



### E91 Plato: Unaware Narrator of a Death by Hemlock Poisoning—From Socrates' Death to the Present

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**Learning Overview:** After attending this presentation, attendees will better understand poisoning by hemlock with the analysis of an emblematic historic case—the death of Socrates.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by underlining the uniqueness of the Platonic writing in the tale of a rare case of poisoning by hemlock.

Poisonings are classified according to the manner in which they occur. The forensic sciences deal with the deaths that occur with violent modality, such as suicides or homicides. Poisoning by hemlock has special toxicological characteristics. Hemlock (*Conium maculatum* L. *Umbelliferae*) has long been known as a poisonous plant, belonging to the Apiaceae family.<sup>1</sup> The toxicity of hemlock is due to the 5-piperidine-type coniine alkaloids, including coniine and  $\gamma$ -coniceine. The dried plant contains the highest concentration of coniine, while the fresh plant material tends to contain the most  $\gamma$ -coniceine. The action of coniine alkaloids is intended to stimulate and then paralyze the nicotinic receptors. The  $\gamma$ -coniceine is among the most toxic alkaloids biosynthetically formed. The poisoning in humans can be caused by ingestion of the plant. No forensic cases of poisoning by hemlock have been reported. For this reason, this study reports on a historic and emblematic case of this type of poisoning through the historical-scientific analysis of the death of Socrates.

A review of literature was performed on the search engine PubMed NCBI inserting the keywords “Socrates” and “Hemlock & *Conium maculatum* death.” Socrates (Athens, 469-399 BC), son of a sculptor and a midwife, dedicated himself from an early age to philosophy. After the fall of the Thirties, in 399 BC, he was subjected to a political process with the charge of impiety (not believing in the gods of the state) and moral corruption of the young disciples. It is probable that the accusers intended only to exile him, but Socrates refused the compromises and renounced the opportunity of escape. Plato, in *Phaedo*, describes in detail, through the eyes of Critone, the death of Socrates. In the conclusive lines, it reads that a servant entered the room with the prepared drug, pounded into a cup. Socrates, after drinking it, began to feel heavy legged and began to lie on his back. Meanwhile, the Executioner was examining his feet and legs through the application of painful stimuli in order to see if the pain was perceived. By now, cold had come to his belly and, a little later, the widened eyes of Socrates remained open and fixed. This description, quite detailed even considering the era in which it was written, currently remains the only report in the literature.

It would appear that the poisoning of Socrates represents to date, after more than 2,000 years, the first case with forensic aspects regarding the manner of death in history, primarily because it was a capital punishment. The scientific articles published to date have focused in particular on chronic hemlock poisoning in cattle, on chemical characteristics of the alkaloids, or on cases of accidental poisonings. General symptoms of poisoning by hemlock are represented by effects on the central and peripheral nervous system and the autonomic nervous system ganglia with vomiting, tremor, rhabdomyolysis, ataxia, headache, acute renal failure, rapid breathing, ipsalivation, nausea, convulsions, and coma until the fatal outcome. The alkaloids are volatile and produce a characteristically unpleasant odor that can be observed in the breath and urine of poisoned individuals. The progressive centripetal paralysis is characteristic of poisoning by hemlock.<sup>2,3</sup> This data makes it doubtful hemlock was used in the death of Socrates, according to some authors, especially noting the absence of the description of unpleasant odor and the common gastrointestinal effects of the poison. However, it is believed that Plato gave a modified side of the story about the death of Socrates for political, apologetic, and philosophical reasons, describing a more “noble” death. Through looking at the past, the case of Socrates is unique for its characteristics, but, above all, because it represents to date the only example of poisoning by hemlock of historical and forensic interest present in ancient literature.

#### Reference(s):

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2. Vetter J., Poison Hemlock (*Conium maculatum* L.). *Food Chem Toxicol.* 2004 Sep;42(9):1373-82.
3. López T.A., Cid M.S., Bianchini M.L. Biochemistry of Hemlock (*Conium maculatum* L.) Alkaloids and Their Acute and Chronic Toxicity in Livestock. A Review. *Toxicol.* 1999 Jun;37(6):841-65.

#### Forensic Science, Socrates' Death, Poisoning