

CASE REPORT

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Fatal Intravenous Drug Abuse Secondary to Streptomycin Overdose

REFERENCE: Rance, F. and Randall, B., "Fatal Intravenous Drug Abuse Secondary to Streptomycin Overdose," *Journal of Forensic Sciences*, JFSCA, Vol. 31, No. 3, July 1986, pp. 1150-1153.

ABSTRACT: A fatal case of chronic intravenous drug abuse involving the injection of a nonpsychoactive veterinary combination of penicillin G and streptomycin is reported. The circumstances surrounding the death indicate that the decedent died as a result of streptomycin induced paralytic neuromuscular blockade.

KEYWORDS: pathology and biology, streptomycin, death, intravenous drug abuse, streptomycin overdose, neuromuscular blockade

Deaths associated with the illicit intravenous use of psychoactive drugs are common in the larger death investigation jurisdictions in the United States. We report here a death associated with intravenous misuse of a nonpsychoactive medication—a veterinary formulation of penicillin G and streptomycin intended for intramuscular injection.

CASE REPORT

A 34-year-old farmer/auctioneer was found dead and firmly frozen seated on the driver's side of a pickup truck parked on a rural road. The decedent had last been seen 42 h before being found. The ignition of the truck was on, the battery dead, and the gas tank empty. A large patch of ice was found on the ground beneath the exhaust.

When the decedent was found he was not wearing a coat. The sleeves of his shirt had been rolled up revealing both antecubital fossae. His one-piece coverall had been unzipped exposing his chest, abdomen, both inguinal areas, and the genitalia. Adjacent to the body was an empty veterinary multidose syringe (Fig. 1) and a 250-cm³ vial of a veterinary formulation of penicillin G and streptomycin containing 200 cm³ of solution (Fig. 2). Several full and one empty liquor bottles were found in the cab of the truck.

Received for publication 3 Sept. 1985; revised manuscript received 16 Oct. 1985; accepted for publication 17 Oct. 1985.

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FIG. 1—*The veterinary type multiple dose injector found adjacent to the decedent.*

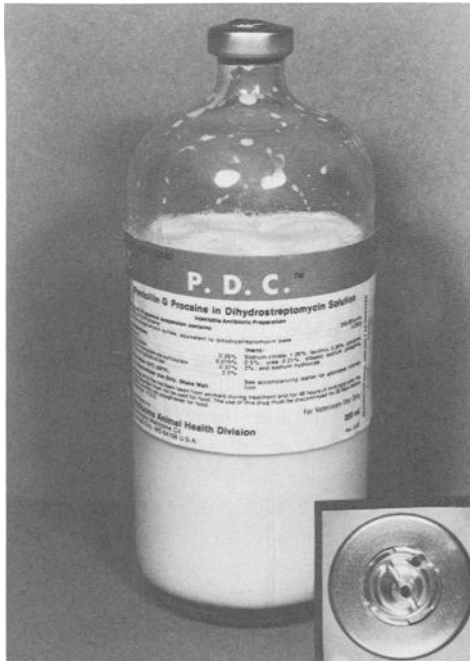


FIG. 2—*Vial containing the veterinary formulation of penicillin and streptomycin injected intravenously by the decedent. Inset shows in place but punctured safety cap.*

The victim had a long history of ethanol and drug abuse. During the months before death the drug abuse had apparently been confined to intravenous use of veterinary antibiotic solutions. The decedent's wife related instances when he would be found sitting in his pickup truck in a "paralyzed state." The wife also reported that the decedent had been complaining of progressive nausea, vomiting, dizziness, headaches, and hearing loss during the year prior to death.

Autopsy Examination

Autopsy examination began 24 h after the decedent was discovered. He was cool but completely thawed at autopsy. Examination revealed evidence of recent and remote intravenous injection sites involving both antecubital fossae and inguinal areas. There were two small healed scars consistent with previous injection sites at the base of the penis. Internal examination revealed diffuse inguinal and axillary lymphadenopathy which microscopically showed reactive lymphoid hyperplasia. A small amount of doubly refractile foreign material was seen within the lungs and the inguinal lymph nodes with no associated granulomatous reaction. No other significant gross or microscopic pathological findings were present.

The postmortem blood ethanol was 180 mg/dL. The blood carbon monoxide was less than 5% saturation. A urine comprehensive drug screen (by thin-layer chromatography and gas chromatography for volatiles) was negative except for nicotine and ethanol. Postmortem blood only was assayed for both streptomycin (by commercial immunoassay) and penicillin (by bioassay) at the Mayo Clinic Laboratories. The streptomycin level was 207 $\mu\text{g}/\text{mL}$ and the penicillin level was 41 $\mu\text{g}/\text{mL}$.

Discussion

In addition to the well-known ototoxicity of streptomycin, streptomycin at high doses is also associated with a paralytic neuromuscular blockade (NMB) [1]. The magnesium-like NMB of streptomycin has been studied in both cats and dogs with as low a dose of 70 mg/kg of streptomycin producing complete flaccid paralysis [2,3]. Soloviev et al. [2] reported that at the 70-mg/kg dose initial serum levels of streptomycin averaged 800 $\mu\text{g}/\text{mL}$ with very rapid onset of NMB. NMB lasted for approximately 20 min with initial resolution beginning at an average serum streptomycin level of 250 $\mu\text{g}/\text{mL}$ with near complete resolution of NMB at 200 $\mu\text{g}/\text{mL}$ of serum streptomycin.

Brazil and Corrado [3] showed that the NMB affect of streptomycin was somewhat variable and dose related with only one of five dogs progressing to complete NMB at a streptomycin dose of 74 mg/kg but six of twenty dogs with complete NMB at a streptomycin dose of 110 mg/kg. The decedent in this case received an estimated streptomycin dose of 170 mg/kg. No reports were found in the literature investigating the relationship of dose, serum concentrations, and NMB with chronic streptomycin administration.

Although penicillin has been associated with NMB [1], the necessary doses are higher than those apparently administered by the decedent or reflected by the postmortem blood levels.

Investigation into this death revealed a history of progressive hearing loss and episodes of partial paralysis during which the decedent needed to be helped from the cab of his pickup truck—all consistent with the known adverse affects of streptomycin.

We feel that the decedent died as a result of NMB induced by streptomycin, probably on the basis of paralytic respiratory failure or possibly as a result of hypothermia if he was unable to drive his pickup truck during the prevailing subzero (F°) weather.

No other cases of lethal streptomycin intravenous overdose were discovered in the English literature. In addition, we found no reported fatal cases of chronic intravenous drug abuse of substances without known psychoactive effect. We are unaware of any psychoactive effect of

either streptomycin or penicillin although streptomycin at high doses have some local anesthetic effect [1].

Large drug abuse treatment centers occasionally encounter individuals who gain primary gratification purely from needle sticks, so-called "needle freaks."³ The "needle freak" phenomenon may explain some of the behavior exhibited by the decedent in this case. The elevated blood ethanol level may also suggest fantasy/fetish behavior occurring during the disinhibiting influence of ethanol intoxication.³

References

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