

CASE REPORT

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Hydromorphone Detected in Bile Following Hydrocodone Ingestion

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ABSTRACT: Two similar cases are reported here in which Tussionex®, a preparation containing hydrocodone and phenyltoloxamine, caused or contributed to death. Toxicological analyses revealed a high concentration ratio of hydromorphone to hydrocodone in the bile in both cases. It is postulated that the finding of hydromorphone is due to the metabolism of hydrocodone.

KEYWORDS: toxicology, hydrocodone, hydromorphone

Two cases have been studied in our laboratory in which hydrocodone (dihydrocodeinone) was prescribed to the decedents as an antitussive just prior to death. In each case, an empty bottle of Tussionex® (a resin complex of hydrocodone and phenyltoloxamine) was found next to the bodies. Blood and bile specimens were collected and analyzed for hydrocodone. In each case, hydrocodone was determined in the blood but an appreciable amount of hydromorphone (dihydromorphinone) and a smaller amount of hydrocodone were demonstrated in the bile. The history of these cases did not indicate that hydromorphone was prescribed or administered to the decedents.

Case 1

The decedent, a white male, 23 years of age, was found dead in bed by his brother. He had been seen alive 6½ h earlier. An empty 0.5-L (1-pint) bottle labeled Tussionex was found in the bed next to the decedent. A friend of the decedent noted that at just before midnight of the morning of his death the bottle had been three-fourths full and that the decedent had obtained the bottle from an undisclosed source. Investigation revealed that both he and his brother had long histories of drug abuse. Autopsy findings revealed pulmonary edema and congestion and moderate cerebral edema. A full toxicological examination of blood, liver, and bile was conducted. Hydrocodone was found in the blood in the level of 0.30 mg/L and phenyltoloxamine in the level of 0.40 mg/L in the bile. Bile had a hydromorphone concentration of 98.0 mg/L and hydrocodone concentration of 14.3 mg/L. The death was ascribed to drug overdose.

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Case 2

The decedent was a 21-year-old male who was known to abuse drugs and alcohol and had been treated for drug overdose on three different occasions. After spending most of the day working on a truck with his friend, he went to his friend's home that night and slept. He was observed to be drinking much beer during the day. During the early morning, the decedent must have gone out to the front porch to sleep. His friend brought him inside the house and laid him on the floor. At about 6:30 a.m., he was heard making gurgling or choking sounds. His friend administered cardiopulmonary resuscitation (CPR) to no avail. The paramedics arrived and pronounced death at 7 a.m. An autopsy showed marked pulmonary congestion with edema. The immediate cause of death was attributed to bronchopneumonia as a consequence of accidental overdose of hydrocodone.

Hydrocodone was found present in the blood in the level of 0.30 mg/L. The bile had a hydromorphone concentration of 48 mg/L but no hydrocodone was detected.

Methods of Analysis

The method for hydrocodone and hydromorphone determination was essentially a previously reported [1] gas chromatographic (GC) procedure for morphine and codeine. Confirmation of the two compounds was by GC/mass spectrometry, with a Finnigan Model 3330 in the electron ionization mode, and by the thin-layer chromatographic procedure of Davidow et al [2].

Discussion

The mechanism of *o*-demethylation of hydrocodone to hydromorphone has been shown by Cone et al [3] to be one of the pathways of hydrocodone metabolism in human subjects. Since there was no history that hydromorphone had been prescribed for the decedents in our case report, its presence in bile could be attributed to this metabolic action. The other likely metabolites in such specimens would be norhydrocodone, a product of demethylation. This polar compound apparently is not extracted and therefore would not appear on the chromatogram under our analytical conditions.

Earlier reports [4] of death resulting from the ingestion of hydrocodone involved a 28-year-old male with a blood hydrocodone level of 0.98 mg/L and a bile level of 5.5 mg/L. No hydromorphone was cited in that case.

References

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