

CASE REPORT

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Poisonings Associated with Cyanide in Over the Counter Cold Medication in Washington State, 1991

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ABSTRACT: In March 1991, four cyanide poisonings were identified in Washington State. Three of these, one nonfatal and two fatal, were directly linked to the consumption of capsules of Sudafed-12 hour cold relief capsules. This article presents the details of these cases including the chronology, causes of death, autopsy and toxicological findings. The fourth case, also fatal, occurred after extensive publicity surrounding the poisonings, and was determined to be a copy-cat case intended to mimic the consumption of tainted Sudafed. The investigation and distinguishing features of this case are also discussed. A further cyanide poisoning occurred in Canada shortly after these incidents and had similar features to the copy-cat case.

KEYWORDS: toxicology, product tampering, cyanide, heavy metal poisoning, forensic toxicology, organ transplantation

Cyanide has been used to adulterate over-the-counter medications on several occasions [1]. In the incident described here, two people died and one recovered after nearly fatal poisoning as a result of ingestion of cyanide tainted Sudafed 12-hour cold capsules, while more tainted capsules were found in the public drug supply.

Cyanide in Sudafed, February 1991

This cyanide product tampering episode occurred in Washington State in 1991, and unfolded as follows (the chronology is summarized in Table 1).

In the February 1991 issue of Readers Digest, an article appeared describing a 1986 incident, in which two people in Washington state died after ingesting extra strength

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TABLE 1—*Chronology of 1991 poisoning incident, Washington State.*

January 1991	Readers Digest article "Who Killed Sue Snow?"
February 2, 1991	First cyanide poisoning linked to Sudafed [non-fatal]
February 9, 1991	Victim 2, first fatal poisoning
February 11, 1991	Death of victim 2
February 17, 1991	Victim 3, second fatal poisoning
February 28, 1991	Toxicology results from victim 2
March 3, 1991	Statewide Sudafed recall
March 4, 1991	Nationwide Sudafed recall
March 12, 1991	Victim 4, copycat poisoning, third fatal episode

Excedrin capsules whose contents had been replaced with cyanide [2]. This magazine appeared on newstands in mid January, and the article described how the 1986 case had been investigated, how the poisoner had learned about toxic and lethal dosing from books in a public library and obtained the cyanide (algae destroyer) from a pet store.

Case 1

On Feb. 2nd 1991, a 28-year-old white woman in Tumwater, Washington, collapsed and went into coma at home, 1 min after taking a Sudafed 12-hour cold capsule. She was hospitalized immediately, and found to have severe metabolic acidosis (pH 7.0), and elevated lactate (19 mmol/L). Following intensive support care for metabolic acidosis, hypertensive shock and bradyarrhythmia, she regained consciousness and recovered completely. Her physician after excluding all other causes, suspected cyanide poisoning, and submitted an admission blood sample to a clinical laboratory for cyanide analysis. The cyanide level, reported some days later, was 6.14 mg/L. Toxicology indicated no pseudoephedrine. Suspecting poisoning, the physician examined her medications and noted that the lot number on the Sudafed blister pack was different from the lot number on the box. This was reported to the local police who initiated an investigation.

Case 2

On Feb. 9th 1991, a 40-year-old white woman collapsed at home in Tacoma, Washington. She had been suffering from hypertension and a persistent sinus infection. She was hospitalized and survived on intensive care support for two days before being declared dead. She never regained consciousness, but had severe metabolic acidosis on admission. At autopsy she was found to have cerebellar hemorrhage and cerebral and pulmonary edema. An admission drug screen had indicated the presence of pseudoephedrine. The forensic pathologist obtained the admission hospital blood samples and requested a drug screen and a cyanide test.

Case 3

On Feb. 17th, 1991, a 44-year-old white man collapsed at home. He had been suffering from a sinus infection. He was hospitalized with metabolic acidosis, but declared brain dead on admission. No conclusive cause of death was determined at this time, nor was cyanide poisoning suspected. He was maintained on a respirator for 5 days when his organs were harvested for transplantation to five different recipients. One of them, the recipient of the spleen, subsequently died apparently of causes unrelated to cyanide.

Sequelae and Discussion

Postmortem toxicology testing on the victim in Case 2 (the first fatality) was completed on Feb. 26th 1991, and the results reported by mail to the medical examiner. A cyanide level of 6.5 mg/L was detected, and the presence of pseudoephedrine was confirmed. Based on these findings and the medical examiner's own investigation, he contacted the Food and Drug Administration (FDA) to express concern over the possibility of a product-tampering incident. The awareness of the pathologist of this particular manner of homicide was heightened by the fact that he had been a resident in the King County (Seattle) Medical Examiners Office at the time of the 1986 Excedrin tampering incident in which two people died. Following consultation with the FDA, a statewide recall of the Sudafed 12-hour capsules was made on March 3rd 1991, and this was expanded to a nationwide recall the following day.

As a result of this recall, coroners and medical examiners across the state reviewed their case files and submitted samples for testing in cases where none had been submitted or where cyanide analysis was not performed and other factors indicated the possibility of cyanide poisoning. It was during this process that the death of the Victim 3 was found to have been a result of cyanide poisoning. Cyanide testing was also performed on all cases where ephedrine or pseudoephedrine had been found. No other cases tested were found to be positive for cyanide.

