



K40 Postmortem Fentanyl Concentrations Following High-Dose Transdermal Administration

Rebecca A. Jufer, PhD*, Adrienne Sekula Perlman, MD, John Ingle, and Richard T. Callery, MD, State of Delaware, Office of the Chief Medical Examiner, 200 South Adams Street, Wilmington, DE 19801

The authors intend to present postmortem fentanyl concentrations from a patient that was receiving high-dose transdermal fentanyl.

This presentation will report postmortem fentanyl concentrations following high dose transdermal administration. The reported case will provide information that will assist with the interpretation of postmortem fentanyl concentrations.

Fentanyl is a synthetic opioid analgesic that is approximately 50100 times as potent as morphine. It is used as an adjunct to surgical anesthesia and for the management of chronic pain. Transdermal fentanyl patches (Duragesic®) are available for chronic pain management in delivery doses of 25, 50, 75 and 100 mcg/hr. Steady-state serum fentanyl concentrations reported for the 25, 50, 75 and 100 mcg/hr patches are 0.3-1.2 ng/mL, 0.6-1.8 ng/mL, 1.1-2.6 ng/mL and 1.9-3.8 ng/mL, respectively.

A case was received at the State of Delaware Office of the Chief Medical Examiner involving an AIDS patient who was receiving fentanyl for chronic pain. The decedent was a 43-year-old black male who resided alone in an apartment. He was diagnosed as HIV + in 1985 which had since progressed to full blown AIDS. According to his physician, he was dying from End Stage AIDS and had developed a staphylococcal infection of the spine. He suffered from severe pain and was initially receiving morphine for pain management. Approximately 6 to 7 months prior to his death, the decedent was prescribed Duragesic® patches for pain management. The dose was gradually increased and at the time of his death he was wearing eight 100 mcg/hr Duragesic® patches as well as receiving morphine and oxycodone for breakthrough pain. According to his physician, the decedent continued to work and function normally even at this high dose of medication. He often traveled out of town to visit friends and relatives. His physician also described him as a compliant patient.

The decedent was found dead in bed when his niece requested the police check on his welfare because he failed to show up for a doctor's appointment two days earlier. Early decompositional changes were present at the time the decedent was found. The decedent was brought to the OCME for examination because the investigator noted eight 100 mcg/hr Duragesic® patches on his thighs and was concerned he may have overdosed. During the postmortem examination, the specimens collected for toxicological analysis included subclavian blood, antecubital blood, liver and urine.

Fentanyl was analyzed in biological specimens by solid phase extraction followed by electron ionization gas chromatography-mass spectrometry (SIM mode). Quantitation was performed with deuterated fentanyl as an internal standard and a 6-point calibration curve ranging from 1.0-50 ng/mL. The concentrations of fentanyl in the various specimens analyzed are summarized in the table below:

Specimen	Fentanyl (ng/mL or ng/g)	Other findings
Subclavian Blood	35	Oxycodone: 119 ng/mL
Antecubital Blood	33	Oxycodone: 76 ng/mL
Liver	352	None
Urine	175	Oxycodone: 222 ng/mL

The blood and liver fentanyl concentrations in this case are significantly higher than the reported therapeutic concentrations for fentanyl. However, these fentanyl concentrations are consistent with the high dose of fentanyl that the decedent was receiving. Since the decedent was known to tolerate this high dose of fentanyl and function normally, the death was not ruled a fentanyl overdose. The cause of death was attributed to end stage acquired immunodeficiency syndrome and the manner was ruled natural. This case illustrates the importance of obtaining a comprehensive case history along with the autopsy and toxicological findings when determining cause of death.

Fentanyl, Transdermal, Postmortem