

# CASE REPORT

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## Phenol Poisoning: Three Fatal Cases

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**REFERENCE:** Soares, E. R. and Tift, J. P., "Phenol Poisoning: Three Fatal Cases," *Journal of Forensic Sciences*, Vol. 27, No. 3, July 1982, pp. 729-731.

**ABSTRACT:** Phenol poisoning, although less common now than in the early part of this century, still occurs. The fatal cases discussed include the ingestion and percutaneous absorption of phenol. Death appeared to be the result of central nervous system toxicity and respiratory failure, the common autopsy finding being pulmonary edema. Blood concentrations of phenol were determined in two cases.

**KEYWORDS:** toxicology, phenol, poisons, Castellani's paint

Phenol (hydroxybenzene, carboic acid) is a common chemical that has been widely used in the past for both its antiseptic and anesthetic qualities. It is still used occasionally in preparations for treatment of localized skin disorders (Castellani's paint) and as a local anesthetic. Phenol is readily available commercially as phenol or its derivatives in products including household cleaners and some common over-the-counter antiseptics. It is also widely used in the manufacture of plastics, insecticides, and disinfectants.

The following cases are the experience of North Carolina Office of the Chief Medical Examiner with fatal phenol poisoning in the period from 1972 to 1980.

### Case 1

A 43-year-old male was found dead at home. He had a history of mental illness for which he had received treatment. A search of the scene revealed several types of medication and an empty bottle of Castellani's paint (a mixture of phenol, basic fuchsin, resorcinol, acetone, ethanol, and water).

Gross autopsy findings included moderate edema of the lungs and a gray, fixed appearance of the mucosal lining of the stomach. Microscopic examination showed pulmonary congestion and edema, coagulation of gastric mucosa, and extensive renal autolysis.

Toxicologic studies revealed a blood ethanol concentration of 30 mg/dL and a blood phenol concentration of 5.6 mg/dL. Phenol was identified in the liver (7.4 mg/100 mg of wet tissue). Identification and quantitation of phenol were made by ultraviolet spec-

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trophotometry of acidic and basic solutions prepared from steam distillates of the specimens. Death was attributed to phenol poisoning, the result of suicidal ingestion of Castellani's paint.

### Case 2

A four-week-old female developed extensive seborrheic dermatitis several days prior to death. Nystatin® was administered with no effect. The physician then prescribed a 1:6 dilution of Castellani's paint to be applied from the neck down twice daily. Twelve hours prior to death (5 h after application) the child became listless and developed seizures that could not be controlled with anticonvulsants. It was then recognized that the child had been treated with undiluted Castellani's paint. She was washed to remove the compound from the skin. Supportive efforts failed and the child died.

The autopsy revealed widespread dermatitis, pulmonary edema, visceral congestion, and renal tubule cell vacuolization. Toxicologic studies for phenol were not performed. Death was attributed to phenol poisoning.

### Case 3

A 17-year-old male disposing of industrial waste was splattered over portions of his face, neck, and right trunk with a chemical solution containing 30% phenol. Following the accident, he walked away from the scene and was washed with water about the face and neck. Shortly thereafter (within 30 min) he experienced a seizure and died.

The autopsy revealed a young male with red areas about the face, neck, right shoulder, and torso involving approximately 15% of his body surface. There was marked pulmonary edema but no epiglottic, laryngeal, or nasal lesions. Other organs were unremarkable.

Toxicologic evaluation revealed a blood ethanol concentration of 30 mg/dL and a phenol concentration of 2.7 mg/dL. Death was attributed to phenol poisoning by absorption through intact skin.

### Discussion

In 1909 there were 3376 reported poisoning deaths in the United States; 1621 were due to phenol, of which 1466 were suicide [1]. Since that time, the National Institute of Occupational Safety and Health (NIOSH) reports that deaths from phenol have become far less common. Nevertheless, as illustrated by the three cases reported here, fatal exposure to phenol can and does occur.

Phenol is very toxic when inhaled, absorbed percutaneously, or taken orally. Its toxicity varies among species, and in humans there is considerable variation among individuals. As little as 1 g orally may be lethal in humans, although there are reports that as much as 100 g by mouth have not been fatal [2]. Other data suggest that phenol is most toxic when absorbed through the skin [1,2]. Contact with solutions containing 1% phenol has led to skin necrosis and to coma in one instance of exposure repeated over 17 days [1]. Lucas and Lane [3] reported the collapse and deaths of two children among several hundred treated for various conditions with 5% phenol compress.

The specific mechanism of action of phenol is not clear; however, a recent study [4] has shown central nervous system effects of both phenol and the glucuronide conjugate. Those authors postulate that these observed effects might account for both increased excitability of the cortex as well as the involuntary tremors noted in the early stages of phenol poisoning.

The death investigator should be aware of the toxicity of phenol, particularly via the percutaneous route. In our cases, the only consistent autopsy finding was pulmonary edema. The cause of death can be confirmed by toxicology, with blood being the most convenient specimen.

**References**

- [1] "Criteria for a Recommended Standard. . . Occupational Exposure to Phenol," National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare Publication (NIOSH) 76-196, Washington, DC, 1976.
- [2] Gosselin, R. E., Hodge, H. C., Smith, R. P., and Gleason, M. N., *Clinical Toxicology of Commercial Products*, 5th ed., Williams and Wilkins, Baltimore, 1976, pp. 271-274.
- [3] Lucas, R. C. and Lane, W. A., "Two Cases of Carbolic Acid Coma Induced by Application of Carbolic Acid Compresses to the Skin," *Lancet*, Vol. 1, 1895, pp. 1362-1364.
- [4] Turner, G. A. and Wardle, E. N., "Effects of Unconjugated and Conjugated Phenol and Uremia on the Synthesis of Adenosine and 3':5'-Cyclic Monophosphate in Rat Brain Homogenates," *Clinical Science and Molecular Medicine*, Vol. 55, No. 3, 1978, pp. 271-275.

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