Chapter 2

Specimens for Drugs-of-Abuse Testing

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SUMMARY

A wide variety of body fluid specimens have been utilized for analysis for the presence of drugs of abuse. Urine has been and remains the most widely used body fluid specimen for routine testing for drugs of abuse, but several alternative specimens are establishing their place as suitable for drug testing. Hair, sweat, and oral fluid have reached a sufficient level of scientific credibility to be considered for use in the federally regulated workplace drug-testing programs. Each specimen provides different information about time and extent of use and likelihood of impairment. Some of these specimens (e.g., urine and oral fluid) can even be analyzed with simple on-site, noninstrumented testing devices, as well as through standard laboratory methods. These drug-testing tools, as objective pieces of information identifying drug use, have proven highly useful in addressing our society’s ongoing substance abuse challenges. This chapter reviews the use of these various body fluid specimens for drugs-of-abuse testing, addressing the balances between ease of specimen collection and handling, the ease and accuracy of analytical methods, the capability for sound interpretation of results, and, ultimately, legal defensibility.

1. INTRODUCTION

Drug abuse remains a significant public health issue worldwide. Although major advances have been made in our understanding of the neurobiology of addiction and the pharmacology of abused drugs, society still has few tools to
effectively address drug abuse and addiction. However, drug testing has proven to be one of the key objective tools to at least identify those who have used and abused drugs of abuse. Furthermore, drug testing, with appropriate responses and sanctions for positive test results, has deterred drug use. These tests have demonstrated their utility in a wide variety of clinical and nonclinical settings, including emergency toxicology, perinatal testing, criminal justice, the workplace, schools, and drugged driving.

Urine is the most widely used specimen for such routine drugs-of-abuse testing, but several “alternative” specimens are establishing their place as suitable for drug testing (1–3). Hair, sweat, and oral fluid (see Chapters 7–11) have reached a sufficient level of scientific credibility to be considered for use in the federally regulated workplace drug-testing programs under the Substance Abuse and Mental Health Services Administration (SAMHSA) (4). Each of these specimens offers a different balance among ease of specimen collection and handling, ease and accuracy of analytical methods, capability for sound interpretation of results, and legal defensibility. Legal defensibility is important because tests for drugs of abuse are often utilized in a variety of criminal, civil, and administrative adversarial proceedings.

All of these specimens lend themselves to accurate analysis of drug and/or metabolite levels through conventional scientific techniques, i.e., immunoassays and chromatographic methods such as high-performance liquid chromatography (HPLC), gas chromatography (GC), and gas chromatography–mass spectrometry (GC-MS; see Chapter 3). However, some specimens are clearly easier to analyze than others, with simple noninstrumented, on-site devices having been developed for urine and oral fluid. Furthermore, the analyte(s) in question varies between specimens, with the parent drug being predominant in some specimens (hair, sweat, oral fluid) whereas more polar metabolites are predominant in others (urine). Finally, issues of specimen collection, handling, transport, and stability also vary. Of importance are concerns about handling of biological specimens and the relative risks of exposure to, and transmission of, infectious agents. In 1991, the Occupational Safety and Health Administration (OSHA) published the Bloodborne Pathogen Standards at 29 CFR 1910.1030 (and subsequent OSHA Standards Interpretation and Compliance letters), which address the handling and infection risks of various biological specimens (5).

This chapter addresses the various body specimens that have been routinely utilized to identify use and abuse of drugs.

2. Blood

Blood is widely regarded as the specimen offering the best correlation between drug levels and likely dosing and likely concomitant pharmacological,