

# Limits and Pitfalls of Drug Testing



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# Conflicts of Interest



- Expert witness work for Elkus & Sisson and Leitner Williams Dooley Napolitan
- Above was for post mortem drug testing analysis

# Pitfalls in Laboratory Testing



- Immunoassays (can have false positives and negatives)
- Urine Drugs of Abuse – initially designed for occupational testing
- Based on concentration cutoffs
- Confirmation Chromatography and Mass Spectrometry

# Laboratory Testing Continued



**TABLE 1**  
**False positives and negatives**

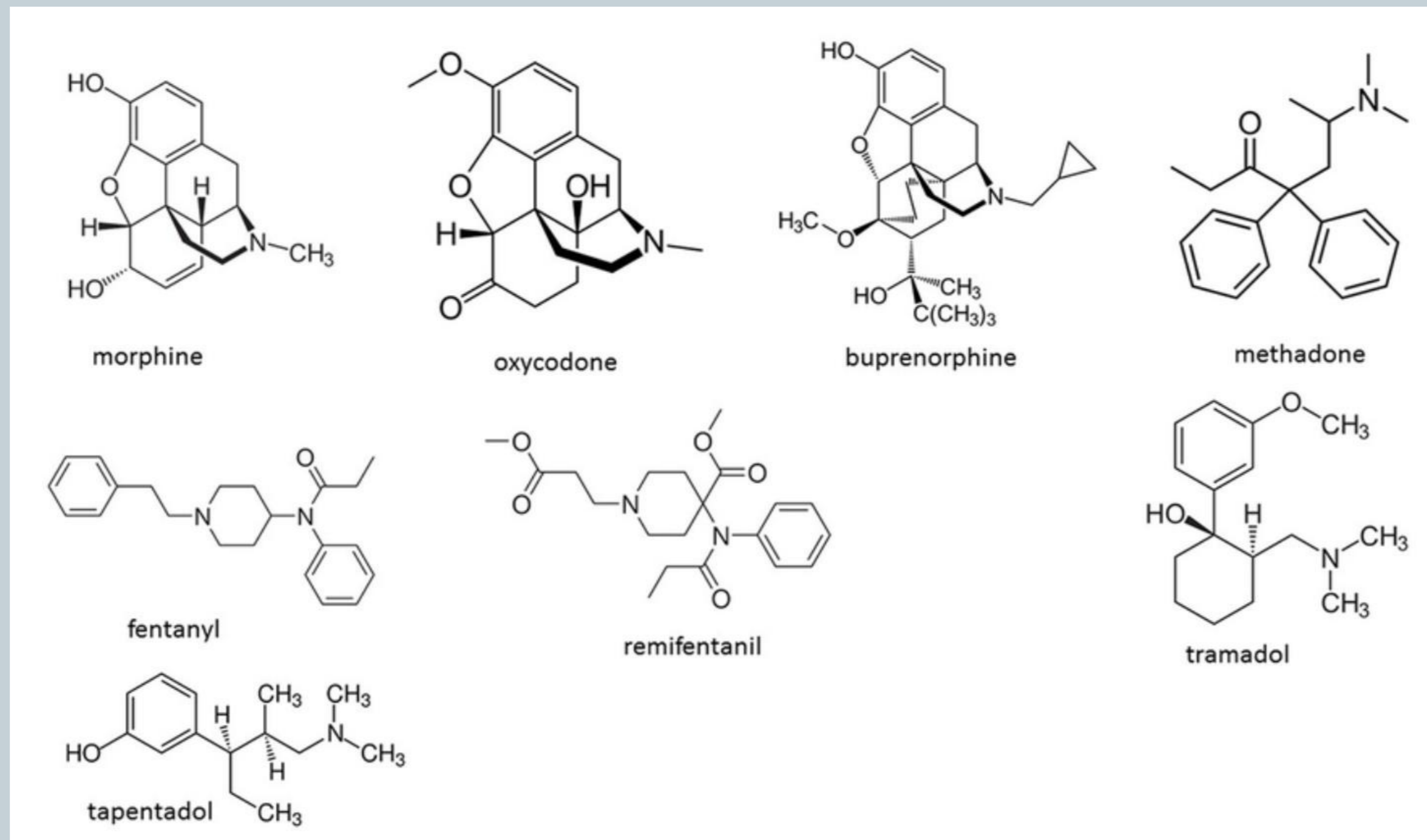
Drug (with common immunoassay target)	Substance causing false positive	Substances associated with false negatives
Amphetamines (D-amphetamine, D-methamphetamine)	Amitriptyline, atomoxetine, bupropion, chloroquine, efedrine, pseudoephedrine, phenylephrine, metformin, phentermine, ranitidine, selegiline, labetalol, chlorpromazine, promethazine, trazodone, doxepin, desipramine	MDA, MDMA, most substituted cathinone derivatives, most substituted phenethylamine derivatives
Barbiturates (secobarbital)	Ibuprofen, naproxen	Sodium thiopental
Benzodiazepines (nordiazepam, oxazepam)	Sertraline, oxaprozin, efavirenz	Clozapine, lorazepam, alprazolam, midazolam, flunitrazepam, chlordiazepoxide
