Drug Testing: Technologies & Programs

Ken Pidd

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National Centre for Education and Training on Addiction (NCETA), Flinders University

Drug testing technologies

Biological specimens that can be analysed to detect drug use include blood, sweat, urine, oral fluid/saliva, and hair. This fact sheet focuses on urine, oral fluid/saliva, and hair as the most common biological specimens tested for drugs outside medical settings.

Urine

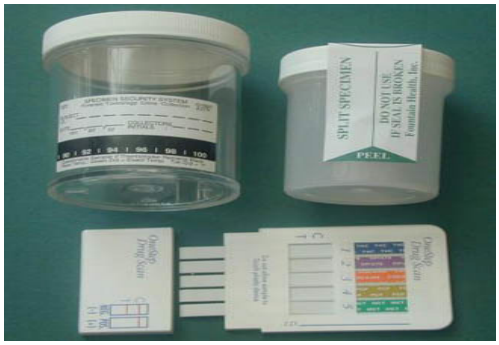
Urinalysis is one of the most researched drug test technologies. For most drug types it can detect use that has occurred up to three days prior to the test. One exception to this is cannabis, where the window of detection can be up to several weeks. Specimen donors are usually required to produce a urine sample, delivered directly into a sterile tamper-proof container.

Advantages:

- Onsite drug screening tests exist for urine
- Sufficient quantities of specimen sample can be obtained for confirmatory analysis and retesting
- A substantial number of Australian laboratories have expertise in urinalysis
- Higher concentrations of drug metabolites[1] are present in urine compared to other types of specimen samples, allowing for reliable detection of past drug use
- Australian standards exist for urine testing.

Disadvantages:

- Relatively intrusive
- Cannot detect very recent use (e.g. past few hours)
- Collection facilities that maintain donor privacy and comfort need to be provided
- Can be time consuming (e.g. donor may not be able to readily provide a sample)
- Dilution, adulteration, or substitution of urine samples is more easily achieved compared to other specimen samples
- Storage and transport issues may occur as urine specimens require refrigeration.



[1] Metabolites are chemical compounds created as a drug is activated or deactivated by internal chemical processes after ingestion. In some cases, very little of the actual (parent) drug is evident in biological samples, however recent use can be determined by the presence of drug metabolites.

Oral fluid/saliva

Oral fluid/saliva testing is a relatively new technology that is increasing in popularity. Compared to urinalysis it is a less invasive form of testing but has a shorter window of detection (generally up to 48 hours).

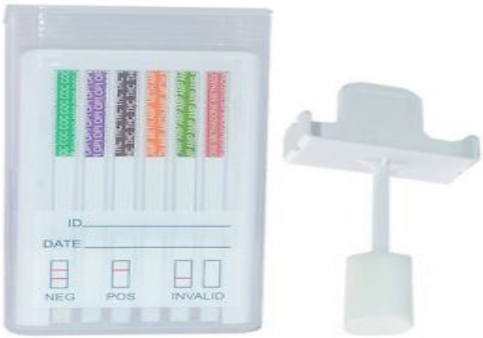
Saliva samples are usually collected from inside the donor's mouth by use of a swab or pipette.

Advantages:

- Onsite drug screening devices exist for oral fluid/saliva
- Specimen collection process is relatively non-intrusive
- Window of detection is narrow (can detect current/very recent use)
- Collection of sample is more easily supervised which reduces opportunity for specimen substitution, dilution, or adulteration
- Higher concentrations of the parent drug in oral fluid/saliva allow for reliable indication of drug type and recent use
- Australian standards exist for oral fluid/saliva testing.

Disadvantages:

- Can be difficult to collect sufficient sample quantities (some drugs affect oral fluid/saliva production)
- Oral contamination (e.g., eating or drinking) can adulterate or dilute the sample
- Can be time consuming (to minimise contamination, risk donor needs to be supervised for up to 30 minutes prior to sample collection).



Hair

Hair testing has a very wide window of detection (up to 6 months and longer, depending on drug type/hair growth rate) and, unlike urinalysis and oral fluid/saliva testing, can be used to identify long term patterns of drug use.

