

# National Association of Medical Examiners Position Paper on the Certification of Cocaine-Related Deaths

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**Abstract:** The National Association of Medical Examiners Committee on Cocaine-related Deaths recommends that the following guidelines be applied in the process of documenting, interpreting, and certifying potential cocaine-related fatalities. The committee cautions that the investigation of any drug-related death requires a complete investigation of the circumstances of death, the death scene, and past medical history. It is also necessary to have the results of the forensic toxicological analysis and those of a complete forensic autopsy examination prior to formulating an opinion as to the cause and manner of death. Cocaine should be considered the underlying cause of the death when 1 or more of the following is true: (1) the circumstances surrounding the death can be associated with an acute cocaine exposure and there are no supervening causes of death; (2) the immediate cause of death is directly due to a readily identifiable mechanism or disease such as a gunshot wound or a stroke, yet the acute use of cocaine was the direct underlying cause of the trauma or the disease process; and (3) chronic cocaine use leads to a disease that results in an ultimately fatal pathologic process leading to organ injury and death. The committee further cautions that reported drug levels may not directly relate to the toxic or lethal effects of the drug upon the patient. These guidelines are intended for use by practicing medical examiners and physicians who certify drug deaths, as well as providing education tools for students.

**Key Words:** cocaine, certification of death, proximate cause

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A substantial portion of all the deaths reviewed by medical examiners and coroners relates to the use of cocaine. The Drug Abuse Warning Network survey of medical examiner offices indicated that in 2000, there were 4043 reported deaths related to the use of cocaine.<sup>1</sup> Because of reported inconsistencies in the interpretation of the antemortem and postmortem effects of cocaine on morbidity and mortality, the National Association of Medical Examiners (NAME) believes that this review will be of practical value to the practicing physician and toxicologist. There have been attempts in the past to provide written guidelines to assist medical examiners with the process of certification of cocaine-related deaths.<sup>2</sup> Previous surveys upon the subject have documented an inconsistent pattern of interpretation of the data by various medical examiners practicing in the field. The analysis of drug-related deaths requires that the medical examiner have a full understanding of the results of the investigation of the death and competence in the interpretation of drug concentrations.

## Investigation of Death

### Scene Investigation

The investigation of the scene of death by a skilled death scene investigator is frequently key to the suspicion of a drug-related death. Cocaine is commonly smoked, and the pipe is quite different from those that are used to smoke other drugs, such as methamphetamine, in that it may be a straight glass tube or have a bowl.<sup>3</sup> In some areas, cocaine may also be used along with heroin, a process known as "speedballing," although that process is uncommon in other jurisdictions. The heroin is often injected; the cocaine, smoked. There may or may not be evidence of injection sites, syringes, or chronic drug use. However, the presence of multiple burnt matches, multiple cigarette lighters with few consumed cigarettes, or the presence of small portions of copper mesh are scene findings that should be considered supportive of cocaine use. Fresh focal burns about the lips or fingers are supportive of the diagnosis of cocaine smoking. A focal callus upon the palmar surface of the thumb also supports the diagnosis. Unexplained agitated behavior, acute violence or

psychosis, and hyperthermia all suggest the potential of a centrally active drug affecting the neurotransmitter process of the brain, such as cocaine.

The death scene investigator, maintaining the chain of custody, should properly recover any physical evidence supporting drug abuse. It should be provided to the laboratory upon request. If the body has been previously removed from the scene for resuscitative measures, the initial blood and urine specimens should be recovered and submitted for analysis whenever possible. A quantitative core body temperature should be obtained at the earliest opportunity and documented in the investigative report.<sup>4</sup>

### Autopsy Examination

A complete forensic autopsy should be performed on all deaths suspected to be caused by acute cocaine ingestion or use. Blood should be properly recovered from a peripheral vessel, such as the iliac, subclavian, or femoral veins, to decrease the effect of central postmortem redistribution. More than 1 blood sample should be collected. Blood samples should be placed in a new, clean container containing sodium fluoride at a final dilution concentration of between 5 and 10 mg/mL.

