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Make Better Decisions



Clinical Reference Guide

Period of Detection

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Patients exhibit varying periods of detection for any given drug. Periods of detection provide general estimates for the period of time in which a drug is expected to be detected in a given matrix. This time frame depends on many factors, including thresholds, analytes tested, dosing regimen, etc.

The windows of detection are different for each specimen type. Typically periods of detection are shortest for blood and oral fluid, longer for urine, and longest for hair. Various factors will influence the period of drug detection: drug half-life, specimen type, test threshold, whether parent drug and metabolites are included in testing, patient renal and hepatic function, drug plasma-protein binding, nutritional status, route of administration, drug absorption, genetic differences, drug interactions, food interactions, age, body composition, etc. Drugs taken infrequently on an as-needed (PRN) basis are likely to be detected for shorter periods than drugs taken chronically. All published periods of detection are gross estimates, as it is impossible to predict exactly how long a drug will remain detectable for any one patient.^{1,2}

A. Oral Fluid

Drugs present in oral fluid roughly mirror drug presence in blood, although concentrations will not generally show a direct correlation. Drugs may be detectable in oral fluid as early as 15 minutes following ingestion. On the other hand, medications may not be detectable in urine for 2-6 hours post ingestion.³⁻⁹ Medications which are chronically administered in pain management may be detectable in oral fluid for a period up to 48 hours. Studies have observed extended oral fluid detection of 6-monoacetylmorphine (heroin metabolite), methadone, amphetamine, and methamphetamine for up to 8 days in patients on an observed detoxification unit; however, these extended periods of detection are atypical in the context of other oral fluid studies.^{10,11} Use of medications on an infrequent basis (for example, taken at bedtime, but not every day) shortens the detection period.

B. Blood

As with oral fluid, the period of detection of a drug in blood is shorter than urine and will vary significantly from patient to patient. Detection of drugs in blood is almost always limited to current use. The detection period

will depend on medication dose, dosing frequency, drug half-life, and pharmacokinetic parameters of the patient.¹² About 97% of a drug dose will be eliminated from the body after five half-lives.¹³

C. Urine

The period of detection for drugs in urine typically exceeds that of oral fluid and blood. Lipophilic drugs which readily deposit into fat (such as marijuana, diazepam, methadone, and others) may exhibit notably longer periods of detection.^{2,7,13} In addition, many drug metabolites exhibit longer elimination half-lives than parent drug. Testing for metabolites in urine may therefore extend the detection window. This is true for illicit drugs such as marijuana and cocaine, as well as prescription medications like opioids and benzodiazepines.¹³⁻¹⁵ Testing for opioid normetabolites may extend the detection period for this drug class.^{14,15}

Periods of detection may also be longer when using gas chromatography/mass spectrometry (GC/MS) or liquid chromatography/tandem mass spectrometry (LC/MS/MS) methods compared to immunoassay, due to increased sensitivity and lower testing thresholds. Period of detection estimates for urine with typical drug use are presented in Table 6.1.

D. Special Note on Marijuana

The detection time for marijuana in urine depends heavily on the body composition of the patient and the frequency of use. Daily use of marijuana is expected to be detectable in urine for a period up to 10 days; light use (such as one joint) may only be detectable for up to 3 days.¹⁶ One study demonstrated that 73% of 37 chronic marijuana users had THC concentrations below a cutoff of 15 ng/mL within 2 weeks of last ingestion.¹⁷

Patients with a large amount of adipose tissue may store marijuana and excrete metabolites for a longer period of time, especially after abnormally heavy use over a chronic period. In such rare cases, marijuana has been

reported with a period of detection up to 30 days, with the longest period published as 95 days. Such a long

