E28 Sudden Infant Death in a Newborn From Drug-Dependent Parents: The Utility of Hair Analysis

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Learning Overview: The goal of this presentation is to emphasize the usefulness of hair analysis to identify chronic exposure and life-threatening situations for children of drug-dependent parents.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by revealing specific neonatal data that are lacking and that the interpretation of hair results with respect to systemic or only external exposure is particularly important for an accurate assessment of the toxic health risk.

Drugs abuse is on the rise in our society and with the growing use of methadone in adults, the number of poison exposure cases in infants is increasing. Drug-related deaths in infants is more difficult to identify due to the different pharmacological parameters and the lack of specific data. Moreover, it is difficult to distinguish between systemic incorporation into hair after ingestion and external contamination. However, the difference is crucial to assess particularly dangerous situations and evaluate the health risk. Therefore, the parameter of hair concentrations should not be used alone since it could be difficult to interpret. As a consequence, forensic experts should take into consideration this datum together with a thorough investigative history and laboratory and autopsy findings.

Pediatric exposure to drugs is relatively rare but concerning, with potentially serious complications, such as seizures, dysrhythmias, and death. The variations in pediatric metabolism and the lack of neonatal data make a precise diagnosis difficult. This may contribute to these cases being labeled as "undetermined" by the forensic community. Hair has been suggested to be a suitable matrix to document repetitive exposure to drugs.

Reported here is the case of a sudden and unexpected death of a 5-month-old girl born to drug-addicted parents. The infant was delivered by cesarean section after a full-term pregnancy. Newborn urine was positive for methadone, as her mother had a known history of methadone intake during pregnancy. The baby had a withdrawal syndrome treated by phenobarbital. The infant was discharged from the hospital healthy. At home, she was both breast- and bottle-fed. Four months after birth, the baby had a seizure, spontaneously solved, and Electrocardiogram (ECG) and Electroencephalograph (EEG) were unremarkable. The day the child died, she had fever for which she had been given acetaminophen. In the evening, she had her meal and fell asleep, but soon after she started to vomit. Emergency services were called, and cardiopulmonary resuscitative maneuvers were initiated by the parents. The infant arrived at the emergency room in asystolic arrest and could not be resuscitated. Blood tests showed anemia and leukocytosis. An autopsy was disposed by the local prosecutor.

At the external examination, traumatic injury was not observed; postmortem Computed Tomography (CT), autopsy, and microbiological and histopathological examination revealed no significant findings. Also, the toxicological analyses, Liquid Chromatography/High Resolution Mass Spectrometry (LC/HRMS), performed on the peripheral blood and organ specimens were negative. Instead, hair analysis showed a strong positivity for methadone (2.3ng/mg) and its metabolite EDDP (0.1ng/mg), cocaine (2.6ng/mg) and its metabolite benzoylecgonine (0.75ng/mg), 6-monoacetylmorphine (a direct metabolite of heroin, (0.2ng/mg), and morphine (1.0ng/mg), suggesting chronic exposure to cocaine, methadone, and heroin. Literature reveals the association between sudden death (due to arrhythmias, seizures, or respiratory failure) and chronic exposure to such substances; accordingly, the infant's death can be reasonably attributable to the combined effect of all these drugs.

In young children, the major problem in testing hair for drugs is the interpretation of the findings. Hair is thinner and more porous than in adults and therefore the risk of contamination by sweat is higher, the growing is asynchronous, and it is difficult to detect. Transfer through sweat can be the result of contact with pillows, bedding, parental kisses, and skin contact, and it is the first reason to have positive hair tests in children. Considering that metabolites could also be present in large amounts in sweat, their presence cannot be discriminative for drug administration or accidental intake. Moreover, drugs positivity in children's hair could be the result of *in utero* exposure.

Drug Intoxication, Sudden Infant Deaths, Hair Analysis