Cocaine (cocaine, benzoylecgonine)	Coca tea, some forms of yerba mate	Fluconazole (however, this is with confirmatory testing)
LSD (LSD, 2-Oxo-hydroxy-LSD)	Fentanyl, norfentanyl, fluoxetine, buspirone, haloperidol, labetalol, risperidone, trazodone, doxepin, diltiazem, verapamil, amitriptyline, metoclopramide, methylphenidate, imipramine, ergonovine, sertraline, bupropion, prochlorperazine	n/a
Opioids (Morphine, Codeine)	Poppy seed containing foods, levofloxacin, ofloxacin, imipramine, naltrexone, rifampin, dextromethorphan	Non-naturals (hydrocodone, hydromorphone, oxycodone, fentanyl, tramadol, U-47700, methadone, buprenorphine)
Opioids (Oxycodone, oxycodone)	n/a (typically very specific to oxycodone and metabolites)	n/a
Opioids (Methadone, EDDP)	Doxylamine, diphenhydramine, verapamil, quetiapine, tapentadol	n/a
Opioids (Buprenorphine, norbuprenorphine)	Morphine, codeine, methadone, tramadol	n/a
PCP (PCP)	Venlafaxine, o-desmethylvenlafaxine, dextromethorphan, ibuprofen, thioridazine, diphenhydramine, tramadol, ketamine, MDPV, lamotrigine, zolpidem	n/a
THC (9-carboxy-THC)	Efavirenz, promethazine, some NSAIDs, pantoprazole	Synthetic/designer cannabinoids
Tricyclic antidepressants (amitriptyline, imipramine)	Cyclobenzaprine, quetiapine, carbamazepine, cyproheptadine, hydroxyzine, cetirizine, diphenhydramine	n/a

