Introduction

Screening urine for the presence of drugs is undertaken to detect recent drug use or misuse. This may be undertaken for a variety of reasons including healthcare, occupational monitoring, insurance screening, legal and forensic purposes. Any errors in the analysis could have severe consequences for the individual whose urine is being analysed. These include, but are not restricted to, dismissal from work or a potential miscarriage of justice.

The AXIO Drugs of Abuse In Urine (DAU) Proficiency Testing scheme offers four testing rounds per year, each containing 3 samples of lyophilised human urine. Assessment of the results returned by participants are undertaken according to the participant’s choice of reporting thresholds. It includes the drugs that have thresholds dictated by the European Workplace Drug Testing Society (EWDTS) and the Substance Abuse and Mental Health Services Administration (SAMSHA). Additional substances are also included within the annual schedule to cover current additional drugs of abuse and also to more broadly test the laboratories capabilities.

Incorrect results may be reported for a variety of reasons. Commonly, these reasons include ‘non-analytical errors’ such as transcription errors or sample mix-ups and ‘analytical errors’ such as method effects, sample/matrix interferences and methodological sensitivity. False positive and false negative findings can have various consequences for individuals and/or criminal proceedings. Results obtained from the DAU scheme were examined including fentanyl cross-reaction with LSD screening tests, the use of amphetamine screening tests and their limitations, and the failure of some barbiturate screening tests to detect the presence of certain barbiturates. The results obtained demonstrated the potential risks of relying on screening tests alone, with the possible consequences explained.

False Positive Findings

It is recommended and is standard practice in a Forensic environment that any positive screening test result should then be confirmed using an additional confirmatory technique such as LC-MS/MS. In order to unequivocally identify the presence or absence of the substance in question, if this process is not followed there is a possibility that an individual may be accused or subjected to the repercussions of a positive result when no substance (or an alternative substance) was present. This may occur when other substances, additional to those for which the assay is designed, react with the assay to produce a positive response.

An example of this type of error is the presence of fentanyl in urine specimens and the positive screening results that may be encountered with certain LED Screening Tests. The manufacturers of the screening tests that have been identified below do include details regarding the cross-reactivity of fentanyl with the LSD Screening tests within their literature. Fentanyl has been included in the DAU scheme for a number of samples at different concentrations and the following observations noted. Figure 1 shows the Fentanyl Information from various Historical samples.

Figure 1: Fentanyl Information

It is interesting to note that only in one round (DU199) all the laboratories who reported a positive LSD Screening Test result undertook a confirmatory analysis that excluded the presence of LSD. For all other rounds identified, a significant number of the laboratories did not exclude the presence of LSD and therefore there is the possibility that if a real case a report detailing the positive finding for the LSD Screening test may have been issued.

False Negative Findings

A false negative result may have serious consequences, as a negative screening test result would not necessarily be followed up with the confirmatory analysis unless there was other evidence/information to suggest that a substance had been ingested. Therefore, there is the possibility of the presence of a substance being missed entirely and the repercussions that may be associated with that scenario.

A false negative result may be encountered due to the varying cross-reactivities of an assay depending on the particular screening group to various substances that are within that class of substances. Examples of this are Benzodiazepine Assays and the various benzodiazepines such as diazepam, temazepam, nitrazepam and many others too numerous to list, opiates assays, amphetamine assays, barbiturate assays and many others.

Amphetamines and Screening Tests

There are numerous screening techniques and methodologies used to detect the presence of amphetamine and amphetamine-type drugs (including amphetamine, methamphetamine, MDMA, MDMA screening tests). Since not all laboratories use or are able to use the MDMA or methamphetamine Screening Tests, LGIC requests that for assessment purposes everything should be reported under the amphetamine screening group (and then additionally using the methamphetamine and/or MDMA Screening Groups if applicable). Metabolites may also cross to the Screening tests to varying degrees e.g. MDA.

We are not going to look at the responses to the presence of amphetamine as that is what the amphetamine screening tests are raised to detect and no issues have been observed where amphetamine has been present in the DAU test samples, as amphetamine screening tests are typically raised against this molecule.

Figure 4 shows the assessments for Round 148, Sample 1 which contained MDMA (1500 µg/L) and MDA (507 µg/L). Figure 5 shows the assessments for Round 148, Sample 2 which contained Methylamphetamine (1250 µg/L). The concentrations of each of these drugs are greater than the Clinical (1000 µg/L) and SAMSHA and EWDTS (500 µg/L) reporting thresholds.

Conclusion

Urine drug screening may be undertaken using screening tests such as those of Care Tests (POCT) or laboratory based tests that are certified by the manufacturers. It is however common for laboratories to use the MDMA or methamphetamine Screening Tests, LGC requests that for assessment purposes everything should be reported under the amphetamine screening group and then additionally using the methamphetamine and/or MDMA Screening Groups if applicable. Metabolites may also cross to the Screening tests to varying degrees e.g. MDA.

It is extremely important that users are aware of the limitations of screening tests which include the possibility of false negatives due to sensitivity issues and false positives due to the potential of other substances to cross-react with the assays and when any unexpected findings are received from both case samples and PT schemes that these potential causes are considered. Therefore, it is important to note that both false positive and false negative results obtained from the AXIO Drugs of Abuse in Urine (DAU) PT scheme.

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