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AMPATHCHAT

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# Drugs of abuse screening

**Drugs of abuse screening (DOAS) is well established in the workplace and in professional sports. It is increasingly being used in casualties and/or emergency departments for the medical management of patients with an altered mental state and in trauma patients.**

- **The standard urine screening panel for DOA** offered at Ampath includes quantitative immunoassay for amphetamines, benzodiazepines, cannabis, cocaine, mandrax, methadone and opiates, as well as confirmatory testing for ecstasy, methamphetamines (TIK-TIK) and methcathinone (CAT).
- Barbiturates are offered as part of the **urine toxic screen** in combination with benzodiazepines, and can also be requested separately.
- Due to **low positivity rates**, lysergic acid (LSD), phencyclidine (PCP) and propoxyphene (PPX) have been removed from the standard screening profile and are available as confirmatory tests on specific request only, with the exception of PCP, which is also available on dipstick testing.
- **Qualitative screening profiles** by means of dipstick testing (immunochromatography) are also available and may contain different profiles depending on local needs.
- The **immunoassay platform** has adequate sensitivity (low false negatives) that is ideal for screening purposes and also has relative good specificity for certain drug classes, such as cocaine and cannabis, but lower specificity (high false positives) for others, such as opiates and amphetamines, due to the structural similarities shared between the DOA and cross-reacting drugs.
- A **positive result** is therefore considered **presumptive** and must always be **confirmed by a second highly specific method**. The tandem mass spectrometry (with either gas/GC-MS/MS or high-performance liquid chromatography/LC-MS/MS) is considered the method of choice for the confirmation of a positive result. It is also used as the primary test where screening tests are either unavailable or have very poor specificity (e.g. Ecstasy, TIK and CAT).

Of the biological samples (i.e. blood, hair, saliva, etc.), **urine is the sample of choice** because of the ease of collection, and the long detection period of the drug or its metabolite. DOAS can be falsified through a variety of methods, e.g. adding adulterants, by substitution, or by dilution. To reduce this, appropriate collection techniques and tests for specimen integrity (eg. pH, creatinine) are recommended. The acceptable urine pH is 4.5–8.0. If the pH is < 3 or > 11, it is considered abnormal and most likely adulterated.

The cut-off levels cited below with each DOA are from the Substance Abuse and Mental Health Administration (SAMHSA). The cut-off levels have been established for adults only and were developed to eliminate false positives. Values below the cut-off level are reported as negative.

There are essentially four major groups of DOA tested. These are listed below with key points necessary for interpretation. Information regarding cross-reactivity is applicable to the current quantitative in-use method (i.e. Roche Integra).

## PSYCHOSTIMULANTS

I. **Amphetamines** [speed, meth]
- Cleared rapidly from blood, therefore urine is the specimen of choice.
- Detected in urine for up to four days after use.
- False positive results occur in the presence of several other drugs or over-the-counter (OTC) medications, such as pseudoephedrine, ephedrine, phenylephedrine, labetalol, stimulants used as anorexiants (eg. phentermine), bupropion and trazodone, although this is more pronounced with dipstick testing.
- Amphetamine screens detect MDMA (Ecstasy) and metamphetamines (Tik) to a varying degree.
- Cut-off limit is 1 000 ng/ml.

II. **Methamphetamine** [Tik, crystal meth, ice]
- Is metabolised to amphetamine.
- If both are present in urine, methamphetamine is the primary drug, and if only amphetamine is detected, it is the primary drug.
- Methamphetamine are chemically related to 3, 4 – methylene-dioxymetamphetamine (MDMA or Ecstasy).
- Most imunoassays and dipstick methods detecting methamphetamine, therefore, show cross-reactivity with MDMA as this is excreted predominantly unchanged. The LC-MS/MS method used by Ampath will distinguish between methamphetamine and MDMA.
- Cut-off limit is 1 000 ng/ml (if using a screening test).

III. **Cocaine** (benzoylmethylecgonine) [coke, crack]
- Is a natural compound extracted from the leaves of the coca plant.
- It is used medicinally as a topical anaesthetic.
- Cocaine is metabolised rapidly and excreted predominantly as its metabolite, benzoylecgonine, which is detected by immunoassays.
- The specificity of these immunoassays is extremely high; hence, false positive results are uncommon.
- Benzoylecgonine is detected in the urine of occasional users for up to two days and in chronic users for up to seven days.
- Cut-off limit is 300 ng/ml.

