



## K46 Fatal Hydromorphone Overdose in a Child: A Case Report

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The goal of this presentation is to describe the circumstances and postmortem toxicology results in a case of fatal hydromorphone toxicity in a child.

This presentation will impact the forensic science community by contributing to the forensic literature regarding hydromorphone blood concentrations in children. Furthermore, this case provides support for comprehensive drug screening in pediatric deaths.

Hydromorphone is a semi-synthetic opioid analgesic that is approximately eight times more potent when compared to morphine. It is prescribed for the treatment of post-operative or chronic pain; however, it may also be encountered in forensic casework as a drug that is used recreationally. Toxicity due to hydromorphone is dependent on an individual's tolerance, but can include stupor, hypotension, muscle flaccidity, coma, and respiratory depression.

The decedent in this case was a 13-month-old child found vital signs absent in her crib. Emergency medical services were notified, but she was pronounced dead upon arrival at the hospital. Prior to being put to bed the night before her death, she was described as "fussy" and lethargic. The autopsy described a well-developed, well-nourished child, with no significant injuries to head, neck, or torso, and no anatomic cause of death. Heart blood, femoral blood, liver, and stomach contents were submitted for toxicological analysis. Comprehensive drug screening was performed according to a pediatric death protocol used in the province of Ontario, Canada. This protocol comprised: Gas Chromatography/Nitrogen Phosphorous Detection (GC/NPD) and Gas Chromatography/Mass Spectrometry (GC/MS) screen for chemically basic drugs; immunoassay for acetaminophen, salicylates, barbiturates, benzodiazepines, cannabinoid metabolites, cocaine metabolite, opioids (morphine, hydromorphone, codeine, hydrocodone, levorphanol), oxycodone, and fentanyl; Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) analysis for benzodiazepines; and headspace Gas Chromatography/Flame Ionization Detector (GC/FID) for ethanol and other volatiles.

The only toxicologically significant finding in the case was hydromorphone, which was tentatively identified in heart blood by immunoassay and confirmed in femoral blood by a quantitative LC/MS/MS method. The concentration of hydromorphone was determined to be 60ng/mL. Additional case information revealed a variety of prescription and over-the-counter medications used by adults in the home, including hydromorphone in both sustained-release (24mg) and immediate-release (1mg) formulations. The medication history for the deceased included infant acetaminophen drops and a mouthwash preparation comprised of diphenhydramine, aluminum hydroxide and magnesium hydroxide antacid, and lidocaine, prescribed for the treatment of mucositis, mouth pain, and/or oral ulcer.

The scientific literature is of limited assistance with respect to the toxicological interpretation of postmortem blood hydromorphone concentrations in children. Only one previously published case of pediatric overdose provides information on postmortem blood concentrations in children.<sup>1</sup> In that case, postmortem peripheral and heart blood concentrations of 30ng/mL and 60ng/mL, respectively, were measured in a 3-year-old who was determined to have accidentally ingested hydromorphone. Clinical studies are also rare, but provide information on plasma concentrations in children receiving hydromorphone therapeutically. For example, an average plasma concentration of 4.7ng/mL was reported for ten children receiving 2mg hydromorphone intravenously.<sup>2</sup> By comparison, oral administration of a 5mg sustained-release preparation to a 7-year-old child every 12 hours produced a plasma concentration of 1.48ng/mL.<sup>3</sup>

Based on the clinical history, autopsy results, and toxicology findings, the coroner determined the cause of death in this case to be hydromorphone toxicity. The manner of death was undetermined.

### Reference(s):

1. Cantrell F.L. et al. A pediatric fatality due to accidental hydromorphone ingestion. *Clin Toxicol. (Phila)*. 2017; 55(1): 60-62.
2. Collins J.J. et al. Patient-controlled analgesia for mucositis pain in children: A three-period crossover study comparing morphine and hydromorphone. *Pediatr*. 1996; 129(5): 722-8.
3. Babul N.B., Darke A.C., Hain R.H. Hydromorphone and metabolite pharmacokinetics in children. *J Pain Symptom Manage*. 1995; 10: 335-337.

### Hydromorphone, Child, Overdose