



## Acute Veratrum Poisoning: A Case Report and Literature Review

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### Abstract

**Background:** Veratrum poisoning represents a rare form of botanical intoxication; however, due to its recognized medicinal properties and widespread distribution, documented case reports of intoxication have been published in multinational medical literature.

**Case Presentation:** We report a case of an 80-year-old geriatric patient who presented with dizziness, palpitations, and nausea following ingestion of a *Veratrum nigrum* decoction. Admission electrocardiogram revealed sinus bradycardia (HR <60 bpm), sinus arrhythmia, a prolonged QT interval, and abnormal T waves in the anteroseptal and lateral leads. Normal sinus rhythm was restored after 7 hours of continuous intravenous atropine infusion.

**Conclusion:** Patients with a history of therapeutic use of *Veratrum*-based preparations or foraging of wild herbs require vigilance for Veratrum poisoning. Atropine serves as an established antidote in such intoxications, with continuous intravenous infusion considered for severe cases exhibiting profound cardiovascular compromise.

### Keywords

Veratrum Poisoning, Steroidal Alkaloids, Sinus Bradycardia, Atropine Infusion, Phytotoxicity

### Introduction

False hellebore (*Veratrum* Linn.), a perennial herbaceous plant of the genus *Veratrum* in the family Liliaceae, exhibits a geographic distribution spanning Eurasia. In China, it primarily occurs in Northeast China and the provinces of Hebei, Shandong, Henan, Shanxi, Inner Mongolia, Gansu, Hubei, Sichuan, and Guizhou [1]. This species inhabits montane slopes and grasslands at elevations of 1,200–3,000 meters above sea level [2].

Its medicinal use traces back to the *Shen Nong Ben Cao Jing* (Divine Farmer's Materia Medica, c. 200 BCE), which documents therapeutic properties including: Management of toxin-induced syndromes, Alleviation of cough and dyspnea, Treatment of diarrhea and dysentery, Healing of cephalic ulcers, Control of pruritic dermatoses, Eradication of malignant ulcers, Vermicidal action against parasitic infestations, Debridement of necrotic tissue [3].

Modern toxicology confirms that the entire plant

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contains veratrum alkaloids, with the highest toxicity concentrated in the roots and rhizomes [4]. The oral LD<sub>50</sub> in mice is reported to be 15.9 mg/kg [5,6]. Due to its narrow therapeutic index (NTI), clinical use is now rare, and *Veratrum* poisoning represents an uncommon form of phytotoxic intoxication. Nevertheless, cases continue to be reported globally due to erroneous medicinal use or accidental ingestion of wild herbs.

### Case Presentation

An 80-year-old male patient presented to the emergency department three hours after experiencing dizziness, palpitations, and nausea following oral ingestion of approximately 150 mL of a decoction

containing 15 g of *Veratrum nigrum* and *Glycyrrhiza glabra*, prepared for treating low back pain.

Head CT revealed a few parenchymal ischemic infarcts with localized encephalomalacia, cerebral atrophy, and demyelinating changes in the cerebral white matter. Chest CT showed scattered chronic inflammation in both lungs with mild interstitial changes. The initial electrocardiogram (ECG) (**Fig-1**) demonstrated sinus bradycardia, sinus arrhythmia, prolonged QT interval, and abnormal T waves in the anteroseptal and lateral leads. A repeat ECG performed 10 minutes after atropine administration (**Fig-2**) showed a restored sinus rhythm.