period of detection is the exception, not the rule.^{2,12,16}

Table 6.1: *Drug Periods of Detection in Urine**

DRUG/METABOLITE	REPORTING LIMIT	PERIOD OF DETECTION	DRUG/METABOLITE	REPORTING LIMIT	PERIOD OF DETECTION
AMPHETAMINES			BENZODIAZEPINES (CONT.)		
Amphetamine	250 ng/mL	Up to 5 days	Clonazepam		Up to 10 days
Methamphetamine	250 ng/mL	Up to 5 days	7-aminoclonazepam	50 ng/mL	
Amphetamine	250 ng/mL		Clorazepate		Up to 10 days
Methamphetamine D/L Isomer	125 ng/mL	Up to 5 days	Nordiazepam	50 ng/mL	
MDA	100 ng/mL	Up to 5 days	Oxazepam	50 ng/mL	
MDEA	100 ng/mL	Up to 5 days	Diazepam	50 ng/mL	
MDA	100 ng/mL		Nordiazepam	50 ng/mL	Up to 10 days
MDMA	100 ng/mL	Up to 5 days	Oxazepam	50 ng/mL	
MDA	100 ng/mL		Temazepam	50 ng/mL	
Phentermine	250 ng/mL	Up to 5 days	Flurazepam		Up to 10 days
ANTICONVULSANTS			2-hydroxy-ethyl-flurazepam	50 ng/mL	
Carbamazepine	50 ng/mL	Up to 5 days	Lorazepam	50 ng/mL	Up to 10 days
Lamotrigine	500 ng/mL	Up to 10 days	Temazepam	50 ng/mL	Up to 10 days
Levetiracetam	500 ng/mL	Up to 3 days	Oxazepam	50 ng/mL	
Oxcarbazepine	500 ng/mL	Up to 3 days	Oxazepam	50 ng/mL	Up to 10 days
Oxcarbazepine metabolite	500 ng/mL		ILLICIT DRUGS		
ANTIPSYCHOTICS			Designer Benzodiazepines	1 ng/mL	Up to 10 days
Asenapine	1 ng/mL	Up to 5 days	Designer Opioids	1 ng/mL	Up to 5 days
N-Desmethyiasenapine	5 ng/mL		Cocaine	50 ng/mL	Up to 5 days
Aripiprazole	10 ng/mL	Up to 7 days	Benzoylcegonine	50 ng/mL	
Dehydroaripiprazole	10 ng/mL		Hallucinogens/Dissociatives	1 ng/mL	Up to 5 days
OPC-3373	10 ng/mL		Heroin		Up to 24 hours
OPC-3952	10 ng/mL		6-monoacetylmorphine	10 ng/mL	
Brexipiprazole	10 ng/mL	Up to 7 days	Codeine	100 ng/mL	
Cariprazine	2 ng/mL	Up to 5 days	Morphine	100 ng/mL	
N-didesmethyl Cariprazine	10 ng/mL		Hydrocodone*	100 ng/mL	
Chlorpromazine	10 ng/mL	Up to 3 days	Hydromorphone*	100 ng/mL	
7-Hydroxy Chlorpromazine	2.5 ng/mL		Lysergic acid diethylamide (LSD)	0.1 ng/ml	Up to 24 hours
Clozapine	50 ng/mL	Up to 5 days	2-oxo-3-hydroxy LSD	0.5 ng/ml	
Clozapine N-oxide	50 ng/mL		Marijuana**	15 ng/mL	Up to 10 days
Desmethyloclozapine	50 ng/mL		Phencyclidine (PCP)	25 ng/mL	Up to 5 days
Fluphenazine	2 ng/mL	Up to 3 days	Psilocybin		Up to 12 hours
