G53 Fatal Accidental Methadone Intoxication in a Child: An Analytical Method to Define the Time of Ingestion

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The goal of this presentation is to show a case of fatal accidental methadone intoxication in a 1-year-old male infant in which the toxicological investigations have helped to define not only the cause of death but also the time of the ingestion of the toxic substance. Postmortem findings with a complete histological and toxicological analysis of methadone distribution in fluids and tissues are discussed.

This presentation will impact the forensic science community by showing the importance of an accurate anamnestic, circumstantial, histological, and toxicological investigation in all drug-related deaths in order to clarify the exact mechanism of death and the time of ingestion of the toxic substance.

Methadone is a synthetic opioid. It was initially synthesized as a morphine substitute in Germany during World War II and approved by the U.S. Food and Drug Administration (FDA) in 1947 for use as an analgesic. By 1950, physicians prescribed it for the treatment of withdrawal symptoms associated with heroin and other opioids. Recreationally, methadone is abused for its sedative and analgesic effects.

The primary effects of methadone include drowsiness, sedation, dizziness, mood swings (euphoria to dysphoria), depressed reflexes, altered sensory perception, stupor, and coma. Other physiological effects include strong analgesia, headache, dry mouth, facial flushing, sweating, nausea and vomiting, respiratory depression, muscle flaccidity, pupil constriction (miosis), and decreased heart rate. The principal mechanisms by which methadone causes death are discussed: respiratory depression; aspiration of vomit; pulmonary edema; bronchopneumonia; cardiac problems; and, renal failure.

The drug is distributed as a watery solution in very small bottles, which are fitted with an ordinary screw cap. This kind of distribution may have fatal consequences, in particular for children. The literature shows numerous fatal accidental methadone intoxications in children. In these cases, postmortem (external and internal) examination and toxicological analyses are indispensable for the final clarification of the cause of death but also, as this case demonstrates, to establish the time of ingestion of the substance.

A 1-year-old male infant was seen in the emergency room after accidental methadone ingestion. He presented with coma, miosis, non-reactive pupils, respiratory depression, and asystole. The child's father reported to the police that he and his wife were being treated with methadone for heroin addiction. In the afternoon, after taking their usual dose of methadone, they left the bottle, which still contained methadone, on a chest of drawers. Suddenly, they realized that their son had the bottle in his hand and was drinking. Immediately the father took the bottle from the hand of his son and, seeing the baby sleepy and sweaty, put him on the bed. After two hours, he touched the child and realized he was cold and unconscious. When they arrived in the emergency room, the baby was already dead.

A complete autopsy was performed 24 hours after death. The external examination did not reveal any traumatic lesions. The internal examination revealed only polivisceral stasis and massive pulmonary and cerebral edema. Histological examination revealed cytotoxic and vasogenic edema in the brain, endoalveolar edema, bronchial aspiration of food material in the lungs, sinusoidal stasis, microvesicular steatosis in the liver, and subcapsular hemorrhages in the spleen.

Methadone was detected in the subject's urine through immunoenzymatic screening. Toxicological analysis by solid-liquid extraction and Gas Chromatography/Mass Spectrometry (GC/MS) analysis was carried out to identify and quantify the lethal substances present in the standard biological fluids and organs. Concentration of methadone was determined as follows: blood 1.06mcg/ml; bile 1.26mcg/ml; urine 0.53mcg/ml; brain 0.19mcg/ml; liver 3.89mcg/ml; and kidney 0.96mcg/ml. 2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine (EDDP) concentration was: blood 0.34mcg/ml; bile 3.56mcg/ml; urine 0.56mcg/ml; brain 0.06mcg/ml; liver 1.66mcg/ml; and, kidney 0.63mcg/ml.

To define the time of the accidental ingestion of the substance, a toxicological analyses was also performed on the gastrointestinal tract. In these samples, methadone concentration was: gastric contents 19.88mcg/ml; duodenum 0.29mcg/ml; ileum 0.37mcg/ml; colon 0.36mcg/ml. EDDP concentration was: gastric contents 6.99mcg/ml; duodenum 0.33mcg/ml; ileum 0.3 mcg/ml; and colon 0.13mcg/ml.

Chromatographic investigation was also carried out on the hair of the child. It revealed traces of methadone which are the result of environmental contamination and not due to the intake of the substance. All other substances of abuse and alcohol were negative.

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According to the crime scene data, autopsy, and histological and toxicological findings, death was attributed to an acute intoxication by accidental ingestion of methadone, which occurred three to five hours before the death of the child, certified upon arrival at the emergency room.

Methadone Intoxication, Time of Ingestion, Toxicological Findings

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