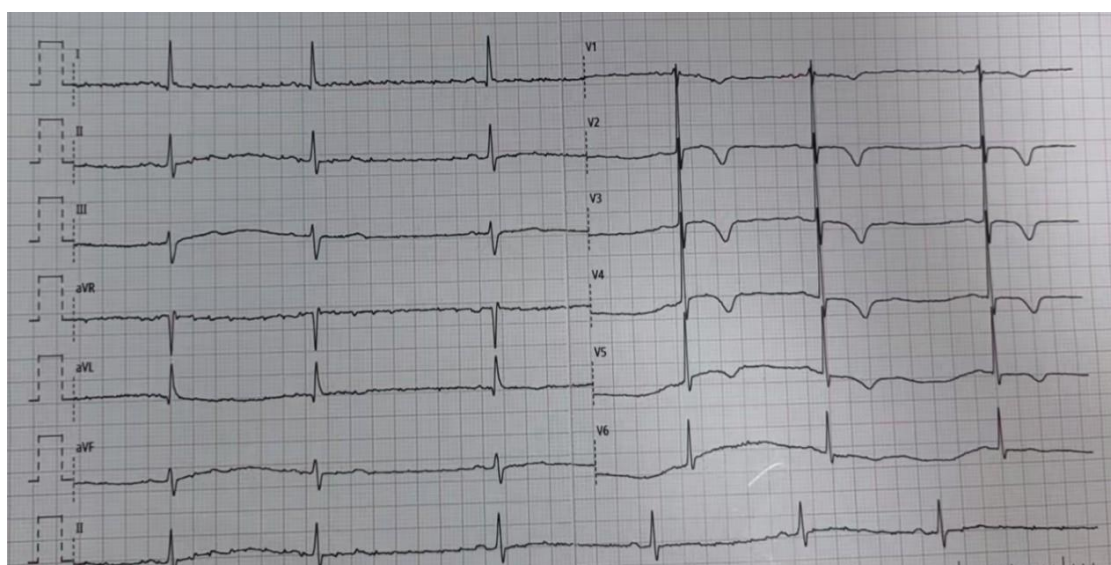


Fig-1: Initial Electrocardiogram upon Admission

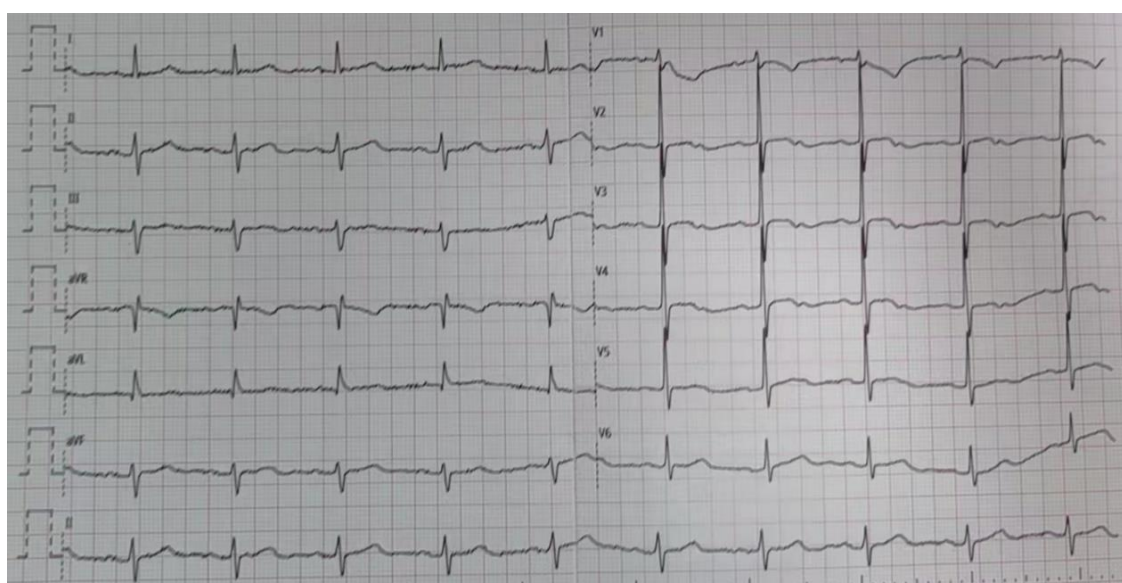


Fig-2: Repeat Electrocardiogram 10 minutes' Post-Atropine Administration

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Laboratory findings included: NEUT% 77.8, HGB 110 g/L, TP 64.8 g/L, ALB 37.8 g/L, GLU 16.37 mmol/L, CREA 130  $\mu$ mol/L, AG 21.8 mmol/L, APTT 24.1 s, D-dimer 0.22 ng/L, Pro-BNP 347 pg/mL, TPN-T 19.5 ng/L.