Haloperidol	1 ng/mL	Up to 10 days	Psilocin	10 ng/mL	
Iloperidone	1 ng/mL	Up to 5 days	Synthetic Cannabinoids	1 ng/mL	Up to 10 days
Lumateperone	10 ng/mL	Up to 3 days	Synthetic Stimulants	1 ng/mL	Up to 5 days
N-desmethyl Lumateperone	5 ng/mL		MISCELLANEOUS		
Hydroxy Lumateperone	10 ng/mL		Atomoxetine	10 ng/mL	Up to 3 days
NDM Hydroxy Lumateperone	5 ng/mL		4-Hydroxy Atomoxetine	100 ng/mL	
Lurasidone	1 ng/mL	Up to 5 days	Benzotropine	10 ng/mL	Up to 3 days
Hydroxylurasidone	1 ng/mL		N-desmethyl Benzotropine	10 ng/mL	
Olanzapine	10 ng/mL	Up to 7 days	Bupropion	50 ng/mL	Up to 7 days
Desmethylolanzapine	10 ng/mL		Hydroxybupropion	50 ng/mL	
Paliperidone		Up to 7 days	Buspirone	25 ng/mL	Up to 3 days
9-hydroxyrisperidone	10 ng/mL		6-Hydroxybuspirone	25 ng/mL	
Perphenazine	1 ng/mL	Up to 3 days	Clonidine	2.5 ng/mL	Up to 3 days
7-hydroxy Perphenazine	10 ng/mL		Dextromethorphan	50 ng/mL	Up to 5 days
Quetiapine	10 ng/mL	Up to 7 days	3-methoxymorphinan	50 ng/mL	
7-hydroxyquetiapine	10 ng/mL		Dextrophan/Levorphanol	50 ng/mL	
Norquetiapine	10 ng/mL		Diphenhydramine	50 ng/mL	Up to 3 days
Risperidone	10 ng/mL	Up to 7 days	Ethanol	10 mg/dL	Up to 8 hours
9-hydroxyrisperidone	10 ng/mL		Ethyl Sulfate (EtS)	200 ng/mL	Up to 3 days
Ziprasidone	10 ng/mL	Up to 7 days	Gabapentin	5 mcg/mL	Up to 5 days
S-Methyldihydroziprasidone	10 ng/mL		Guanfacine	50 ng/mL	Up to 3 days
BARBITURATES			3-Hydroxyguanfacine	50 ng/mL	
Amobarbital	200 ng/mL	Up to 10 days	Hydroxyzine	2 ng/mL	Up to 7 days
Butalbital	200 ng/mL	Up to 10 days	Ketamine	1 ng/mL	Up to 3 days
Pentobarbital	200 ng/mL	Up to 10 days	Dehydronorketamine	5 ng/mL	
Phenobarbital	200 ng/mL	Up to 10 days	Norketamine	5 ng/mL	
Secobarbital	200 ng/mL	Up to 10 days	Kratom (Mitragynine)		Up to 5 days
BENZODIAZEPINES			7-Hydroxymitragynine	10 ng/mL	
Alprazolam	50 ng/mL	Up to 10 days	Lemborexant	1 ng/mL	Up to 24 hours
Alpha-hydroxyalprazolam	50 ng/mL		Lofexidine	10 ng/mL	Up to 3 days
Chlordiazepoxide		Up to 10 days	Loperamide	0.5 ng/mL	Up to 3 days
Nordiazepam	50 ng/mL		Lorcaserin	50 ng/mL	Up to 3 days
Oxazepam	50 ng/mL		<i>*Minor metabolite</i>		
			<i>**Reflex definitive testing for marijuana will include delta-9 carboxy-THC, delta-8 carboxy-THC, and cannabidiol.</i>		

