K10 False Positive Emit II Plus Ecstasy Assay Due to Bupropion

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Learning Overview: The goal of this presentation is to learn about the causes of false positive screening toxicology tests and how to deal with such results.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing knowledge about false positive screening results in toxicology.

This study describes a forensic toxicology case in which evaluating the driving under influence of drugs was required. Blood and urine samples were taken from an injured driver involved in a car accident to perform drug analysis.

Toxicological analysis started with preliminary screening of urine using a Syva VIVA-E analyzer and Emit II Plus Assays for barbiturates, benzodiazepines, Tetrahydrocannabinol (THC), cocaine, methadone, opiates, ecstasy, and amphetamines. Screening tests showed that the urine was positive for benzodiazepines, THC, cocaine, and ecstasy. Blood and urine were then analyzed by Gas Chromatography/Mass Spectrometry (GC/MS) and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). The results of confirmation methods showed the presence of diazepam, midazolam, alprazolam, THC and its metabolites, cocaine and its metabolites, and the antidepressant drug bupropion. But, ecstasy or other drugs which cross-react to 3,4-Methylenedioxymethamphetamine (MDMA) EMIT II Plus Assays were not detected at all. Since it is known from experience that benzodiazepines, THC, and cocaine would not react positively to the MDMA Assay, it was assumed that it might be due to bupropion. However, in the EMIT Cross-Reactivity list, bupropion is listed in the list of drugs structurally related to MDMA that react positively to the MDMA Assay only in non-clinically significant concentrations, which means in much higher concentrations than normally seen in patients taking these drugs.[1] According to the MDMA Cross-Reactivity list, the concentration of bupropion that would react positively to the MDMA Assay is 4,400µg/mL.

In this case, the quantitative analysis of bupropion in urine was not performed due to a lack of a deuterated standard. Nevertheless, considering the results of the qualitative GC/MS analysis and all the available data regarding the case, it was possible to assume that the driver consumed the usual therapeutic dose of bupropion and that the bupropion concentration in his urine was common.

Since the screening methods are fast, inexpensive, and do not require complicated sample preparation, due to a large number of forensic toxicology cases, they are used as a triage: if the result of screening is positive to any listed drugs, samples are analyzed by GC/MS and/or LC/MS/MS, and samples negative on screening are not analyzed any further. Consequently, it is clear that the reliability of the screening method is of great importance in forensic toxicology, and a lot of attention has been paid to it, especially when it comes to unusual results, as in this case.

Therefore, nine solutions of bupropion standard with concentrations from 15µg/mL–2,000µg/mL were tested on EMIT II Plus MDMA Assay to determine the cut-off concentration of bupropion that gives a positive reaction. The result showed that cut-off was 150µg/mL of bupropion, which is about 30 times lower than the concentration given in the MDMA Cross-Reactivity list.[1]

Reference(s):

1. *EMIT Drugs-of-Abuse Urine Assays Cross-Reactivity List.*
https://kids.wakemed.org/documents/pathology/EMIT_Drugs_of_Abuse_Cross_Reactivity_List.pdf

EMIT Ecstasy Assay, Bupropion, Cross Reactivity