Upon admission, the patient exhibited marked dizziness and palpitations, with a heart rate fluctuating between 33–40 bpm and blood pressure recorded at 90/26 mmHg. Intravenous atropine (0.5 mg) was administered slowly, resulting in a heart rate increase to 60–69 bpm and blood pressure improvement to 115/61 mmHg. Supportive treatment with 0.9% sodium chloride and activated charcoal tablets was initiated to limit further toxin absorption. Because the patient was elderly and had ingested the decoction more than one hour earlier, gastric lavage was deemed high risk and

therefore not performed.

Although initial atropine therapy temporarily stabilized hemodynamics, recurrent bradycardia and hypotension required additional atropine interventions (detailed in **Table-1**). Pharmacologic intervention was discontinued 10 hours post-ingestion, after which the heart rate stabilized at 50–62 bpm and blood pressure ranged between 119–159/48–69 mmHg. Transthoracic echocardiography performed 20 hours after admission revealed:

1. Mild left atrial enlargement
2. Interventricular septal hypertrophy
3. Preserved left ventricular systolic function

The patient achieved complete clinical recovery and was discharged 24 hours after admission (**Table-2**).

**Table-1: Treatment Summary**

| Hours Postingestion | Atropine  | Vital Signs Prior to Atropine |
|---------------------|-----------|-------------------------------|
| 3                   | 0.5mg iv  | P33, BP 90/26                 |
| 5                   | 0.5mg iv  | P42, BP 77/39                 |
| 6                   | 3mg iv-vp | P59, BP 87/45                 |

iv=intravenous injection; iv-vp=intravenous pump

**Table-2: Comparison of Laboratory Results on Admission versus Post-Treatment Day 1**

|                                          | Day1 | Day2 |
|------------------------------------------|------|------|
| Red Blood Cell( $10^{12}$ /L)            | 3.45 | 3.13 |
| Hemoglobin(g/L)                          | 110  | 101  |
| pro-B-type Natriuretic Peptide (pg/ml)   | 347  | 520  |
| Troponin T(ng/L)                         | 19.5 | 13.5 |
| Activated Partial Thromboplastin Time(s) | 24.1 | 25.5 |
| D-dimer(mg/l)                            | 0.22 | 0.81 |
| Creatinine(umol/L)                       | 130  | 77   |
| Anion Gap(mmol/L)                        | 21.8 | 16.2 |

## Discussion

The principal constituents of *Veratrum* species are steroidal alkaloids, categorized into two classes: 1. *Jerveratrum* alkaloids (e.g., jervine, rubijervine); 2. *Ceveratrum* alkaloids (e.g., protoveratrine A/B, veratramine). Some species additionally contain solanine and colchicine [7,8]. The entire plant is toxic due to its alkaloid content, with protoveratrine exhibiting the highest toxicity, followed by jervine.

The mechanisms of toxicity include:

1. Gastrointestinal irritation: Alkaloids induce

mucosal inflammation, leading to nausea, vomiting, and gastroenteritis.

2. Central nervous system effects: Initial excitation followed by depression, manifesting as convulsions, seizures, and impaired consciousness.

3. Autonomic nervous system effects: *Veratrum* alkaloids stimulate the vagal nucleus in the medulla oblongata, increasing vagal tone, which results in hypotension, bradycardia, arrhythmias, profuse sweating, enhanced intestinal peristalsis, and respiratory depression [7].