DRUG/METABOLITE	REPORTING LIMIT	PERIOD OF DETECTION	DRUG/METABOLITE	REPORTING LIMIT	PERIOD OF DETECTION
MISCELLANEOUS (CONT.)			OPIOID ANALGESICS (CONT.)		
Methylphenidate	50 ng/mL	Up to 3 days	Tramadol	100 ng/mL	Up to 5 days
Ritalinic Acid	50 ng/mL		O-desmethyl-tramadol	100 ng/mL	
Mirtazapine	10 ng/mL	Up to 7 days	N-desmethyl-tramadol	100 ng/mL	
Nicotine		Up to 5 days			
Cotinine	125 ng/mL		OPIOID ANTAGONISTS		
3-hydroxycotinine	125 ng/mL		Naloxone	10 ng/mL	Up to 3 days
Pregabalin	5 mcg/mL	Up to 5 days	6-Beta-naloxol	10 ng/mL	
Promethazine	50 ng/mL	Up to 3 days	Naltrexone	10 ng/mL	Up to 5 days
Suvorexant	0.1 ng/mL	Up to 24 hours	6-Beta-naltrexol	10 ng/mL	
Topiramate	500 ng/mL	Up to 10 days			
Trazodone	100 ng/mL	Up to 3 days	SEDATIVE HYPNOTICS		
m-CPP	100 ng/mL		Eszopiclone/Zopiclone	4 ng/mL	Up to 24 hours
Trihexyphenidyl	5 ng/mL	Up to 3 days	Zaleplon	4 ng/mL	Up to 24 hours
Vilazodone	10 ng/mL	Up to 5 days	Zolpidem	4 ng/mL	Up to 3 days
Viloxazine	5 ng/mL	Up to 3 days	Zolpidem Metabolite I		
5-hydroxy Viloxazine	5 ng/mL				
Vortioxetine	10 ng/mL	Up to 7 days			
MIXED OPIOID AGONISTS/ ANTAGONISTS			SNRIs		
Butorphanol	1 ng/mL	Up to 2 days	Desvenlafaxine	50 ng/mL	Up to 7 days
Nalbuphine	1 ng/mL	Up to 2 days	O-Desmethylvenlafaxine	50 ng/mL	
Pentazocine	25 ng/mL	Up to 3 days	Duloxetine	5 ng/mL	Up to 7 days
			Milnacipran/Levomilnacipran	50 ng/mL	Up to 7 days
			Venlafaxine	5 ng/mL	Up to 7 days
			O-desmethylvenlafaxine	50 ng/mL	
MUSCLE RELAXANTS			SSRIs		
Baclofen	500 ng/mL	Up to 3 days	Citalopram/Escitalopram	50 ng/mL	Up to 7 days
Carisoprodol	200 ng/mL	Up to 5 days	N-desmethylcitalopram/	50 ng/mL	
Meprobamate	200 ng/mL		N-desmethylescitalopram	50 ng/mL	
Chlorzoxazone	500 ng/mL	Up to 2 days	Fluoxetine	50 ng/mL	Up to 7 days
6-hydroxychlorzoxazone	500 ng/mL		Norfluoxetine	50 ng/mL	
Cyclobenzaprine	10 ng/mL	Up to 5 days	Fluvoxamine	50 ng/mL	Up to 7 days
Norcyclobenzaprine	10 ng/mL		Paroxetine	50 ng/mL	Up to 7 days
Dantrolene	500 ng/mL	Up to 7 days	Paroxetine Metabolite I	50 ng/mL	
5-hydroxydantrolene	500 ng/mL		Sertraline	50 ng/mL	Up to 7 days
Meprobamate	200 ng/mL	Up to 5 days	Norsertaline	50 ng/mL	
Metaxalone	50 ng/mL	Up to 3 days			
Methocarbamol	500 ng/mL	Up to 2 days	TRICYCLIC ANTIDEPRESSANTS		
Tizanidine	25 ng/mL	Up to 2 days	Amitriptyline	10 ng/mL	Up to 7 days
Dehydrotizanidine	5 ng/mL		Nortriptyline	10 ng/mL	
			Clomipramine	10 ng/mL	Up to 7 days
OPIOID ANALGESICS			Desmethyldesipramine	10 ng/mL	
Buprenorphine	1 ng/mL	Up to 7 days	Desipramine	10 ng/mL	Up to 7 days
Norbuprenorphine	2.5 ng/mL		Doxepin	2 ng/mL	Up to 7 days
Codeine	100 ng/mL	Up to 5 days	Desmethyldoxepin	1 ng/mL	
Morphine	100 ng/mL		Imipramine	10 ng/mL	Up to 7 days
Hydrocodone*	100 ng/mL		Desipramine	10 ng/mL	
Norcodeine	100 ng/mL		Nortriptyline	10 ng/mL	Up to 7 days
Dihydrocodeine	100 ng/mL	Up to 5 days	Protriptyline	10 ng/mL	Up to 7 days
Fentanyl	5 ng/mL	Up to 5 days	Trimipramine	10 ng/mL	Up to 7 days
Norfentanyl	5 ng/mL				
Hydrocodone	100 ng/mL	Up to 5 days			
Dihydrocodeine	100 ng/mL				
Hydromorphone	100 ng/mL				
Norhydrocodone	100 ng/mL				
Hydromorphone	100 ng/mL	Up to 5 days			
Levorphanol/Dextrorphan	50 ng/mL	Up to 5 days			
Meperidine	100 ng/mL	Up to 5 days			
Normeperidine	100 ng/mL				
Methadone	200 ng/mL	Up to 10 days			
EDDP	200 ng/mL				
Morphine	100 ng/mL	Up to 5 days			
Hydromorphone*	100 ng/mL				
Oxycodone	100 ng/mL	Up to 5 days			
Noroxycodone	100 ng/mL				
Oxymorphone	100 ng/mL				
Oxymorphone	100 ng/mL	Up to 5 days			
Tapentadol	100 ng/mL	Up to 5 days			
Nortapentadol	100 ng/mL				
*Minor metabolite					