It is a relatively non-intrusive test and normally requires the donor to provide a 3 cm long pencil thickness sample of head hair. While head hair is preferred other types of body hair can be used.

Advantages:

- Specimen collection process is relatively non-intrusive
- Can provide an indication of pattern of use over time
- Higher concentrations of the parent drug in hair allow for reliable indication of drug type and pattern of use
- Collection of sample is easily supervised which reduces the opportunity for specimen substitution/evasion.

Disadvantages:

- No onsite drug screen devices exist (requires laboratory analysis)
- Cannot detect current or recent use (use in past 4 weeks)
- Cannot detect single (once only) use
- Subject to environmental contamination (washing, bleaching, dyeing etc.)
- Drug concentration can vary according to hair type (e.g., colour, structure) and individual differences (e.g., ethnicity, age, gender)
- Very expensive compared to other tests
- Can be evaded by shaving all body hair
- No Australian standards exist for hair testing.

Table 1. Issues related to testing urine, oral fluid/saliva, and hair samples for past drug use

Issue	Urine	Oral fluid/saliva	Hair
Level of invasiveness	High	Low	Low
Window of detection	Up to 3 days[1]	Up to 48 hrs[2]	Up to 6+ months[3]
Indicator of potential impairment	Poor	Good	Poor
Indicator of pattern of use	Poor	Poor	Good
Environmental contamination risk	Low	Low	Medium
Sample adulteration/dilution risk	Medium	Medium	Low
Sample substitution risk	Medium	Low	Low
Collection difficulty	Medium	Low	Low
Sample storage/transport difficulty	Medium	Medium	Low
Availability of onsite devices	Yes	Yes	No
Availability of Australian laboratories	High	Medium	Low
Applicable Australian standards	Yes	Yes	No

[1] For cannabis use, window of detection varies by individual and can be up to several weeks depending on frequency of use.
[2] Varies by drug type.
[3] Varies by drug type and hair growth rate.

Drug testing programs

A number of drug testing programs are commonly used in Australia. These include:

1. Random testing
2. For-cause (targeted) testing
3. Post-accident/incident testing
4. Pre-employment testing.

The choice of testing program varies according to the testing context. For example, for-cause testing is used in workplace and sporting contexts, where the target of the test is suspected of drug use, or in clinical settings where it is necessary to determine if drugs are being used by the client/patient. Post-accident testing occurs in the context of workplace and road traffic accidents, while pre-employment testing is implemented solely in the workplace. Each of these different types of testing programs has advantages and disadvantages.

1. Random testing

- involves screening a pre-determined proportion of a given population
- usually conducted without notice
- commonly applied in workplace, roadside, and sporting contexts, proposed for testing welfare recipients
- main objective is to deter use
- inefficient for detecting use - only a very small proportion of occasional drug use likely to be detected in a given population
- may not be effective in deterring drug use if the target population succumbs to the “gambler’s fallacy” (a belief that you are unlikely, or unlucky, to be caught more than once).

2. For-cause (targeted) testing

- involves the screening of individuals where drug use is expected or individual is monitored for drug use
- usually used in workplace, sporting, and clinical settings
- main objective is to detect past drug use
    - ability to achieve this objective is reliant on accuracy of targeting/ identifying individuals to be tested and accuracy and reliability of the test technology used.

3. Post- accident/incident testing

- involves screening individuals involved in accidents or near-miss incidents
- usually only occurs in the context of the workplace or road traffic accidents
- main objective is to detect past drug use
  - ability to achieve this objective is reliant on accuracy and reliability of the test technology used
- major limitations
  - cannot determine if drug use played a causal role in the accident/incident
  - may lead to under-reporting of workplace minor accidents and near-misses.

4. Pre-employment screening

- involves screening job applicants for drug use as part of the application process
- usually only used in workplace contexts
- main objective is to detect past drug use
  - ability to achieve this objective is reliant on the accuracy and reliability of the test technology used
- main limitations
  - only a one point in time test
  - job applicants usually have advance notice of the test - likely to detect only the uninformed, forgetful or severely addicted.

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Australia's National Research Centre on AOD Workforce Development

Flinders UNIVERSITY

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www.nceta.flinders.edu.au

nceta@flinders.edu.au

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