Evaluation of the Impact of Expanding Enzyme-Linked Immuno-Sorbent Assay (ELISA) Screening in Driving Under the Influence of Drugs (DUID) Investigations

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After attending this presentation, attendees will better understand the prevalence of the therapeutic drugs carisoprodol, meprobamate, and zolpidem in blood samples from DUID arrests. Attendees will be able to use the data to justify the use of ELISA testing for these compounds as part of a standardized drug screening approach in DUID investigations.

This presentation will impact the forensic science community by increasing knowledge of rates of these therapeutic drugs among the population of drivers arrested for DUID. The results should encourage other laboratories to test for these impairing drugs in DUID cases.

Historically, investigating agencies in North America have employed different standards and approaches to DUID testing. Many laboratories or agencies requesting testing in DUID cases rely on immunoassay (ELISA) screening methods which frequently do not employ zolpidem (Ambien®) or carisoprodol (Soma®) assays as part of their scope. A recently published set of standardized guidelines by Logan et al. added carisoprodol and zolpidem to the recommended scope of drug testing in DUID arrests1.1 These central nervous system depressant drugs have been reported to appear frequently in DUID cases in a 2012 survey of toxicology laboratories across the United States. There is still significant variability in terms of the scope of testing employed by different toxicology laboratories. This results in incomplete datasets in which drug incidence patterns are difficult to ascertain.

The purpose of this study was to determine what the incidence of carisoprodol and zolpidem are in a DUID population, in order to assess the frequency with which potentially impairing drugs might go undetected.

A large dataset (n=1,672) of drug screen results from DUID investigations between June 2013 and June 2014 was provided by NMS Labs in Willow Grove, PA. Toxicology results were obtained on blood samples using a Liquid Chromatography/Time-Of-Flight/Mass Spectrometry (LC/TOF/MS) method that was validated according to Scientific Working Group for Toxicology (SWGTOX) guidelines.

The method tests for approximately 280 common therapeutic and abused drugs and their metabolites. Positive cases were confirmed and quantified by Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) or Gas Chromatography/Mass Spectrometry (GC/MS). Results specifically for zolpidem and carisoprodol and its metabolite meprobamate were evaluated, as well as data on other drugs and alcohol present in these cases.

Zolpidem was found to be positive in 5.3% of cases (n=89). Among the cases which tested positive for zolpidem, many were positive for other drugs among which opiates (20%, n=18), benzodiazepines (19%, n=17), and alcohol (18%, n=6 (33 of 89 tested)) were most prevalent. Carisoprodol and/or meprobamate

were positive in 5.9% of cases (n=99). Among the cases which tested positive for carisoprodol and/or meprobamate, other drugs present included opiates (62%, n=61) and benzodiazepines (53%, n=53).

Following assessment of these results, ELISA screening kits from Neogen® for carisoprodol, meprobamate, and zolpidem were validated, and a further 300 random blood samples in DUID investigations that had been tested according to a more limited protocol were subjected to ELISA testing for these three drugs. Positive results were confirmed using a Solid Phase Extraction (SPE) extraction method followed by LC/MS/MS or GC/MS.

Reference:

1. Logan BK, Lowrie KJ, Turri JL, Yeakel JK, Limoges JF, Miles AK, et al. Recommendations for Toxicological Investigation of Drug-Impaired Driving and Motor Vehicle Fatalities. *J Anal Toxicol* 2013;37(8):552–8.