Unfortunately, no hospital admission samples from the victim in Case 3 were available for testing once cyanide became suspected, however a blood sample taken 28 h after admission was found to have a cyanide level of 0.34 mg/L. Rates of cyanide elimination *in vivo* vary, and estimation of the cyanide level at the time of admission is difficult. In one nonfatal poisoning, blood cyanide levels were 2.0, 1.6, and 1.2 mg/L, 12, 22, and 84 h, respectively after admission [3]. In another case, a blood level of 1.5 mg/L 1 h after ingestion had fallen to 0.07 mg/mL, 12 h later [4]. In addition, cyanide levels are known to decrease postmortem, through evaporation, thiocyanate formation, and reaction with tissue components. When cyanide is added to blood *in vitro*, 17 to 33% can be lost within 1 hr [5]. Organs from cyanide poisoned patients have been successfully transplanted in the past [6,7], and although cyanide was not suspected at the time organs were removed in this case, there was no reason to believe that cyanide played a direct role in the death of the recipient of the spleen, particularly because blood taken at the time organs were removed for transplantation (120 h postingestion) had a cyanide level of less than 0.1 mg/L.

Once cyanide was identified and linked to Sudafed, federal investigators became involved and the overall picture of two deaths and one poisoning was confirmed as being due to the ingestion of Sudafed 12-hour capsules laced with cyanide. In all, six Sudafed 12-hour packets containing sodium cyanide laced capsules were found either on supermarket shelves or in home medicine cabinets. All were located within the Tacoma or Olympia area, 30 miles south of Seattle. An important factor making the immediate diagnosis of these cases difficult, was the fact that each tampered packet contained only one tampered capsule. This meant that the only obvious evidence of tampering available to the investigator was the mismatched blister pack and box lot numbers, since the capsule was gone and the foil backing opened. While an important clue in this case, this mismatching may not be present in all cases of tampering, and matched packaging certainly does not rule out tampering.

Further Indirectly Related Cyanide Poisonings

The extensive publicity surrounding this episode, heightened public awareness of the toxicity of cyanide. Newspapers ran comprehensive stories on cyanide, historical poisonings and poisoners, and sources of cyanide with subtitles including "Cyanide is Not

Difficult to Obtain" [8]. It was alarming therefore, when on March 12, 1991, nine days after the announced recall and in the midst of all this publicity, a 30-year-old white man from Everett, Snohomish county, 30 miles north of Seattle, called a medical aid crew complaining of illness after ingesting Sudafed. He was admitted to hospital, became comatose and died shortly afterward. The admission blood cyanide level was 3.9 mg/L, and 0.39 mg/L pseudoephedrine. A search of his home showed no Sudafed capsules, but a plethora of other over the counter cold medications (approximately 30 different in total, including Sudafed tablets), large amounts of vitamin and herbal tablets and other medications. Further investigation of this individual revealed several recent suicide attempts, domestic problems and significantly, the fact that the dead man had worked in an electronics supply plant where circuit board connectors were gold plated from a gold monocyanoide solution. An admission blood sample was analyzed for gold and found to contain a level of 5.9 mg/L. Normal levels are under 0.04 mg/L. This was ruled as a suicide attempt masquerading as a product-tampering case, possibly perpetrated with the intent of a law suit against the manufacturers, and as an attempt to attract sympathy to aid in the resolution of the deceased's domestic problems. The use of gold cyanide in a suicidal poisoning has been reported in another case, where although cyanide antidote therapy was administered, the toxic effects of the gold contributed significantly to the death [9].

Subsequent to this incident, another fatal cyanide poisoning case was identified in British Columbia, Canada, about 300 miles north of Seattle. In this incident, an individual with significant psychological problems and a history of suicidal ideation, committed suicide by ingesting cyanide salts. A search of his home revealed a supply of cyanide salts, and other evidence indicating that he had been planning, or attempting to fill gelatin capsules with cyanide. In addition, he had a "death list" of people he intended to poison. With the cooperation of the media, this case was successfully played down to avoid public concern and further copy-cat poisoning, but was thoroughly investigated to ensure that no tampered materials had been publicly distributed.

These last two cases highlight the fascination the public has for poisoning, and apparently the publicity surrounding the Sudafed cyanide poisonings caught the imagination of these individuals, which led to the use of this poison in their own deaths. The truly random nature of this type of crime and the vulnerability of all members of the public as potential victims, engenders a great deal of public sympathy for the actual victims and their families. Public recognition and the associated media attention may be a contributing factor in the decision of individuals to stage copy-cat, self inflicted poisoning. Disguising a suicide as product tampering for the purposes of attracting sympathy and attention, or staging a poisoning with a view to a lawsuit, must be taken into account when dealing with apparent product tampering cases [1,2].

The media should be cautious in their handling of these cases, and investigators should be aware of the copy-cat phenomenon and view all cases, particularly those occurring after widespread media coverage, as possible staged poisonings.

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