC cough products (isopropyl alcohol)

* NSAIDs resulting in false-positive for marijuana mainly consist of ibuprofen and naproxen and modern tests **do not** result in false positives ; + THC concentrations in hemp products are low enough to prevent positive immunoassay results

Interpreting Urine Drug Testing[2,3-5]		
Drug or Class	**Expected Results**	**Considerations**
Alcohol	Alcohol	• Testing for ETOH metabolites, ethyl glucuronide or ethyl sulfate, can identify alcohol up to 80 hours after consumption
Amphetamines	**Immunoassay**–amphetamines, methamphetamines or MDMA **Confirmatory**–amphetamines, methamphetamines or MDMA	• Immunoassay tests are highly cross-reactive; therefore confirmatory testing is required and can identify which amphetamine is present
Benzodiazepines	**Immunoassay**–unconjugated oxazepam or its metabolites **Confirmatory**–alprazolam, diazepam, clonazepam, lorazepam, etc.	• Immunoassays for benzodiazepines have a 28% overall false negative rate • Confirmatory testing is needed when use is expected or suspected (alprazolam, clonazepam and lorazepam often not detected by immunoassay)
Barbiturates	**Immunoassay**–barbiturates	• N/A
Cocaine metabolites	**Immunoassay**–cocaine or benzoylecgonine (BEG)	• Cocaine's primary metabolite, BEG, has low cross-reactivity with other substances and is highly predictive of cocaine use • A positive result should be interpreted as recent exposure to cocaine

continued

Interpreting Urine Drug Testing[2,3-5]		
Drug or Class	**Expected Results**	**Considerations**
Opioids or "opiates"- Natural (from opium)		
Codeine (Tylenol # 2,3,4)	**Opiates Immunoassay**–positive **Confirmatory**–codeine, possibly morphine & hydrocodone	• Immunoassays for "opiates" are responsive to morphine and codeine but do not distinguish which • Codeine is metabolized to morphine and small quantities of hydrocodone
Morphine (Avinza, Embeda, MS Contin, Kadian)	**Opiates Immunoassay**–positive **Confirmatory**–morphine, possibly hydromorphone	• Immunoassays for "opiates" are responsive to morphine and codeine but do not distinguish which • Morphine (<10%) may be metabolized to hydromorphone
Heroin	**Opiates Immunoassay**–positive **Confirmatory**–heroin (6–MAM), morphine, possibly codeine	• 6-MAM is pathognomic for heroin use, detection 12–24 hrs • Heroin is metabolized to morphine
Opioid Metabolic Pathways		

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Interpreting Urine Drug Testing[2,3-5]		
Drug or Class	**Expected Results**	**Considerations**
Opioids-Semisynthetic (derived from opium)		
Hydrocodone (Lorcet, Lortab, Norco, Vicodin)	**Opiates Immunoassay**–positive **Confirmatory**–hydrocodone, possibly hydromorphone	• "Opiates" immunoassay may detect semisynthetic opioids º hydrocodone > hydromorphone > oxycodone • Negative result does not exclude use and confirmatory testing (GC/MS) is required • Hydrocodone is metabolized in small amounts to hydromorphone, both may be found in urine • Oxycodone is metabolized to oxymorphone, both may be found in urine • Hydromorphone and oxymorphone use does not result in positive screens for hydrocodone and oxycodone, respectively
Hydromorphone (Dilaudid, Exalgo)	**Opiates Immunoassay**–may be positive **Confirmatory**–hydromorphone	
Oxycodone (Roxicet, OxyCotonin)	**Opiates Immunoassay**–may be positive **Oxycodone Immunoassay**–positive **Confirmatory**–oxycodone possibly oxymorphone	
Oxymorphone (Opana)	**Oxycodone Immunoassay**–positive **Confirmatory**–oxymorphone	
Opioids-Synthetic (man-made)		
Fentanyl	**GC/MS**–fentanyl and norfentanyl	• Current "opiates" immunoassays do not detect synthetic opioids • Confirmatory testing (GC/MS) is needed
Meperidine (Demerol)	**GC/MS**–normeperidine, possibly meperidine	
Methadone (Methadose)	**Methadone Immunoassay**–positive **GC/MS**–methadone, EDDP	
Propoxyphene (Darvon, Darvocet)	**Propoxyphene Immunoassay**–positive **GC/MS**–propoxyphene & norpropoxyphene	

Confirmatory testing: Chromatography (gas chromatography-mass spectrometry (GC/MS) or liquid chromatography-mass spectrometry (LC/MS)) Note: Each facility may have its own order sets and lab policies and procedures. Contact your lab for additional details.