



### K51 The Role of Toxicology in Child Custody Disputes

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After attending this presentation, attendees will be able to discuss the importance of good laboratory practices, the pharmacology of drugs in analysis, and the interpretation of specimens in child custody cases.

This presentation will impact the forensic science community by describing the role of toxicology in child custody disputes.

Two cases are presented which highlight the importance of validated testing and interpretation of results in child custody cases. For both cases, a private toxicology lab (Lab A) was contacted and asked to review the analytical work performed at other laboratories, review the reported findings, and/or comment on opinions provided by other scientists.

**Case 1:** The mother of three children was accused of exposing them to Gamma Hydroxybutyrate (GHB), diazepam, and cocaine. Lab A performed hair testing; Lab B performed blood and segmented hair analysis on the mother and all the children; and Lab C tested urine, hair, and blood from both parents and the children. In total, more than 50 different tests were performed at Lab C. The following results will be discussed: diazepam in blood and urine specimens from both adults; diazepam in hair of all tested individuals at concentrations of 39.3ng/mg–215ng/mg; GHB in hair of all tested individuals at concentrations of 76.3ng/mg–225.5ng/mg; and methylecgonine in one hair segment from child 1 at a concentration of 39.3ng/mg. Despite testing hair specimens covering the same time range with reporting limits well below the results reported by Lab C, Labs A and B had no positive findings.

Despite the fact that analytical data was not available for review, the following inconsistencies between the known disposition of analytes in biological matrices and previously reported findings were identified: diazepam was reported in blood and urine specimens in the absence of nordiazepam or temazepam though the reports indicated these analytes were in the scope of testing; diazepam concentrations in hair were approximately 1,000 to 10,000 times higher than the concentrations reported in women with known dosing regimens of the drug and at least five times higher than those reported in a drug abuser; nordiazepam was reported in the hair despite published studies that indicate that nordiazepam concentration typically exceeds those of diazepam in this matrix; GHB concentrations reported in this case were 76ng/mg–225ng/mg while one reported case of an individual given multiple doses had a maximum hair concentration of 1.66ng/mg; and, methylecgonine levels reported in the hair segments were at least 25x higher than what has been reported in patients who were administered cocaine, and neither cocaine nor benzoylecgonine were detected.

**Case 2:** A father was accused of exposing two children to phensuximide. Lab D performed testing on a powder found in the home and reported no drugs found. The data was forwarded to a chemical engineer (Dr. X, who concluded that the powder was 88% phensuximide. Subsequently, urine specimens were collected from the children and analyzed by the chemical engineer at Lab E, who indicated in a deposition that the urine samples contained succinimide and phenol, which he concluded were metabolites of phensuximide, proving exposure.

The data from Lab D and multiple reports, letters, and the deposition of Dr. X were provided to Lab A for review; no data was made available from Lab E. Based on the review of the available data and the deposition of Dr. X, it appeared as if Dr. X concluded that a large peak in Lab D's data was phensuximide based on the results of Lab D's in-house library search, which identified the peak as phensuximide with a match factor of 50; however, comparison of the spectrum of the unknown to the spectrum of phensuximide proved that this conclusion was not valid. Additionally, there is no literature or metabolic pathways that support the conclusion that succinimide or phenol are metabolites of phensuximide. A review of the data and comparison to known mass spectra led to the preliminary conclusion that the large unknown peak from the brown powder that smelled like cinnamon was cinnamaldehyde and none of the testing performed provided any evidence of phensuximide exposure.

#### **Child Custody, Hair Testing, Jurisprudence**