G67 Comparison of the Distribution of Fentanyl in Deaths Related to Use and Abuse of the Duragesicâ Patch and Intravenous Administration of Patch Contents

Jaime L. Oeberst, MD, and Timothy P. Rohrig, PhD, Sedgwick County Regional Forensic Science Center, 1109 North Minneapolis, Wichita, KS*

The goals of this presentation are to provide the audience postmortem distribution data of fentanyl relating to its route of administration

Fentanyl is a synthetic narcotic analgesic of high potency and short duration that has been in clinical use since 1963. Initially the drug was used as an adjunct to surgical anesthesia. The transdermal fentanyl system, under the trade name of Duragesic®, was developed for chronic pain control. The product labeling for the patch states that it is a schedule II controlled substance that can produce drug dependence similar to that produced by morphine. The transdermal system allows for the maintenance of a relatively even steady state blood concentration. The patches are available in three dosage forms: 25, 50, and 100 mcg/hr. Because of its relatively short half live of 3 ½ hours and high potency, an addicted individual is likely to constantly seek a source (supply) of the drug. The Sedgwick County Regional Forensic Science Center has seen increasing numbers of cases where death was due to or related to use and abuse of the Duragesic® patch.

The 6 individuals in this series, 3 males and 3 females, ranged in ages from 30 to 53 years of age. All were Caucasian. Five of the decedents were reported to have chronic pain syndrome: fibromyalgia, lower back pain, chronic headaches, Crohn's disease, and pain due to remote blunt force injuries from a traffic accident. Three of the individuals had been prescribed the Duragesic® patch as part of their pain management therapy. The patch had been obtained by 2 individuals without a prescription. The prescription history of the last individual was not known. Found dead in bead were 2 decedents, 1 of the decedents was found obtunded in bed and died a short time later, and the 3 remaining decedents were found dead either seated or lying on a couch or chair.

On external examination, 2 individuals had transdermal patches on their trunk, 1 of the individuals, a 45-year-old white male had 6 100 mcg/hr patches on his lower chest/upper abdomen, 1 decedent from another county had the patch removed at the scene of death, and 3 of the decedents had injected the patch contents intravenously.

At autopsy, 4 of the individuals had bilateral pulmonary congestion; 3 had aspirated gastric contents. All the decedents had mild to moderate cardiomegaly with heart weights ranging from 370 g to 470 g. In one case, coronary artery atherosclerosis was listed as a contributory cause of death. All of the individuals with a history of intravenous injection of the patch contents had extensive amounts of polarizable material in the lungs on histologic examination.

Toxic effects of fentanyl were listed as the cause of death in 3 of the cases. The cause of death for the remainder of the cases was mixed drug intoxication. Toxicological analyses revealed multiple prescription medications in 5 of the 6 cases. Toxicological analysis in one case revealed the presence of benzoylecognine, fentanyl and amphetamine. The presence of ethanol was detected in only one case.

The analysis of fentanyl (identification and quantitation) was accomplished by gas chromatography-mass spectrometry in the selective ion-monitoring (SIM) mode.

The average postmortem blood/tissue distribution of the "patch" cases were as follows: heart blood, 13.3 ng/ml (range 4-25); femoral blood, 10.3 ng/ml (range 4-18); vitreous, 10.0 ng/ml (range 3-14); brain, 32.0 ng/g (range 12-52); and liver, 35.6 ng/g (range 28-42). The average postmortem blood/tissue distribution of the "IV" cases were as follows: heart blood, 11.3 ng/ml (range 5-17); femoral blood, 4.0 ng.ml (range 2- 7); vitreous, 3.3 ng/ml (range <2-5); brain, 26.6 ng/g (range 21-34; and liver, 25.6 ng/g (range 11-38).

Fentanyl concentrations did exhibit site dependency. The average heart/femoral blood concentration in the "patch" cases was 1.2 (range 11.3); whereas the "IV" cases demonstrated a greater concentration, averaging 3.3.

The data from these case studies demonstrates that the distribution of the fentanyl is similar, irrespective of the two common routes of administration: transdermal absorption or intravenous injection of the patch contents.

Duragesic®, Fentanyl, Postmortem Distribution

 ** Presenting Author*