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Conium maculatum Intoxication: Literature Review and Case Report on Hemlock Poisoning

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ABSTRACT: The aim of this paper is to highlight the symptomatology in three *Conium maculatum* intoxication incidents, one of which was fatal. A number of studies were reviewed in order to update and summarize the relevant literature on the incidence, sociodemographic variables, method of poisoning, pathophysiology, diagnosis, variables associated with survival and fatality, management, and treatment of *C. maculatum* intoxication as well as the biosynthesis and biological effects of poison hemlock alkaloids. Results show that hemlock poisoning is relatively rare, although incidence varies in different regions, despite its worldwide distribution. Hemlock poisoning is more common in European and especially Mediterranean countries. The majority of the patients are adult males over 38 years of age. The clinical course of hemlock poisoning includes neurotoxicosis, tremor, vomiting, muscle paralysis, respiratory paralysis/failure, rhabdomyolysis, and acute renal failure. The therapeutic management focuses on absorption reduction, close observation for complications, and supportive therapy (especially for respiration). Acute occurrence is severe and life-threatening, but the survival rate is high if treatment is provided promptly. Recovery is rapid, generally taking only a few days.

KEYWORDS: Acute, alkaloids, γ-coniceine, coniine, *Conium maculatum*, cowbane, forensic pathology, forensic science, hemlock, intoxication, neuromuscular blockage, neurotoxin, poisoning.

INTRODUCTION

History of the Plant

Conium maculatum (poison hemlock) (**Figure 1**) is known as one of the most poisonous herbaceous plants and has historically been linked to various deaths. It is considered to have been used during classical antiquity for killing older or handicapped men that were unable to work. Hemlock is a poison strongly associated with ancient Greece, mainly due to its use to execute the great philosopher Socrates (399 BCE). However, there had been reported cases of hemlock poisoning that preceded that of Socrates [46].

The first reported death by hemlock in ancient Greece was that of Thiramenes (404 BCE) during the Athenian rule of the Thirty Tyrants. The general and politician Thiramenes was condemned to death and forced to drink hemlock by Critias, a rival member of the Thirty Tyrants driven by ambition for power and characterized by violence. According to the legend, Thiramenes, after having drunk the poison, spilled the last drops on the ground, while prophetically asserting that the latter would be destined for his rival, Critias. Not long after Thiramenes's forced suicide, Critias's killing followed, liberating ancient Athens from oligarchy. Thiramenes was the first case in history of hemlock being used to execute a prisoner, paving the way for Socrates's way of dying [46]. Other historically known cases of execution by hemlock were the deaths of rhetorician Aeschines in 323 BCE, politician Phocion in 318 BCE, and Iustinus Martyr in 167 CE [46].

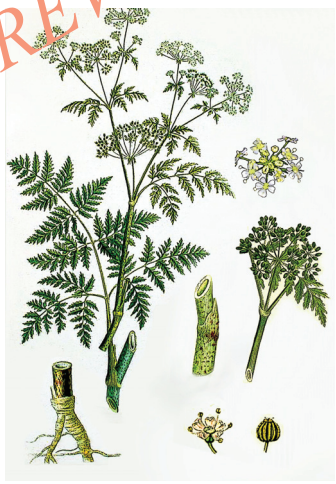

Figure 1. Sketch of the plant *Conium maculatum* portraying leaves, flowers, seeds, stem, and roots — Based on artworks of William Curtis (1746–1799 and Carl Axel Magnus Lindnus (1856–1928).

Poison hemlock was called "κώνειον" (*kṓneion*) by the Greeks, meaning to "whirl about", because of its consumption causing vertigo, ataxia, tremor, and convulsions. The Romans at first used the name *Cicuta* for many different poisonous plants of the same family. That name, however,

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