K21 Evaluation of Postmortem Methamphetamine Concentrations: A Series of Case Studies

Kelley M. Kitts, MS, AIT Laboratories, 2265 Executive Drive, Indianapolis, IN 46241; George S. Behonick, PhD, AIT Laboratories, 2265 Executive Drive, Indianapolis, IN 46241; and Kevin G. Shanks, MS, 2265 Executive Drive, Indianapolis, IN 46241*

The goal of this presentation is to report and describe observed postmortem blood methamphetamine/amphetamine concentrations in a series of cases within the context of case history, Cause Of Death (COD), and Manner Of Death (MOD) determinations. The expected outcome is a comparison and contrasting of blood methamphetamine/amphetamine concentrations between cases in which the drug and metabolite were deemed to be COD or contributing-cause related and cases in which the methamphetamine/amphetamine were considered incidental to COD.

This presentation will impact the forensic science community by augmenting previously reported blood concentrations of methamphetamine/amphetamine in forensic toxicology references described for postmortem cases.

Incidents involving illicit methamphetamine, also known as “meth,” “crystal,” “ice,” “glass,” and “speed” have demonstrated a dramatic increase in recent years. This prevalence has been attributed to the low cost, availability, and extended duration of action as a central nervous system stimulant. Furthermore, the ease of production from inexpensive and readily available materials has contributed to its increased production and distribution throughout the United States. When used moderately, effects include euphoria, increased heart rate, elevated blood pressure, reduced appetite, and loss of inhibition. Excessive or chronic use may lead to manic and violent behavior, dizziness, confusion, hyperthermia, seizure, cardiorespiratory depression, and death. Typical routes of administration include insufflation, smoking, ingestion, and intravenous injection.

The pharmacological properties of methamphetamine are well documented. The drug works as a dopaminergic central nervous system stimulant by freeing dopamine from nerve terminal storage vessels and blocking its reuptake while also endorsing the release of norepinephrine and inhibiting its reuptake. The physiological effects of long-term use include tooth decay, parasitosis, fatigue, and malnutrition. Several studies have also indicated a strong association between methamphetamine use and cardiac complications (coronary artery disease, hypertension, cardiac enlargement, etc.) as well as subarachnoid hemorrhage. In addition, numerous studies have been reported on postmortem methamphetamine concentrations.

Despite this, debate remains in regard to cause-of-death determinations based on methamphetamine presence and postmortem toxicology results. Presented here are a series of cases submitted to this study’s laboratory for toxicology testing. Analyses for methamphetamine were completed on postmortem blood specimens using Liquid Chromatography with Time-Of-Flight Mass Spectrometry (LC/TOF) followed by confirmation using Liquid Chromatography with Tandem Mass Spectrometry (LC/MS/MS). Cases were selected from a pool of specimens that resulted in the detection of methamphetamine submitted to the laboratory over a 12-month period (January 1, 2012-December 31, 2012).

Examination of the methamphetamine concentrations determined in each case, along with case histories for each decedent, demonstrate considerable overlap in methamphetamine concentrations related to deaths from intoxication and those related to other causes and manners (suicide, homicide, traffic accidents, cardiovascular incidents, etc.). For cases where the cause of death was due solely to methamphetamine intoxication, postmortem blood concentrations ranged from 102ng/mL to 17,662ng/mL. Considerable variation was also seen for those cases in which methamphetamine was determined to be an incidental finding, with a range from 91.5ng/mL to 9,10 ng/mL seen. For each specimen, this presentation discusses the case history, toxicology findings, and autopsy findings (if performed) with the objective of demonstrating the diversity of postmortem methamphetamine concentrations relative to the actual cause-of-death determinations.

Toxicology, Postmortem, Methamphetamine

 ** Presenting Author*