

## Drugs Implicated in False-Positive Results of Drug Screens

Urine drug screens identify pre-specified drugs and/or their metabolites in urine samples. The screens may be implemented for several reasons including: by employers as an attempt to maintain drug-free employment sites; by Correctional Services before, during and after (parole) incarceration; by prescribers monitoring patients taking opioids; and more.<sup>1-3</sup> Many drugs have been reported to cause false-positive results on drug screens, which can have profound implications.

By definition, drug screens are intended for quick identification; generally the quicker the results, the higher the risk of false-positives. Tests with the highest risk of false-positives are point-of-care (POC), which provide immediate results; these tests are not commonly used in the Saskatchewan healthcare setting,<sup>3,4</sup> though private sectors may use them. Immunoassay testing, which may be used more commonly in community healthcare, is more accurate than POC but is also limited by an inability to distinguish all drugs of similar molecular structure.<sup>3,5</sup> The most reliable methods are chromatography (gas or liquid) and mass spectrometry (MS).<sup>3,5,6</sup>

### RESOURCES

When looking for information about potential false-positive results to urine drug screens, one must consider the reliability of the resource. Unfortunately, relatively little primary research is available and one is faced with using potentially unreliable resources or nothing at all. While reports of false-positives on potentially unreliable websites need not be ignored, they should be considered a possibility (not a certainty) to be verified - see text



The Roy Romanow Provincial Laboratory (RRPL), formerly the Saskatchewan Disease Control Laboratory, uses tandem MS for analysis of all samples.<sup>4</sup> Tandem MS is associated with a very low false-positive rate and false-positives that do occur are mostly on account of human error in handling the samples.<sup>4</sup> The RRPL services the Ministry of Health and the Provincial Correctional centres by testing original samples as well as providing confirmatory testing of positive results obtained from POC or immunoassay tests.<sup>4</sup> As such, false-positives are unlikely when tests originate from the healthcare or correctional sectors.

However, employers undertaking drug screening do not have access to the RRPL<sup>4</sup> and may rely on POC or immunoassay tests. Whether confirmatory testing for false-positives is undertaken will depend on the employer. Therefore, this may represent a situation that triggers investigation of a drug's potential to cause a false-positive.

Reported false-positive results are summarized in Table 1. Neither the presence nor absence of a drug in this table provides definitive evidence. Using this table (and others available) merely begins the process of interpreting false-positive results. It is important to obtain a thorough medication history from the patient including over-the-counter medications and natural products. If a drug the patient takes is found on Table 1

as potentially causing false-positives, the results should be verified through confirmatory testing (i.e. MS) or, when feasible, by providing a sample when the drug is no longer in the system.

**Table 1: Drugs Reported to Cause False-Positive Urine Drug Screen Results<sup>5-11</sup>**

False-positive for:	Drugs Causing False-Positives
<b>Amphetamines</b>	<b>ADHD agents:</b> atomoxetine, methylphenidate
	<b>Antidepressants:</b> bupropion, desipramine, doxepin, fluoxetine, imipramine, trazodone, venlafaxine
	<b>Anti-Parkinson agents:</b> amantadine, carbidopa, levodopa, selegiline
	<b>Antipsychotics:</b> aripiprazole, <sup>12</sup> chlorpromazine, promethazine
	<b>Beta-blockers:</b> atenolol, labetalol, propranolol
	<b>OTC cold products</b> containing: brompheniramine, ephedrine, pseudoephedrine, phenylephrine
	<b>Misc:</b> chloroquine, ginkgo biloba, metformin, ofloxacin, ranitidine
<b>Barbiturates</b>	<b>Anticonvulsants:</b> phenytoin
	<b>NSAIDs:</b> ibuprofen, naproxen, oxaprozin
<b>Benzodiazepines</b>	<b>Misc:</b> efavirenz, oxaprozin, <sup>13</sup> sertraline
<b>Buprenorphine</b>	<b>Opioids:</b> codeine, methadone, morphine, tramadol
<b>Cannabinoids / marijuana</b>	<b>Cannabis derivatives:</b> cannabidiol / THC (Sativex), hemp oil, hemp seed
	<b>NSAIDs:</b> ibuprofen, naproxen
	<b>PPIs:</b> pantoprazole
	<b>Misc:</b> efavirenz, promethazine
<b>Lysergic acid diethylamide (LSD)</b>	<b>Antidepressants:</b> amitriptyline, bupropion, desipramine, doxepin, fluoxetine, imipramine, sertraline, trazodone
	<b>Antipsychotics:</b> chlorpromazine, haloperidol, prochlorperazine, risperidone
	<b>Antihypertensives:</b> diltiazem, labetalol, verapamil
	<b>Misc:</b> brompheniramine, buspirone, fentanyl, methylphenidate, metoclopramide
<b>Opioids</b>	<b>OTC cold products</b> containing: dextromethorphan, doxylamine
	<b>Opioid antagonists:</b> naloxone, naltrexone
	<b>Quinolones:</b> ciprofloxacin, levofloxacin, moxifloxacin, norfloxacin, ofloxacin
	<b>Misc:</b> imipramine, poppy seeds, quinine, ranitidine, rifampin
<b>Opioids - methadone</b>	<b>OTC cold products</b> containing: diphenhydramine, doxylamine
	<b>Psychotropics:</b> chlorpromazine, clomipramine, quetiapine
	<b>Misc:</b> tapentadol, verapamil
<b>Phencyclidine (PCP)</b>	<b>Analgesics:</b> ibuprofen, ketamine, tramadol
	<b>Antidepressants:</b> desvenlafaxine, <sup>14,15</sup> imipramine, venlafaxine
	<b>OTC cold products</b> containing: dextromethorphan, diphenhydramine, doxylamine
	<b>Misc:</b> lamotrigine, zolpidem

**ADHD = attention deficit hyperactive disorder; Misc = miscellaneous; NSAIDs = nonsteroidal anti-inflammatory drugs; OTC= over-the-counter; PPI = proton pump inhibitors**

Thanks to the availability of MS technology, purported false-positive drug screens from the health and correctional sectors in Saskatchewan can be verified. For those screens in which MS verification is not possible, Table 1 can be used to rule in or rule out possible drug culprits. Also, for patients who undergo urine drug screens, Table 1 can be used when choosing treatments.

## References:

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