Positive and negative, both true and false, vary depending on immunoassay target and specific laboratory cutoffs and cross reactivity.  
MDA, 3,4-methylenedioxyamphetamine; MDMA, 3,4-methylenedioxyamphetamin; LSD, lysergic acid diethylamide; n/a, not applicable; EDDP, 3-ethylidene-1, 5-dimethyl-3, 3-diphenylpyrrolidine; MDPV, methylenedioxypropylone; PCP, phencyclidine; NSAID, nonsteroidal anti-inflammatory drug; THC, tetrahydrocannabinol.  
Adapted with permission from Nelson et al.<sup>7</sup>

# Common pitfalls



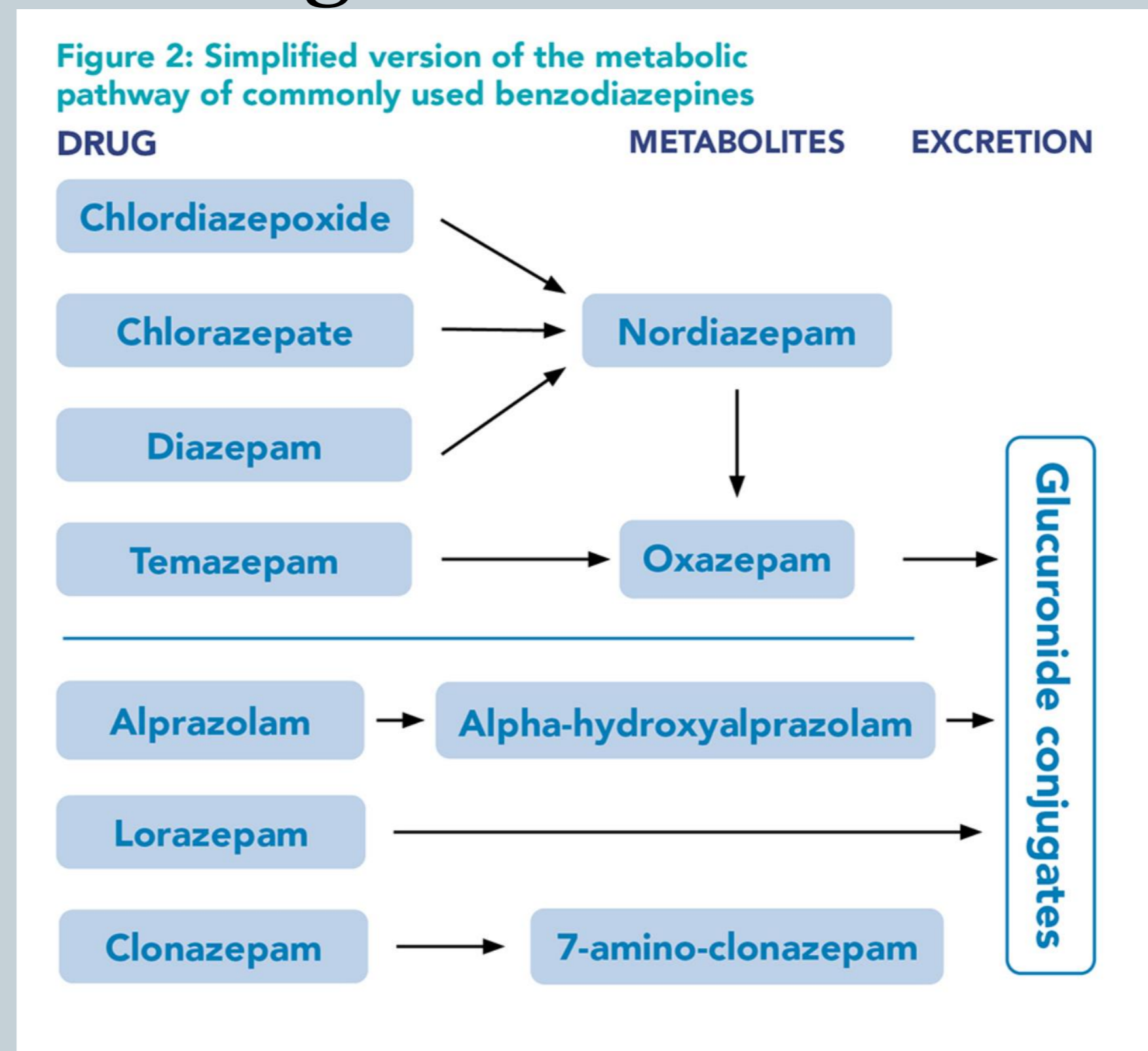
- Opiate screen negative but patient took methadone, buprenorphine, or fentanyl
- Opiate screens look for morphine