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Arrhythmias caused by *Veratrum* poisoning are primarily due to vagal excitation, which inhibits the sinus node and slows the heart rate. The alkaloids may also exert a direct myocardial toxic effect, increasing metabolic activity, excitability, and membrane permeability in cardiomyocytes, disrupting potassium and sodium ion exchange [7]. The Bezold–Jarisch reflex, characterized by bradycardia, vasodilation, and hypotension, may also be triggered by cardiac receptor stimulation [6,9,10].

Symptoms typically appear within 30 minutes to 4 hours after ingestion [11]. Clinical features include:

- Paresthesia (e.g., tingling of the tongue and pharynx)
- Perioral numbness
- Nausea, vomiting, abdominal pain
- Diaphoresis and muscular weakness
- Visual disturbances and hematochezia (less commonly)

Severe poisoning can result in bradycardia, hypotension, conduction abnormalities, respiratory depression, loss of consciousness, and even death [12]. ECG findings most commonly include sinus bradycardia and atrioventricular block, while atrial fibrillation is rare [7].

Diagnosis relies on clinical presentation and history of exposure. Advanced techniques such as liquid chromatography-tandem mass spectrometry (LC-MS/MS) and high-performance liquid chromatography-quadrupole time-of-flight mass spectrometry (HPLC-QTOF) can identify *Veratrum* alkaloids in serum or plant material, supporting accurate diagnosis [6,11,13].

*Veratrum* poisoning often arises from mistaken identity during wild herb foraging. Among 26 reviewed cases, 57.5% involved misidentification. Commonly confused species include *Hosta montana* [13], *Symplocarpus foetidus*, *Phytolacca americana*, *Allium ampeloprasum*, *Allium tricoccum*, *Allium ursinum*, and *Gentiana lutea* [6,13].

Early management emphasizes limiting absorption using gastric lavage, activated charcoal, and cathartics such as magnesium sulfate [10]. Intravenous atropine is

effective for bradycardia, whereas epinephrine is contraindicated [12]. Hemodialysis and hemoperfusion are generally ineffective for removing toxic alkaloids [10].

In our case, repeated intravenous atropine administration was required throughout the clinical course, raising concerns of atropine toxicity. Coexisting atropine and *Veratrum* toxicity may complicate treatment and worsen prognosis. In this patient, a continuous intravenous atropine infusion was used to maintain stable heart rate and blood pressure. Because atropine has a short half-life, infusion rate was titrated based on heart rate to ensure therapeutic effect.

A summary of previously reported cases (**Table-3**) highlights the following observations:

- Symptoms typically resolved within 24 hours of active treatment.
- Several cases required increased or repeated doses of atropine.
- In some reports, atropine alone was ineffective, necessitating vasoactive support.
- Although most patients recovered, fatal outcomes have occurred, particularly in those with comorbidities or delayed treatment.
- Atropine is not universally required—eight cases recovered without it.
- Four cases responded to digoxin immune Fab, although one case required additional atropine due to ineffectiveness.

*Veratrum* is a medicinal herb with a narrow safety margin. The reported oral LD<sub>50</sub> in mice is 15.9 mg/kg, and toxicity can occur at doses as low as 70 mg per administration [14]. Toxicity is influenced by species, plant origin, and method of preparation (e.g., decoction, tincture). Alkaloid concentrations are significantly higher in roots and rhizomes than in aerial parts [15]. Thus, diagnosis should not be based solely on dosage but must consider patient history and clinical presentation to avoid misdiagnosis.

