Drugs of abuse

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Part 5

This fifth article concludes the series on drugs of abuse (DAU) by completing the descriptions of frequently used drugs. An explanation of the correct collection of specimens for laboratory testing and the types of drugs for which testing is usually conducted is provided.

Phencyclidine[1-6]

Streetnames

Angel dust, Killer weed, PCP, Hog

PCP was originally introduced for use as a surgical anaesthetic, but was subsequently withdrawn from application because of adverse side effects. Because of its euphoric and hallucinogenic properties and its ease of synthesis, illicit use of the drug continues, especially in a few large metropolitan cities. The acronym PCP is derived from the chemical name 1-(1-Phenyl-Cyclohexyl)-Piperidine or, more colourful, from its designation during the 1960s as the "Peace Pill".

The pharmacological actions of PCP are complex, because it interacts with several neurotransmitter systems i.e. GABA-ergic, dopaminergic, cholinergic, adrenergic). PCP has stimulant, depressant, hallucinogenic and analgesic properties. Adverse effects are complex and unpredictable and include euphoria, ataxia, diaphoresis, hypertension, tachycardia, nystagmus, muscle rigidity, hallucinations, delusions of grandeur, anxiety, agitation, hostility, paranoia, disorientation, stupor, coma, seizures and respiratory depression. PCP-related deaths most often result from intentional or accidental trauma secondary to adverse behavioural effects of the drug. With repeated use of PCP, psychological dependence may develop, but tolerance or withdrawal syndromes are not profound.

The drug is rapidly absorbed from the GI tract. This form of ingestion is difficult to regulate and results therefore in the highest probability of overdose or "bad trips". Thus, smoking (PCP sprinkled on tobacco, parsley leaves or marijuana) is now the most popular mode of ingestion, because users may self-titrate the most dangerous effects of PCP. Once absorbed, PCP is extensively metabolised by the liver; only 10–15% is excreted unchanged in the urine. It is secreted and "trapped" in the acidic gastric fluid where concentrations may be 20–50 times greater than in serum; subsequently PCP is reabsorbed in the duodenum. This gastro-entero-hepatic recirculation probably contributes to the waxing and waning of the clinical effects of PCP. This also explains PCP's long elimination half-life (20–50 hours), long duration of action (24–48 hours) and prolonged urinary excretion after the last dose (1–2 weeks; longer with chronic use).

Treatment of PCP toxicity is supportive.

The initial screening test for PCP is most often immunoassay. For confirmation of a presumptive positive, a quantitative drug measurement is performed using GC/MS. Quantitation of PCP in serum is not helpful in the diagnosis or management of PCP toxicity, because there is low correlation between drug concentration and drug effects. However, qualitative identification of PCP in urine is useful to help diagnose PCP toxicity. For this purpose, PCP-specific immunoassays are rapid and generally are more sensitive than TLC. Whether or not PCP is included in a general urine drug screen depends on applicable regulations and on the prevalence of PCP use in the local community. Immunoassays for PCP are generally reliable; false-positives have been reported due to high concentrations of dextromethorphan, diphenhydramine and thioridazine. Confirmation of immunoassay-positive specimens using an alternate technique (e.g. GC/MS) is therefore necessary.

Methaqualone[1,2,3,7]

Streetnames

Mandrax, MAOA, Ludes, Qualudes, Mandrakes, Soapers

Methaqualone is a nonbarbiturate sedative-hypnotic used mostly by young people who believe that it heightens the sexual experience. There is no accepted medical use, and it is no longer manufactured in the USA. Most methaqualone is now manufactured in illicit laboratories or smuggled into the country. Users take one or two standard tablets (300-600 mg) to get high. "Luding out" means taking methaqualone with alcohol, usually wine.

Undesirable effects are dryness of the mouth, headache, urticaria, dizziness, diarrhea, chills, tremors, hangover, paresthesia, menstrual disturbances, epistaxis and depersonalisation. Overdose may result in restlessness, delirium, hypertonia, muscle spasms, convulsions and death. Unlike the barbiturates, methaqualone rarely causes severe cardiovascular and respiratory depression, and most fatalities result from combining methaqualone with alcohol.

Treatment consists mainly of supportive measures to maintain vital functions.

Drugs of abuse – the laboratory[1-3]

Testing for DAU usually involves testing a single urine specimen for a number of drugs. It should be noted, however, that a single urine drug test will detect only fairly recent drug use; it cannot differentiate casual use from chronic abuse. The latter requires sequential drug testing and clinical evaluation.