*Note: Drug detection periods will vary, depending on whether the drug is taken intermittently or chronically, and on many patient-specific factors. The above period of detection estimates are not intended to cover implants or long-acting injectables.

**Please refer to the Special Note on Marijuana section for further information related to its expected period of detection.

REFERENCES:

1. Katz N, Fanciullo GJ. Role of urine toxicology testing in the management of chronic opioid therapy. *Clin J Pain*. 2002;18:S76-82.
2. Verstraete AG. Detection times of drugs of abuse in blood, urine, and oral fluid. *Ther Drug Monit*. 2004;26(2):200-5.
3. Foltz RL, Fentiman AF, Foltz RB. GC/MS assays for abused drugs in body fluids. *NIDA Res Monogr*. 1980;32:1-198.
4. Smith ML, Shimomura ET, Summers J, et al. Urinary excretion profiles for total morphine, free morphine, and 6-acetylmorphine following smoked and intravenous heroin. *J Anal Toxicol*. 2001;25(7):504-14.
5. Rohrig TP, Moore C. The determination of morphine in urine and oral fluid following ingestion of poppy seeds. *J Anal Toxicol*. 2003;27:449-52.
6. Cone EJ, Huestis MA. Interpretation of oral fluid tests for drugs of abuse. *Ann N Y Acad Sci*. 2007;1098:51-103.
7. Allen KR. Screening for drugs of abuse: which matrix, oral fluid or urine? *Ann Clin Biochem*. 2011;48:531-41.
8. Cone EJ, Heltsley R, Black DL, Mitchell JM, Lodico CP, Flegel RR. Prescription Opioids. I. Metabolism and excretion patterns of oxycodone following controlled single dose administration. *J Anal Toxicol*. 2013;37(5):255-64.
9. Cone EJ, Heltsley R, Black DL, Mitchell JM, Lodico CP, Flegel RR. Prescription Opioids. II. Metabolism and excretion patterns of hydrocodone in urine following controlled single-dose administration. *J Anal Toxicol*. 2013;37(8):486-94.
10. Vindenes V, Enger A, Nordal K, Johansen U, Christophersen AS, Øiestad EL. Very long detection times after high and repeated intake of heroin and methadone, measured in oral fluid. *Scan J of For Sci*. 2014;20(2):34-41.
11. Andås HT, Enger A, Øiestad AML, et al. Extended detection of amphetamine and methamphetamine in oral fluid. *Ther Drug Monit*. 2016;38:114-9.
12. Gourlay DL, Heit HA, Caplan YH. Urine drug testing in clinical practice: the art and science of patient care. 6th ed. Stamford, CT: PharmaCom Group, Inc.;2015:1-32.
13. Hawks RL, Chiang CN. Urine testing for drugs of abuse. *NIDA Res Monogr*. 1986;73:1-114.
14. Heltsley R, Zichterman A, Black DL, et al. Urine drug testing of chronic pain patients. II. Prevalence patterns of prescription opiates and metabolites. *J Anal Toxicol*. 2010;34:32-8.
15. DePriest A, Heltsley R, Black DL, et al. Urine drug testing of chronic pain patients. III. Normetabolites as biomarkers of synthetic opioid use. *J Anal Toxicol*. 2010;34:444-9.
16. Heit HA, Gourlay DL. Urine drug testing in pain medicine. *J Pain Symptom Manage*. 2004;27(3):260-7.
17. Lewis J, Molnar A, Allsop D, Copeland J, Fu S. Rapid elimination of Carboxy-THC in a cohort of chronic cannabis users. *Int J Legal Med*. 2016;130(1):147-152.