Performance Characteristics of Selected Immunoassays for Preliminary Test of 3,4-Methylenedioxymethamphetamine, Methamphetamine, and Related Drugs in Urine Specimens

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Abstract

Eight commercially available immunoassays for amphetamines (DRI® Amphetamines, CEDIA® DAU Amphetamines-Semiquantitative, EMIT® d.a.u. Monoclonal Amphetamine/Methamphetamine, Synchron CX® Systems AMPH, TDx®/TDxFLx® Amphetamine/Methamphetamine II, CEDIA Amphetamines/Ecstasy, COBAS® INTEGRA Amphetamines, and Abuscreen® OnLine HS Amphetamine/MDMA) are evaluated for their effectiveness in serving as the preliminary test methodology for the analysis of 3,4-methylenedioxymethamphetamine/3,4-methylenedioxyamphetamine (MDMA/MDA) and methamphetamine/amphetamine (MA/AM). Standard solutions (in urine matrix) of MDMA, MDA, MA, and AM are used to determine these immunoassays' reactivities (or cross-reactivities) toward these compounds of interest. Case specimens containing MDMA/MDA and MA/AM are also used to study the correlations of the apparent immunoassay MDMA (or MA) concentrations and the gas chromatographic–mass spectrometric concentrations of these compounds. Data resulting from this study suggest that CEDIA Amphetamines/Ecstasy can best predict the concentrations of MDMA and MA in case specimens and can also detect the presence of MDMA at low levels, whereas Abuscreen OnLine HS Amphetamine/MDMA can detect both MDMA and MA at low concentrations.

Introduction

Along with heroin, methamphetamine (MA) has long been one of the two most commonly abused drugs in Taiwan. With recent popularity of "club" drugs, especially ecstasy (3,4-methylenedioxymethamphetamine, MDMA), among the younger population (1), we are interested in better understanding the performance characteristics and effectiveness of various commercially available immunoassays for the preliminary identification of urine specimens that contain MA or MDMA and their metabolites, amphetamine (AM) and 3,4-methylenedioxyamphetamine (MDA), respectively.

There have been several reported studies addressing the performance characteristics of immunoassays for amphetamines. For example, in 1988, Ruangyuttikarn and Moody (2) reported low MDMA cross-reactivity of the three immunoassays (Abuscreen RIA, EMIT, and TDx) that adapted MA/AM as the targeted analytes. In 1990, Kunsman et al. (3) reported that MDMA cross-reactivity exhibited by EMIT d.a.u. Monoclonal Amphetamine/Methamphetamine was generally low, while that exhibited by TDx Amphetamine/Methamphetamine was high (118%) at low concentration (150 ng/mL), but unacceptably low (18%) at a higher level (10 µg/mL). Zhao et al. (4) recently evaluated TDx, EMIT II, CEDIA DAU Amphetamines, and five different Abuscreen OnLine formats and concluded that TDx Amphetamine/Methamphetamine II and Abuscreen OnLine HS Amphetamine/MDMA displayed greater detection sensitivity for MDMA. Very recently, scientists from the manufacturer reported the performance characteristics of Multiplex CEDIA Amphetamines/Ecstasy (5), which incorporates three monoclonal antibodies specific for AM, MA, and MDMA.

This study is characterized by 1. the evaluation of an extended list of reagents under the same settings; 2. the emphasis on the effectiveness in simultaneous detection of MDMA/MDA and MA/AM by these immunoassays; and 3. the correlation of case specimen data derived from these immunoassays and gas chromatographic–mass spectrometric (GC–MS) procedures.

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