## Conclusion

*Veratrum* is highly toxic and has a narrow treatment window. Dosage should be paid attention to when used for treatment, and identification should be paid

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Table-3: Clinical Features of Twenty-Six Patients with Veratrum Poisoning

| Case No. [reference] | Age/Sex   | Chief Complaint                                  | Cause of poisoning      | Dosage of veratrum | Atropine dosage | Cardiovascular medicine            | Blood pressure (mmhg)    | Electrocardiogram                                                                                                                  | Treatment | Outcome |
|----------------------|-----------|--------------------------------------------------|-------------------------|--------------------|-----------------|------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------|---------|
| 1 <sup>[16]</sup>    | 33/Male   | Vomiting blood                                   | Overdose                | 3g                 | Yes, /          | No                                 | 90/60                    | Sinus bradycardia                                                                                                                  | 3day      | Cured   |
| 2 <sup>[16]</sup>    | 42/Male   | Vomiting blood                                   | Overdose                | 1g                 | No              | No                                 | /                        | /                                                                                                                                  | /         | Cured   |
| 3 <sup>[17]</sup>    | 74/Female | Consciousness disorder                           | Overdose                | 1.5g               | No              | No                                 | 125/73                   | Sinus bradycardia, Q-T interval extension                                                                                          | 3day      | Cured   |
| 4 <sup>[18]</sup>    | 68/Female | Abdominal pain, chest tightness                  | Overdose                | 5.2g               | 0.5mg im        | No                                 | 80/39                    | Sinus bradycardia                                                                                                                  | 15hour    | Cured   |
| 5 <sup>[18]</sup>    | 22/Female | Chest tightness, disorders of consciousness      | Overdose                | 8g                 | 1mg im          | No                                 | 80/50                    | Sinus bradycardia                                                                                                                  | 20hour    | Cured   |
| 6 <sup>[18]</sup>    | 73/Male   | Palpitations, dizziness                          | Overdose                | 0.32g              | 20mg iv         | No                                 | 80/39                    | Complete atrioventricular block, Ventricular escape rhythm                                                                         | 4hour     | Cured   |
| 7 <sup>[19]</sup>    | 56/Male   | Vomiting, abdominal pain                         | Picking wild vegetables | 350g               | /               | No                                 | /                        | /                                                                                                                                  | /         | Died    |
| 8 <sup>[19]</sup>    | 46/Female | Vomiting, abdominal pain                         | Picking wild vegetables | 350g               | Yes, /          | Dopamine                           | 80-90/45-50              | /                                                                                                                                  | 18hour    | Cured   |
| 9 <sup>[19]</sup>    | 66/Female | Vomiting, abdominal pain                         | Picking wild vegetables | 350g               | Yes, /          | Dopamine                           | 80-90/45-50              | /                                                                                                                                  | 18hour    | Cured   |
| 10 <sup>[19]</sup>   | 54/Male   | Vomiting, abdominal pain                         | Picking wild vegetables | 350g               | Yes, /          | Dopamine                           | 80-90/45-50              | /                                                                                                                                  | 18hour    | Cured   |
| 11 <sup>[14]</sup>   | 57/Male   | Vomiting, disordered consciousness               | Overdose                | 0.5g               | NO              | Isoproterenol                      | 109/60                   | Complete atrioventricular block                                                                                                    | 10hour    | Cured   |
| 12 <sup>[14]</sup>   | 42/Male   | Palpitations, fatigue                            | Overdose                | 0.3g               | 0.5mg im        | Isoproterenol                      | 120/70                   | Complete atrioventricular block                                                                                                    | 7hour     | Cured   |
| 13 <sup>[20]</sup>   | 61/Male   | Numbness of lips and limbs                       | Picking wild vegetables | /                  | 0.5mg iv        | Cedilanid                          | 90/60                    | Atrial fibrillation with ventricular aberrancy and complete right bundle branch block, ventricular rate 141 beats per minute (bpm) | 1.5hour   | Cured   |
| 14 <sup>[21]</sup>   | 27/Male   | Nausea, vomiting                                 | Picking wild vegetables | /                  | No              | Digoxin immune Fab                 | 87/40                    | Sinus bradycardia                                                                                                                  | 12hour    | Cured   |
