Dying to be with yew

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ABSTRACT

*Taxus baccata* (yew) is an easily accessible plant that can cause rapidly fatal cardiotoxicity upon ingestion. While it has been documented as both a method of suicide and homicide, such cases may be underreported due to the difficulty of recognition. Toxicity of the yew is due to the alkaloids Taxine A and Taxine B, both of which form 3,5-dimethoxyphenol metabolite. Neither alkaloids nor the metabolite is detected by routine drug screening. Here, we present a case of suicide by yew ingestion. 3,5-dimethoxyphenol was detected in gastric contents, postmortem blood and urine by two mass spectrophotometric techniques including high resolution mass spectrometry. The gastric contents contained a green, needlelike substance consistent with the yew plant. Utilizing broad spectrum screening by mass spectrometry along with comprehensive history may result in early detection of yew toxicity, facilitate treatment of cardiotoxicity, and improve survival.

Introduction

*Taxus baccata* (yew) are evergreen shrubs with stiff, green needle shaped leaves and brown bark, commonly used as ornamentals ([Figure 1]) [1]. In healthcare, they are utilized to isolate the chemotherapeutic drugs paclitaxel and docetaxel. Yew plants have been used for both suicidal and homicidal purposes [2], as ingestion of these plants is potentially lethal. All parts of the plant are toxic with the exception of the red pulp of the aril.

Yew toxicity is initially difficult to recognize, presenting with nonspecific symptoms such as nausea, abdominal pain, and seizures. The subsequent development of wide complex tachycardia, severe bradycardia with a wide QRS complex, cardiac shock, and hemodynamic instability can lead to death within hours of initial presentation. While rarely reported as a method of suicide, cases may be underreported due to the difficulty of poisoning recognition [3].

We present a case of successful suicide by intentional ingestion of *Taxus baccata*. The metabolite of Taxine A and B was detected in gastric contents by gas chromatography-mass spectrometry (GC-MS) and in postmortem blood and urine by high resolution mass spectrometry (HRMS). Application of broad-spectrum mass spectrometry techniques in suspected yew ingestions may provide an avenue of diagnostic value in an otherwise difficult to recognize toxicity.

Case report

A 26-year-old woman was found by family lying unresponsive on the floor of her residence. The body was mottled and cool to the touch. The unobstructed airways were without foam, vomit or blood, and there were no visible signs of trauma or injury. There were no findings concerning for harmful substance use on scene except for the following prescription medications: quetiapine, clonazepam, prazosin, omeprazole, gabapentin, levothyroxine, and zolpidem. Initial history was significant only for recently diagnosed bipolar disorder.

Investigation by medicolegal death investigator and law enforcement revealed that the decedent had found...
her significant other deceased from suspected overdose two weeks prior. She struggled with depressed mood afterwards. Four days prior to death, the woman told her mother that her boyfriend liked yew plants. They subsequently purchased one. On the day of death, she complained of tightness in her chest. Law enforcement discovered an article about suicide via *Taxus baccata* ingestion on the decedent’s phone.

Postmortem examination by a forensic pathologist was conducted to determine the cause and manner of death. Gross examination of the heart showed normal size, structure, and color, except for scattered petechial hemorrhages present on the outer surface. Blood, urine, and gastric contents were sent for toxicological analysis. Comprehensive drug screening for illicit drugs and medications was negative except for insignificant concentrations of bupropion (206 ng/mL), 7-aminoclonazepam (32 ng/mL), and gabapentin (632 ng/mL). Gross observation of the gastric contents revealed several needlelike green objects consistent with leaves from a yew plant (Figure 2). Gastric contents were analyzed using an untargeted approach by GC-MS and the resulting spectra compared to the NIST Standard Reference Database 1A (NIST14). Blood and urine were analyzed by liquid chromatography-quadrupole time of flight HRMS (LC-QTOF, HRMS), using an information dependent acquisition method and a precursor mass of 154.16. 3,5-dimethoxyphenol (taxicatigenin; CAS No. 500-99-2) was detected in all three specimens (Figure 3).

**Discussion**

The yew plant can be ingested in several different ways, including consumption of raw leaves and bark, being mashed into a pulp, or being made into tea [3]. Most cases of fatal ingestions in humans are intentional. The main toxins found in the yew plant are the alkaloids Taxine A and Taxine B (Figure 1) [4, 5]. Taxine B is responsible for most of the plant’s lethal effects by antagonizing cardiac myocyte calcium and sodium channels, similar to the mechanism of class IV and class I anti-arrhythmics [2]. This can cause an AV conduction block, ventricular fibrillation, cardiogenic shock, and death. Both taxines are metabolized into 3,5-dimethoxyphenol, the most common component used to screen for yew poisoning [6]. There is no effective antidote for yew poisoning. Proposed treatments include digoxin immune fab, lipid emulsions, and lidocaine, none of which have demonstrated proven results. Management therefore involves early recognition, anticipation of arrhythmias, and prompt supportive treatment (activated charcoal, fluid resuscitation, electrolytes, inotropes, and/or cardiopulmonary resuscitation). Mechanical cardiac support like extracorporeal membrane oxygenation may be considered if other measures have failed.

![Figure 1. Photograph of the English yew with berry and seed as well as chemical structures of Taxines A and B, the main toxins of the yew plant.](image)
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Diagnosis of taxine poisoning in livestock after accidental feedings of yew bush clippings has been contingent on history of exposure and identification of yew in the digestive tract [7]. Due to their prolonged gastric transit time, yew leaf recovery from the stomach may reduce taxine absorption [3]. Our discovery of needlelike green objects consistent with the leaves of *Taxus baccata* in postmortem gastric contents (Figure 2) is the first reported instance of yew identification in the gastrointestinal tract of a human victim [6].

This case is also the first to report detection of 3,5-dimethoxyphenol by HRMS. Previously, GC-MS has been the primary means of detection of this molecule [6, 8]. Generally faster and more sensitive than GC-MS, HRMS may be a better technique for both clinical and forensic management of suspected yew ingestions.

**Conclusion**

Yew poisoning difficult to confirm by the standard laboratory assays used in the clinical setting. There are no effective antidotes or evidence-based treatment guidelines. While death may occur early, visualization of gastric contents and use of broad-spectrum mass spectrometry techniques could be useful to confirm the cause of death.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

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