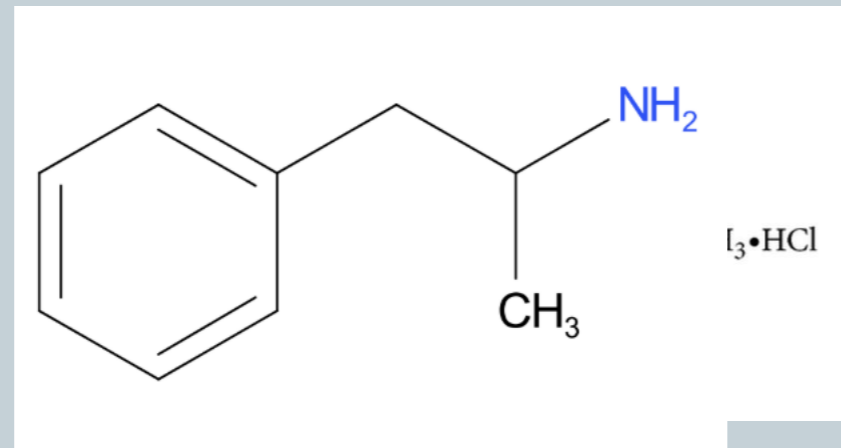
# Benzodiazepine Screen



- Benzodiazepine screen negative but patient took lorazepam (does not get metabolized to oxazepam)



# Amphetamine screen



rine causing false positive on  
ine screen

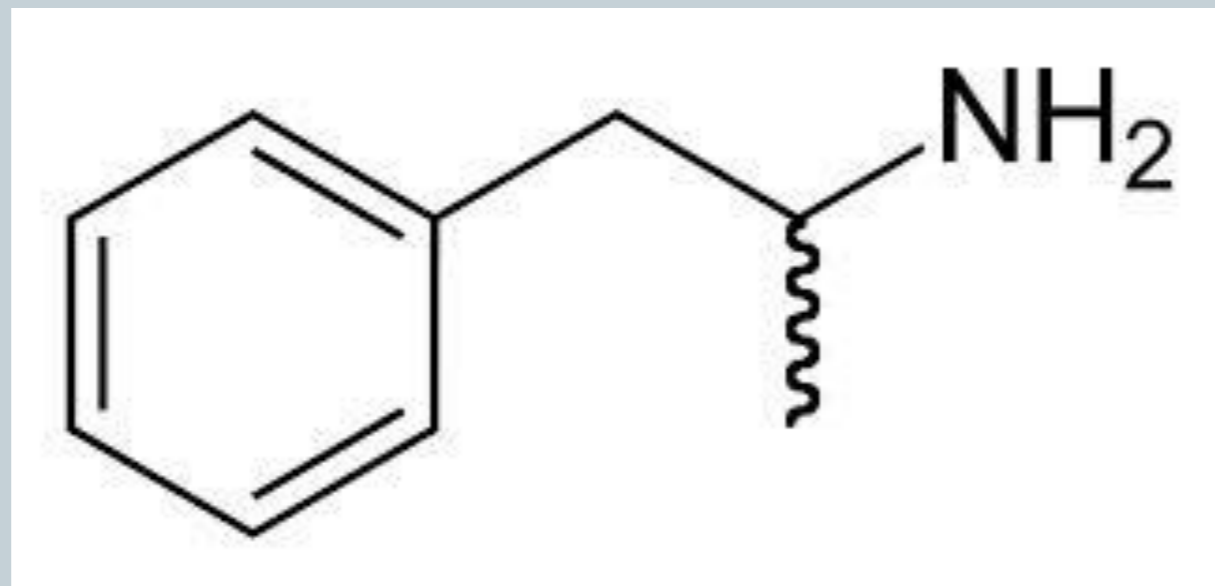
*Phenylephrine*

*Amphetamine*

# Amphetamine Screen Continued



- Adderall (mixed amphetamine salts) and bupropion cause true positives since both have amphetamine structures

