Hair, Oral Fluid, Sweat, and Meconium Testing for Drugs of Abuse
Advantages and Pitfalls

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Summary

Urine is the most widely used specimen for the detection of and analysis of abused drugs. However, commonly abused drugs can only be detected 1–3 days after abuse using urine specimens. Urine collection, for forensic purposes, requires a special collection facility. Despite strict rules for specimen collection, due to privacy issues in urine collection, sample adulteration is not uncommon. The other matrices provide solutions to some of these problems and have additional advantages for drug testing programs. Hair analysis provides non-invasive and supervised sample collection with the largest window of drug detection period (>90 days). Oral fluid analysis provides a convenient way of sample collection under direct supervision and is useful in assessing very recent drug use. The sweat drug analysis provides continuous monitoring of drug use for several weeks. Meconium is a good specimen for detection of intrauterine drug exposure. Despite many advantages, these matrices pose special challenges, particularly analytical and interpretation of results.

Key Words: Hair; oral fluid; sweat; meconium; drugs of abuse.

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1. INTRODUCTION

Currently, urine and blood are the most commonly used specimen types for drugs of abuse testing. In these specimen types, commonly abused drugs and/or their metabolites can generally be detected for a few hours to a few days. One of the reasons for common use of these samples is high concentration of drugs in these specimens. In recent years, with the advent of sensitive methods, the interest in alternate samples such as hair, oral fluid, sweat and meconium has grown. These alternative specimens provide unique and sometimes additional information on drugs of abuse. The advantages of these specimens include ease of sample collection, less intrusion during sample collection, decreased potential of sample adulteration and sample stability. Despite many advantages, these alternative specimens also pose a number of challenges for the analytical laboratory including interpretation of data. Relative drug detection times for various specimens are shown in Fig. 1. Advantages and disadvantages of these specimens are listed in Table 1.

2. HAIR

Hair is a useful specimen when assessment of repeated or chronic drug abuse is desired. Due to high affinity of heavy metals for keratin, hairs have been used for evaluation of chronic exposure of heavy metals such as arsenic, cadmium and mercury since the 1960s. At that time, analysis of drugs in hair was not possible due to unavailability of sensitive methods. However, using radioactive drugs, it was established that the drugs move from blood to hair. With the availability of sensitive methods, a number of drugs have been detected in hair. In 1979, Baumgartner et al. (1),

![Fig. 1. Approximate drug detection periods for various specimen types.](image-url)