| 15 <sup>[21]</sup>   | 25/Female | Nausea, vomiting                                 | Picking wild vegetables | /                  | No              | Digoxin immune Fab                 | 88/40                    | Sinus bradycardia                                                                                                                  | 12hour    | Cured   |
| 16 <sup>[11]</sup>   | 49/Male   | Nausea, vomiting                                 | Overdose                | /                  | Yes, /          | No                                 | 50/30                    | Sinus bradycardia                                                                                                                  | 24hour    | Cured   |
| 17 <sup>[22]</sup>   | Male      | Vomiting, lethargy                               | Picking wild vegetables | /                  | No              | Epinephrine                        | 50/40                    | /                                                                                                                                  | 18hour    | Cured   |
| 18 <sup>[22]</sup>   | Male      | Vomiting, headache                               | Picking wild vegetables | /                  | No              | Epinephrine                        | 80/40                    | /                                                                                                                                  | 18hour    | Cured   |
| 19 <sup>[22]</sup>   | Male      | Vomiting, headache                               | Picking wild vegetables | /                  | No              | Epinephrine                        | 80/40                    | /                                                                                                                                  | 18hour    | Cured   |
| 20 <sup>[23]</sup>   | 60/Female | Vomiting, sweating                               | Overdose                | /                  | 0.5mg           | No                                 | 80/60                    | /                                                                                                                                  | 3hour     | Cured   |
| 21 <sup>[23]</sup>   | 58/Male   | Vomiting, sweating                               | Overdose                | /                  | 0.5mg           | No                                 | 80/60                    | /                                                                                                                                  | 5hour     | Cured   |
| 22 <sup>[24]</sup>   | 40/Male   | Vomiting, diaphoresis, and lightheadedness       | Picking wild vegetables | 100g               | 2.5mg iv        | No                                 | 70/45                    | Sinus bradycardia and a shortened Q-T interval                                                                                     | 14hour    | Cured   |
| 23 <sup>[24]</sup>   | 55/Male   | Paresthesias, dyspnea, and nausea                | Picking wild vegetables | /                  | 2mg iv          | Metaraminol                        | No obtainable BP reading | Sinus bradycardia                                                                                                                  | 14hour    | Cured   |
| 24 <sup>[6]</sup>    | 34/Male   | Abdominal pain, visual disturbances              | Picking wild vegetables | /                  | 0.4mg iv        | Digoxin immune Fab, norepinephrine | 78/40                    | Sinus bradycardia                                                                                                                  | 15hour    | Cured   |
| 25 <sup>[6]</sup>    | 34/Female | Nausea, vomiting                                 | Picking wild vegetables | /                  | /               | Digoxin immune Fab                 | 90/52                    | Sinus bradycardia, incomplete right bundle branch block.                                                                           | 7hour     | Cured   |
| 26 <sup>[6]</sup>    | 58/Female | Vomiting, lightheadedness, generalized weakness, | Picking wild vegetables | /                  | 0.5mg iv        | Dopamine                           | 80/50                    | Sinus bradycardia                                                                                                                  | 24hour    | Cured   |

Im =intramuscular injection; iv=intravenous injection; /=Not mentioned



attention to when collecting wild vegetables. Atropine treatment is effective in the case of veratrum poisoning, and intravenous continuous pumping can be used for treatment options when single doses are not effective. Technologies such as liquid chromatography-tandem mass spectrometry (LC-MS/MS), high performance liquid chromatography-quadrupole time-of-flight mass spectrometry (HPLC-QTOF) can be used for the detection of veratrum alkaloids. Veratrum poisoning is a rare plant poisoning, but there are still reports of poisoning cases. The poisoning treatment center should include the testing of veratrum alkaloids in the testing scope to avoid misdiagnosis and misdiagnosis. The prognosis of veratrum poisoning is generally good, and it is necessary to pay attention to the increased risk of adverse effects when combined with cardiovascular and other underlying diseases.

### Consent for Publication

This case report has been published with informed consent from the patient.

### Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of West China Hospital of Sichuan University.

### Data Availability Statement

The original contributions generated for the study are included in the article; further inquiries can be directed to the corresponding authors.

### Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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