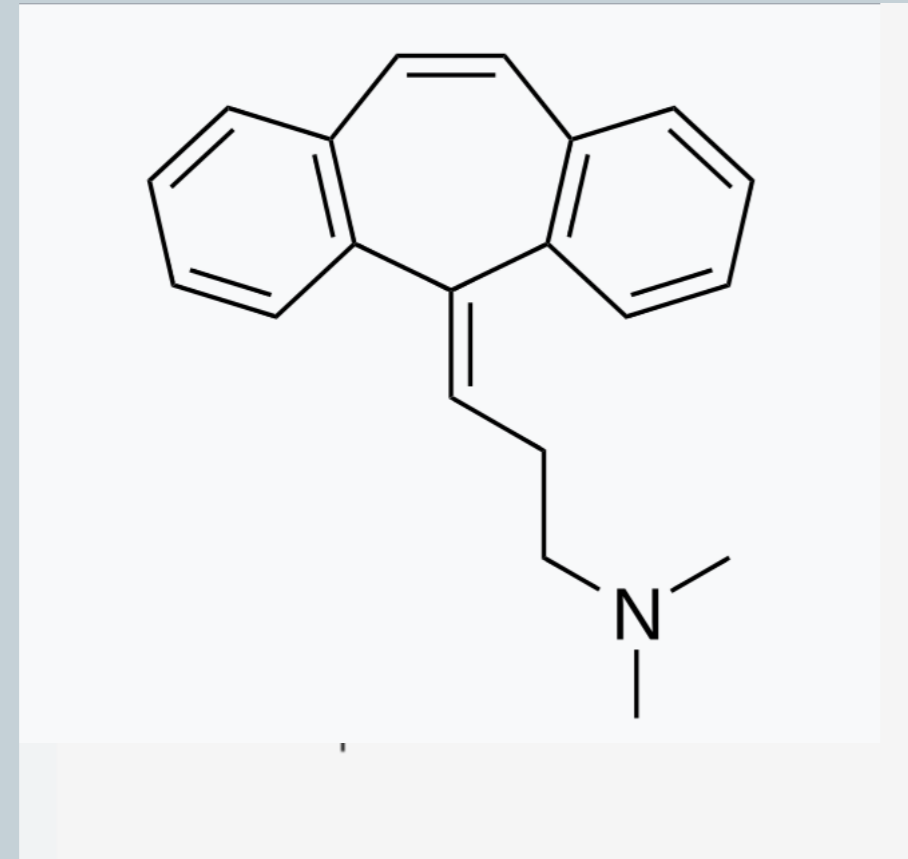


*Amphetamine*



*Bupropion*

# TCA Screen



positives

are starting to remove from drug screens

recommended by Association for  
& Laboratory Medicine

*Amitriptyline*

*Quetiapine*

*Cyclobenzaprine*

# Time duration of positive test



POATSP  
ubccpd.ca

## Detection Time of Substances in Urine

Substance	Detection time in urine
<b>ALCOHOL</b>	
Alcohol	6–8 hours
<b>AMPHETAMINES</b>	
Amphetamines	2–5 days <sup>1,2</sup>
<b>BENZODIAZEPINES</b>	
Short-acting	1–2 days <sup>3</sup>
Intermediate-acting	1–5 days <sup>3</sup>
Long-acting	≤30 days (regular use) <sup>3</sup>
<b>COCAINE AND METABOLITES</b>	
Cocaine	≤1 day <sup>3</sup>
Benzoyllecgonine (cocaine metabolite)	≤4 days <sup>4</sup>
<b>OPIOIDS</b>	
Buprenorphine	≤7 days <sup>3</sup>
Fentanyl—short-term use	≤3 days <sup>3</sup>
Fentanyl—chronic use	≤4 weeks <sup>5,a</sup>
Hydromorphone	≤3 days <sup>3</sup>
Morphine or codeine	2–5 days <sup>6</sup>
6-MAM (heroin metabolite)	<1 day
Methadone	≤3 days <sup>3,b</sup>
EDDP (methadone metabolite)	≤6 days <sup>3</sup>
<b>TETRAHYDROCANNABINOL</b>	
Single use	1–3 days <sup>1</sup>
Chronic use	≤30 days <sup>3</sup>

# Questions?



# A Special Thank You to...



- Dr. Anna Morad
- Dr. Saralyn Williams
- Tennessee Poison Center