

## What common substances can cause false positives on urine screens for drugs of abuse?

### EVIDENCE-BASED ANSWER

False-positive reports on urine drug screens by immunoassay are rare (strength of recommendation [SOR]: **C**, small controlled-exposure studies, small case series). Nonsteroidal anti-inflammatory drugs, fluoroquinolones, and Vicks Inhaler are most frequently implicated (**TABLE**).

Ruling out a false-positive result requires confirmation with a more specific test,

usually gas chromatography/mass spectrometry (GC-MS). A true-positive drug screen may occur in a urine specimen from a patient who legally or unknowingly ingests a product that is metabolized to a drug of abuse. Passive exposure to a substance is unlikely to cause a positive drug screen (SOR: **B**, small controlled-exposure studies).

### CLINICAL COMMENTARY

#### Having a plan makes communication less emotional when the results come back

Before I order a urine drug screen I ask myself, "What will I do with the results?" If other substances are present, will I discontinue controlled substances or refer to psychiatry or pain management? I also ask patients what they think I will find. On several occasions, patients have admitted to taking recreational drugs that the drug

screen misses. Having a plan makes communication less emotional for both the provider and patient when the results come back.

You should be able to follow-up results promptly and order a GC-MS if indicated. In addition, if working in a group, indicate a plan for follow-up in your progress notes so that the patient gets a consistent message.

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#### Evidence summary

Two different assays are commonly available for urine drug testing. The immunoassay is quick, highly sensitive, and relatively inexpensive but may lack specificity. It tests for classes of drugs (such as opiates) without distinguishing among individual drugs within that class. Gas chromatogra-

phy in combination with mass spectrometry (GC-MS) is a more expensive and time-consuming test, but is the gold standard for confirming a positive result on immunoassay. By definition, all positive results on GC-MS are true positives.

Reports of false-positive urine drug screening for substances of abuse are

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TABLE

## Substances reported to cause false-positive urine drug screen results

SUBSTANCE FALSELY IDENTIFIED ON TEST	ACTUAL SUBSTANCE	TYPE OF STUDY	NOTES
Amphetamine and methamphetamine	Selegiline	Single case report <sup>1,2</sup>	L-stereoisomer only detected (D-stereoisomer present in illicit drugs)
Amphetamine and methamphetamine	Vicks Inhaler	Several case reports, controlled-exposure studies <sup>1-3</sup>	L-stereoisomer only detected; most positives noted with twice recommended dosage
Barbiturate	NSAIDs (ibuprofen, naproxen)	Controlled-exposure study of 60 subjects (510 specimens) <sup>4</sup>	0.4% false-positive rate
Benzodiazepine	Oxaprozin	Controlled-exposure study of 12 patients (36 specimens) <sup>5</sup>	100% false-positive rate, some cases lack controls
Cannabinoid	NSAIDs (ibuprofen, naproxen)	Controlled-exposure study of 60 subjects (510 specimens) <sup>4</sup>	0.4% false-positive rate
Opiate	Fluoroquinolone*	Controlled-exposure studies (8 subjects) and case series (9 subjects) <sup>6</sup>	Most levels detected were below new 1998 threshold (2000 ng/mL)
Opiate	Rifampin	3 case reports <sup>7</sup>	
Phencyclidine	Venlafaxine	1 case report <sup>8</sup>	Confirmed by GC-MS (7200 mg intentionally ingested)
Phencyclidine	Dextromethorphan	1 case report <sup>9</sup>	(500 mg ingested)

\*Ofloxacin and levofloxacin most likely to cause false positive.

infrequent and limited to case reports and a few controlled-exposure studies. The **TABLE** lists some of the substances reported to cause false-positive results.

Positive confirmation tests may occur in urine specimens from patients who legally or unknowingly ingest products that contain drugs of abuse. In these instances, the finding is a true positive but may not reflect drug abuse by the client. Many products available without prescription outside of the US contain opiates (eg, Donnagel PG from Canada).<sup>1</sup> Several controlled-exposure studies have shown that as little as 1 poppy seed muffin (about 15 g of seed) can produce detectable amounts of morphine and codeine by immunoassay as

well as GC-MS.<sup>1,2</sup> In 1998, the federal government increased the threshold defining a positive screen for urine morphine and codeine from 300 to 2000 ng/mL to reduce spurious reports of opiate-positive tests from poppy seed consumption.<sup>1,2</sup>

Substances that do not produce positive urine drug screens include passively inhaled crack cocaine or marijuana (unless "extreme"), and ingested products containing hemp or other common herbal preparations.<sup>1,2,10</sup> In one study, 6 volunteers in an 8 × 8 × 7-ft enclosed room were exposed to 200 mg freebase cocaine vapor; none of their urine samples exceeded the federal GC-MS threshold. In a similar study of 3 non-smokers exposed to 8 marijuana

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smokers (smoking 32 joints) in a 10 × 10 × 8-ft enclosed room, no samples from the nonsmokers exceeded the federal GC-MS threshold.<sup>2</sup> In an exposure study of 90 volunteers who ingested 8 different herbal preparations, there were no positive urine drug screens.<sup>1</sup>

### Recommendations from others

The US Department of Health and Human Services requires confirmation of positive immunoassay results by GC-MS for drug testing in the workplace.<sup>1</sup> The College of American Pathologists, the principal organization of board-certified pathologists, states: “Confirmation testing, a standard of practice in forensic toxicology, should be performed in clinical toxicology whenever possible.”<sup>11</sup>

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