Moreover, urine drug testing cannot determine degree of impairment, the dose of the drug taken or the exact time of use.

Drug testing results for non-medical purposes may be the sole evidence for punitive action or denial of individual rights. Therefore, this testing should be considered a forensic toxicology activity, requiring the highest standards of analytical methodology, specimen security and documentation. Moreover, laboratories engaged in this testing should be appropriately certified.

Several techniques are used during the collection of a urine specimen to guard against attempts by a donor to alter the specimen in a manner that may prevent drug detection. These tactics may include the exchange of urine from a drug-free individual, dilution of the specimen to below the cut-off limits with tap or toilet water, or the addition of detergent, bleach, salt, alkali or acid to interfere with immunoassay screening procedures. Direct observation of urine collection is the most stringent means to guard against specimen exchange or adulteration. However, the need for the highest degree of certainty of specimen integrity must be weighed against individual privacy and dignity.

Table 1. Screening and confirmatory test cut-off values for drugs of abuse

Drug or drug class	Immunoassay (ng/mL)	GC/MS (ng/mL)
Amphetamines:	1000	
- Amphetamine	500	500
- Metamphetamine	500	500
Barbiturates:	200	
- Amobarbital		200
- Butalbital		200
- Pentobarbital		200
- Secobarbital		200
Cannabinoids:	50	
- THC		15
Cocaine metabolites:	300	
- Benzoylecogonine		150
LSD	0.5	0.2
Opiates:	2000	
- Morphine		2000
- Codeine		2000
PCP	25	25

Alternative measures to prevent specimen adulteration include a limitation on clothing or personal belongings allowed in the specimen collection area, addition of colouring agent to the toilet water and inactivation of the hot water tap. In addition, the temperature of the urine specimen should be checked at the time of collection, as well as the pH, specific gravity or creatinine level. If values are beyond physiological limits for these parameters, adulteration of the specimen must be suspected.

The urine should be collected in tamper proof specimen cups and a chain-of-custody should be maintained to identify all individuals involved in specimen collection, transfer and testing. Specimens that test positive should be stored for a minimum of 1 year.

Workplace drug testing generally is restricted to alcohol and a few drugs that have a high abuse potential or that are illicit. Depending on the nature of the testing programme, this may involve testing for only one or two or a selected number of the following drugs or drug classes:

- amphetamines / metamphetamines;
- barbiturates;
- benzodiazepines (BZDs);
- cannabinoids;
- cocaine;
- LSD;
- methadone;
- methaqualone;
- opiates;
- PCP; and
- propoxyphene.

Testing programmes for participants engaged in athletic competition may be much more extensive and include assays for a larger group of drugs including stimulants, β-blockers, diuretics and anabolic steroids. A listing of the banned drugs included in the Olympic testing programmes can be found on the Internet (http://www.ipf.com/cces-list.htm)

Initial screening tests for the DAU are most often immunoassays (e.g. EMIT, FPIA, CEDIA, microparticle immunoassay and RIA). These assays are calibrated at established cut-off concentrations. Specimens yielding responses greater than the cut-off (threshold) value are considered positive, whereas values below the cut-off are considered negative. Cut-off values are not synonymous with assay detection limits (to ensure reliable measurement) but low enough to detect drug use within a reasonable time frame.

Immunoassays may not be specific for the tested drug. Similar drugs may results in a positive test; for e.g. pseudoephedrine, present in cold medications, may produce a positive response in immunoassays designed to detect amphetamine and metamphetamine. Therefore, it is imperative that positive screening test be confirmed by an alternate, more definitive test. The most widely accepted method for drug confirmation is GC/MS (gaschromatography/mass-spectrometry).

For confirmation, quantitative drug measurements are performed using selective ion monitoring with GC/MS. Cut-off values for confirmation are established at or generally below cut-off values for the initial screening tests. The result may be reported as positive or negative relative to the cut-off value. However, the actual concentration may be helpful when interpreting morphine and codeine results and when monitoring individuals enrolled in drug treatment programmes. In the latter case, subjects who test positive but who have decreasing values on sequential testing may be judged abstinent, whereas those whose values suddenly increase are likely noncompliant. For this purpose it is essential to normalise the drug concentration to urine creatinine level (ng of drug / mg creatinine). This will compensate for fluctuations in absolute drug concentration related to physiological variation in urine dilution or concentration.

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