

K11 The Postmortem Distribution of 3,4-Methylenedioxyamphetamine (MDMA) and 3,4-Methylenedioxyamphetamine (MDA) From an Accidental Death Due to MDMA Intoxication

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Learning Overview: After attending this presentation, attendees will understand the postmortem distribution of MDMA and MDA from an accidental death due to MDMA intoxication.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing an evaluation of the postmortem distribution of MDMA and MDA, as well as the ratio of MDA to MDMA, in various matrices, which could aid in the approach and analysis of other MDMA intoxication cases.

A 29-year-old female was found kneeling, facedown on her bedroom floor approximately two hours after her last known communication and was pronounced dead on scene roughly 40 minutes later. The scene was unremarkable. Approximately 18 hours after the decedent was pronounced dead, a medicolegal autopsy was performed, and specimens were submitted for toxicological analysis.

An expanded panel was conducted on the priority sample (Femoral Blood 1), and electrolyte's testing was conducted by biosensor analysis on vitreous humor. After completion of the expanded panel, all other specimens were analyzed using a confirmatory, quantitative Gas Chromatography/Mass Spectrometry (GC/MS) method for amines.

Medicolegal autopsy findings included: pulmonary edema (1,300 grams combined lung weight); zonal necrosis of the liver; approximately 25mL of green material in the stomach with gastric mucosal hemorrhage; and a contusion on the inner lower lip (a possible indication of agonal seizure activity). Electrolytes results were determined, and from the expanded panel, seven compounds were reported in Femoral Blood 1: MDMA, MDA, cocaine, benzoylecgonine, diphenhydramine, alprazolam, and naloxone. Furthermore, MDMA and MDA postmortem concentrations and ratios for all submitted specimens were as follows:

Table 1: MDMA and MDA Postmortem Concentrations and Ratios by Specimen

Specimen	MDMA (mg/L or mg/kg) [^]	or	MDA (mg/L or mg/kg) [^]	or	MDA:MDMA	Fluid or Tissue MDMA: Blood 1 MDMA	Fluid or Tissue MDA: Femoral Blood 1 MDA
Femoral Blood 1	16.3		0.31		0.01	1.00	1.00
Femoral Blood 2	15.1		0.26		0.01	0.92	0.83
Heart Blood 1	18.0		0.33		0.01	1.10	1.06
Heart Blood 2	18.1		0.28		0.01	1.11	0.90
Urine	5.89		ND*		--	0.36	--
Vitreous Humor	10.3		0.12		0.01	0.63	0.38
Liver	45.9		1.05		0.02	2.81	3.38
Brain	39.7		0.74		0.01	2.43	2.38
Gastric Content	774		ND*		--	47.4	--

[^]Fluids were reported in mg/L; tissues were reported in mg/kg.

*ND – Not Determined

The official cause and manner of death were ruled as an accident due to MDMA intoxication, although it was recognized that suicide was a distinct possibility. Other drugs detected were not significant in quantity and all electrolyte levels were within normal postmortem limits. The extremely high level of MDMA present in the gastric content suggests the route of administration was ingestion. However, no tablets were found in the stomach and the formulation in which the MDMA was ingested—suspected tablet or liquid form—is unknown. MDMA and its active metabolite appear to exhibit similar pharmacokinetics, showing a seemingly consistent ratio with respect to the MDA/MDMA concentrations (0.01–0.02) in all specimens. The liver and brain concentrations were substantially higher than the femoral blood. The low MDMA concentration present in the urine suggests death occurred soon after ingestion. The MDMA postmortem concentrations in this case are some of the highest reported. While femoral blood remains the preferred sample, this data suggests that heart blood concentrations are comparable to femoral blood, indicating heart blood may be used when necessary.

MDMA, MDA, Postmortem Distribution