SHORT COMMUNICATION

Drug analysis in hair: Case of the Brazilian Legislation

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ABSTRACT

In toxication and also for evaluation of the level of drug circulating in the body over a determined period of time. Urine or oral fluid drug levels show transient changes in levels of drugs in the body over a short period (hours), the analysis of hair samples provides an integrated picture of drug use or abstinence over a much more extended time frame (weeks, months and years). This has led to the big increase in the use of hair samples in the detection of drug use. The levels of drugs detected in hair are currently best used as a guide to changes of use in the individual when sectional analysis is performed, or two different periods are compard in th-e in the same individual. This attribute can be used to monitor drug use patterns, demonstrating increasing or decreasing doses being used by the same individual over longer time periods. Another advantage of hair testing is that a subsequent sample could be taken and similar period being re-tested, provided the hair has not being cut short. A hair test can provide useful information after positive urine or oral fluid, on the drug habit of an individual, particularly in the workplace setting or for cause testing. This presentation will focus on the basic explanation about the biology of the hair, some metabolism aspects, differences among matrices, and the use of segmentation in hair, what can affect the result, some important aspects of hair collection, analytical issues and finally a quick explanation about the Case of the Brazilian legislation.

INTRODUCTION

The purpose of the study was to compare the detection rate of illicit drugs in urine and hair specimens. The samples were taken from subjects trying to regain their revoked driver's license after a drug- or alcohol-related traffic offense. In 2010, we screened 14000 urine and 3900 hair samples for amphetamines, methamphetamines, cannabinoids, cocaine, opiates, methadone, and benzodiazepines as well as for ethyl glucuronide. We used the low threshold values of the new German guidelines for Medical Psychological Assessment (MPA). Positive screening tests were confirmed with Gas Chromatography-Mass Spectrometry (GC-MS), Gas Chromatography-Tandem Mass Spectrometry (GC-MS/MS), or Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS). The results show that positivity rates for methamphetamines, MDMA, cocaine, and monoacetylmorphine were 1.7-, 5.7-, 3.8- and 9.3-fold higher in hair than in urine. In contrast, the detection rate for benzodiazepines was higher in urine than in hair (oxazepam, 0.21% versus 0%, nordiazepam 0.10% versus 0.03%). The positivity rate in hair for ethyl glucuronide was 6-fold (12.7%) that for urine testing (2.1%). The study reveals that in the control of abstinence in the context of driving license re-granting there are in part large differences in positivity rates for some drugs or metabolites between hair and urine samples. These differences should be kept in mind by physicians and psychologists in traffic medicine who are ordering the drug testing. Amphetamines, cannabinoids, cocaine, opiates, methadone, and benzodiazepines in authentic hair samples with drug concentrations around the Medical And Psychological Assessment (MPA) guidelines cut-offs were screened by LUCIO- direct ELISA kits. Following confirmation of all positive and a significant number of negatively screened samples with Gas Chromatography-Mass Spectrometry (GC-MS) or Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS) methods accredited for forensic purposes. Receiver Operating Characteristics (ROC) were plotted and the Area Under the Curve (AUC) and Overall Misclassification Rate (OMR) was calculated and compared to those obtained for the same drug classes in urine. While fulfilling the validation criteria of the German forensic guidelines, for almost all screening tests in hair and urine the AUC were greater than 0.8, indicating good to excellent performance. Moreover, the AUC calculated for the detection of drugs in hair did not differ significantly from the AUC calculated for the detection of the same drug classes in urine, thus showing a comparable screening performance to the well-accepted, previously published application of the same ELISAs for the detection of drugs at unconventionally low cut-offs in urine. For the first time, the validation of the immunoassay tests for the complete 6-drug panel MPA profile in hair and urine using a large population of authentic hair and urine samples with drug concentrations around MPA cut-offs, lower than conventional clinical or workplace drug testing guidelines cut-offs as well as those suggested by the Society of Hair Testing (SoHT) is presented. This work presents the validation of a new immunological assay, the One-Step Enzyme-Linked Immune Sorbent Assay (ELISA) tests from International Diagnostic Systems Corp. for the screening of drugs of abuse (cannabis, amphetamines, opiates, and cocaine) in human hair, with subsequent GC-MS confirmation. After decontamination and segmentation into small pieces, 50 mg of hair sample were incubated in 1 ml of methanol for 16 h at 40 degrees Celsius.

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A 100 microL aliquot was collected and evaporated to dryness in presence of 100 microL of methanol/hydrochloric acid (99:1, v/v) to avoid amphetamines loss.