

Pesticide Exposure Leads to Death

This case study summarizes events relating to the death of a man with a history of seizure disorder who was fatally exposed to pesticides in his unventilated basement apartment. It illustrates the role of an impartial toxicological assessment in litigation involving pesticides. The county coroner suspected pesticide exposure as a contributing factor in the cause of death. Later, during civil litigation, the victim's exposure underwent toxicological examination.

Toxic Assessment of Pesticide Exposure

A 57 year old male was found dead in his basement apartment located near Philadelphia, Pennsylvania. The decedent was fully clothed, wearing his glasses with the Sunday paper nearby, lying face down on the floor. His past medical history was significant only for seizure disorder. Family members reported that the apartment had been treated for termites the day before the decedent's death by a nationally-known pesticide application company. The decedent had remained inside the non-ventilated basement apartment while the pesticides were applied. Later that day, he complained of respiratory difficulties and abdominal pain with nausea.

Coroner's Report and Conclusion

Due to the nature of this case, an examination of the body was performed by the coroner's office. The toxicology report revealed 2.6 ug/ml of phenytoin in the cardiac blood as well as methanol in the liver at 5.1% by weight. Phenytoin is an anti-convulsant agent used to control epilepsy and was within the range for desirable therapeutic results. Methanol is found in formalin embalming products and would be expected in a formalin-preserved liver sample but only at approximately 1.5% by weight (based on certified analysis). The coroner concluded that the cause of the decedent's death lay in whatever agent was sprayed around the decedent's apartment.

Spoilation of Pesticide Application Documents

Per Pennsylvania law, a pesticide application business must keep a record for each pesticide application, and such records must be maintained for at least three years. However, the pesticide-application company failed to keep records of the brand name and formulation of the pesticides used at the decedent's apartment. The company also failed to keep a record of the amount and dosage rate of the pesticides applied. In a legal context, the act of destroying, altering or hiding a document relevant to current litigation is known as "spoliation." The legal system has established that when spoliation occurs, any inference that might be drawn against the offending party is permitted. In this matter, it was unclear as to the exact chemicals applied, quantity and dose due to the company's lack of records and their history of deliberately falsifying records. The applicator could only testify that he used Cy-Kick as well as the pesticide mixture that was left over in his truck's tank from the previous day.

Methyl Bromide

The toxicological finding of methanol within the decedent's liver at 5.1% by weight was greater than could be reasonably explained by the formalin used to preserve the liver sample. Rather, the objective toxicological data was consistent with high-level methyl bromide poisoning as methyl bromide is metabolized to methanol in the liver.



Pesticides are frequently applied within a confined temporary enclosure.^[a]

Methyl bromide is a colorless, odorless, highly toxic gas banned for use inside residential structures. Instead, it is used to sterilize buildings via a process known as fumigation. The building is evacuated and a tent-like structure is used to encapsulate the outside of the building. After treatment, the tent is removed and the poisonous gases are ventilated. Pets and humans can then re-enter the sterilized building. However, in this instance, the applicator failed to surround the building with a tented structure, ventilate the building or even evacuate residents. Application of just ounces of highly volatile methyl bromide within a closed, unventilated room would produce lethal vapor levels.¹

After inhalation exposure, methyl bromide is rapidly metabolized to methanol in the liver. As a neurotoxin, this gas causes central nervous depression with respiratory paralysis and/or circulatory failure as the immediate cause of death generally preceded by convulsions and coma. The onset of symptoms is usually delayed with a latent period from 30 minutes to several hours. Due to a high odor threshold, most people may not realize that a harmful exposure is occurring.

"Cy-Kick" (cyfluthrin)

The applicator testified that he used a pesticide called Cy-kick formulated from 99.9% petroleum distillates and 0.1% cyfluthrin. Respiratory and gastrointestinal abnormalities, such as those described by family members who communicated with decedent prior to his death, are consistent with cyfluthrin toxicity.² Cyfluthrin exposure at high dose exposures prolongs sodium channel inactivation in human neurons. Peer-reviewed toxicological studies have documented profuse salivation, pulmonary edema, seizures, opisthotonos (e.g. spinal column bent forward such that a supine body rests on its head and heels as was found in this case), coma and death at high doses.³

Summary

Dr. Sawyer provided forensic evidence based on the transformation of methyl bromide to methanol within the liver. This evidence indicated that methyl bromide may have been used to treat the apartment. Additionally, Dr. Sawyer provided sufficient peer-reviewed study evidence with respect to exacerbation of decedent's seizure disorder by defendants' admitted use of cyfluthrin within the unventilated basement apartment. The finding of opisthotonos was also consistent with cyfluthrin intoxication. While it could not be determined with absolute certainty which pesticide (or both) was responsible, both cyfluthrin and methyl bromide have the propensity to induce convulsions in an individual with an underlying seizure disorder.

It was also noteworthy that the decedent was present both during and after pesticide application in the small, unventilated basement apartment. As the pesticide application company was guilty of spoliation, it could not argue against either of these scenarios. In this instance, causation was ultimately attributed to toxic pesticide exposure in an unventilated apartment. The matter settled favorably for the plaintiff's estate.

(Disclaimer: Toxicology case studies are impartial and objective summaries of toxicological matters in which TCAS was retained for the purpose of assessing health-based factors which, in some cases, led to a determination of causation. No names or identifying information have been provided due to privacy and legal considerations. In the above matter, Dr. Sawyer was retained by plaintiff's estate.)

Notes and References

1. Wagner, SL., "Clinical Toxicology of Agricultural Chemicals," 1981, Oregon State University Environmental Health Sciences Center, Oregon, pp. 10-33.
2. Lifshitz, M., et al., "Hydrocarbon Poisoning in Children: A 5-Year Retrospective Study," 2003, Wilderness & Environmental Medicine, Vol. 14(2), pp. 78-82.
3. California Department of Pesticide Regulation, "Worker Illness Related to Ground Application of Pesticide," May 12, 2005 in US CDC, MMWR Weekly, May 5, 2006, Vol. 55(17), pp. 486-488.

Images

- a. Adapted from image by [Matthew Field](#) (Creative Commons)

A Message from Dr. William R. Sawyer Chief Toxicologist, TCAS, LLC



"Pesticide poisoning can be difficult to assess due to short half-lives and metabolism. In this instance the problem was compounded by document spoliation. A toxicological assessment based on multiple lines of evidence can make a significant difference."

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