## HALLUCINOGENS

**I. Cannabis** (marijuana/ hemp plant) [dagga, grass, pot]

- Is one of the most widely consumed drugs in the world and is derived from the plant cannabis sativum.
- The psychoactive ingredient is delta-9-tetra-hydrocannabinol (THC).
- A positive result for cannabis does not provide information regarding degree of impairment or quantity and/or frequency of use because THC is lipid soluble and is associated with slow excretion of the drug and its metabolite into the urine.
- A single use can result in a positive urine test up to a week after administration, whereas chronic use can produce a positive urine result for up to 30 days after discontinuation.
- False positive urine tests due to second-hand smoke are considered impossible, and consumption of hemp-containing foods is extremely unlikely to cause a positive urine test.
- Other agents shown to cross-react with some dipstick methods include Efavirenz (non-nucleoside reverse transcriptase inhibitor) and proton pump inhibitors.
- Synthetic cannabinoids are not detected by routine urine assays.
- Cut-off limit is 50 ng/ml.

**II. Lysergic Acid (LSD)** [acid]

- Is excreted in minimal amounts in urine with a detection period of approximately four hours.
- Confirmatory testing is available only and done by LC-MS/ MS.

**III. Phencyclidine** (PCP) [angel dust]

- Is a dissociative anaesthetic.
- The low prevalence of its use, together with the low specificity of the PCP immunoassays, result in a low positive predictive screening test.
- A positive test result is observed for up to four to seven days post ingestion.
- False positive results for PCP have been reported with OTC allergy and cough formulations containing diphenhydramine (Benadryl) and dextromethorphan, although this is more of a concern with dipstick testing.
- Cut-off limit is 25 ng/ml.

## ANAESTHETICS

**I. Barbiturates** [barbs, downers]

- Short- or long-acting (one to 14 days).
- Commonly abused to induce sleep after an amphetamine or cocaine "high".
- Cut-off limit is 200 ng/ml.

**II. Benzodiazepines**

- Commonly prescribed, which makes distinction between pharmacologic use versus abuse difficult, as is the differentiation from single versus long-term use.
- Structurally similar with differences in pharmaco-kinetics i.e. half-life varies significantly.
- Commercial urine assays detect oxazepam and/or nordiazepam, the primary metabolite of many benzodiazepines; but cannot distinguish between individual benzodiazepines.
- Benzodiazepines are generally detected between one to seven days, diazepam metabolites may be detected for weeks after discontinuation.
- Different assays show different cross-reactivities with specific benzodiazepines, but the Roche assay shows significant cross-reactivity (> 50%) with the following: alprazolam (Xanax), clonazepam (Klonopin), midazolam (Versed), triazolam (Halcyon) and flunitrazepam (Rohypnol – date rape drug/ roofies). Other commonly used sleeping aids (eg. eszopiclone, zaleplon, zolpidem, zopiclone) are not detected by the benzodiazepine immunoassay.
- If quantification of a specific benzodiazepine is required to assess toxicity, it should be requested specifically and is done on EDTA-plasma instead of urine. Quantification is available for chlordiazepoxide, clonazepam, diazepam, flunitrazepam, lorazepam, nitrazepam and oxazepam.
- Cut-off limit is 2 000 ng/ml.

## ANALGESICS

**Opioids**

- Class of drugs comprising both prescribed and illicit agents, generally classified according to sources of derivation, natural opioids include codeine and morphine derived from opium.
- Synthetic opioids (fentanyl, meperidine, methadone, pentazocine, propoxyphene and tramadol) and semisynthetic opioids (hydrocodone, hydromorphone, oxycodone and oxymorphone) are widely prescribed and abused.
- Screening tests commonly detect morphine, hence will detect heroin (metabolised to an intermediate monoacetylmorphine) and codeine (metabolised to morphine).
- Some of the synthetic opioids are detected by immunoassays, although with lower cross-reactivity (30%), including hydrocodone and hydromorphone.
- The other synthetic and semisynthetic opioids (eg. Buprenorphine, fentanyl, methadone and oxycodone) are not detected by routine opioid screening tests. A specific immunoassay is available for methadone testing.
- Positive opioid screening results secondary to poppy seed consumption will not occur when using the workplace cut off of 2 000 ng/ml.

## OTHER:

**Mandrax** [white pipe, buttons]

- The active ingredient is methaqualone.
- Commonly abused – mixed with cannabis or smoked alone.
- Cut-off limit is 300 ng/ml.

**Nyaope//Whoonga**

- This drug has emerged in South Africa as an addictive street drug, popular in the Northern parts of South Africa and KwaZulu-Natal.
- It is a mixture of low-grade heroin, marijuana, cleaning detergents and often rat poison.
- The joints are laced with anti-retrovirals, especially Stocrin to increase the hallucinogenic effects of marijuana (no scientific evidence available to support this claim).

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