Very careful attention to all external injuries should be made and any changes documented. This is specifically true for the area about the neck. The recovery of peripheral blood, cerebrospinal fluid by cisternal puncture, head hair, fingernails, and any other physical evidence should be completed prior to any internal examination. In deaths suspected as being due to cocaine, careful examination of the lumen of the esophagus, stomach, and bowel may reveal ingested drug material. Incision and retention of skin injection sites for potential toxicology analysis is also recommended.<sup>5</sup>

### Laboratory Analysis

The forensic toxicology laboratory should identify and quantitate all major drugs, including cocaine and its major metabolite, benzoylecgonine. The analysis should be performed using accepted methodologies and techniques.<sup>6</sup> Not all samples, such as hair, need be examined initially, but the samples should be retained for subsequent testing, should that become necessary. When cocaine toxicity is a likely proximate (underlying) or a contributory cause of death, brain should also be saved for potential analysis for cocaine and for benzoylecgonine.

### Case Interpretation

The time of the terminal cocaine use cannot be reliably determined by drug analysis alone. Estimation of the time and quantity of cocaine ingested may not reliably relate to toxicity, lethality, or the development of excited delirium. Attempts at calculating dose based upon the formula using volume of distribution, weight, and a blood level cannot be

accurately performed on postmortem samples. Drug levels do not necessarily relate to drug toxicity or poisoning.<sup>7,8</sup>

A diagnosis of cocaine-induced agitated delirium can be made when investigative information supports a history of chronic cocaine use. Whenever the victim presents with a clinical or investigative history of acute psychosis (paranoid behavior, undressing, violent behavior, and often with hyperthermia) and a complete investigation and forensic autopsy does not reveal a pathologic process as the proximate or underlying cause of death, then a central nervous system active drug should be suspected. Cocaine may be present in low levels or only the metabolite may be detected in urine or spinal fluid. Chronic drug use is necessary to induce the changes in the neurochemistry that lead to agitated delirium. The presence of hyperthermia (core temperature >103 °F) is strongly supportive of a cocaine-induced event.<sup>9</sup>

A catecholamine-mediated excited delirium, similar to cocaine, is becoming increasingly recognized and has been detected in patients with mental disorders taking antidepressant medications,<sup>10</sup> and in psychotic patients who have stopped taking their medications. This may relate to the same neurochemistry and channelopathies that are associated with the effects of cocaine. Some medical evidence suggests a genetic predilection for a mutated potassium channel locus in some susceptible individuals.

### Manner of Death

Currently, when all other causes of death have been reasonably eliminated, the recommendation is that cocaine-related deaths be certified as accidental. This recommendation reflects the current belief that the death is due to an untoward effect of the drug upon the central brain neurotransmitters and/or the heart. Should new research confirm that a channelopathy of genetic origin selectively predisposes an individual to lethality, that recommendation may have to change.

Where the pathology relates to acute hypertension, such as an intracerebral hemorrhage, aortic dissection, coronary spasm with thrombosis, seizure, etc, the death should be determined to be directly related to the drug. The presence of cocaine associated with a fixed coronary lesion is generally considered accidental. In cases where cocaine is not detected but the major metabolites are present, the presence of cocaine may be documented on the death certificate as another significant factor and the death certified as of a natural manner.

In cases of sudden death related to police actions, the involvement of cocaine as a cause of death should be made with caution. Clinical symptoms such as seizure, hyperthermia, or excited delirium all point to cocaine as the proximate cause of the death. Other obvious causes of death must be carefully ruled out through a careful scene investigation, meticulous forensic autopsy, and a review of the medical information.<sup>11</sup>

## Recommendations

NAME recommends:

1. A complete scene investigation and autopsy examination should be performed on all suspected cocaine-related deaths.

2. Documentation of scene and history information is essential for a competent determination of the cause and manner of death.

3. A diagnosis of cocaine-induced excited delirium requires a clinical history of chronic cocaine use, typically bizarre and violent psychotic behavior, and the presence of cocaine or its metabolites in body fluids or tissues. A clinical history of prior nonfatal episodes and a history of frequent (heavy) cocaine use or bingeing prior to the incident are strongly supportive of the diagnosis.

4. Drug analysis should include the parent compound and the major metabolite, benzoylecgonine. The effects of ecgonine methyl ester, cocaethylene, and other metabolites are not currently established as directly affecting the cause of death.

5. Caution must be used when attempting to estimate the time of ingestion, since more than 1 exposure may result in overlapping drug exposures and biologic half-lives may vary.

6. The contribution of other pathologic conditions must be considered when evaluating the role of cocaine in the cause of death.

7. Blood, serum, and urine levels of cocaine do not necessarily directly correlate to toxic changes or to the cause of death.

8. The manner of death in which only the metabolites of cocaine are detected in urine is generally certified as natural.

9. The manner of death where death is sudden and in association with cocaine in the blood is generally considered accidental.

10. Specimens must be properly obtained, stored, and preserved in sodium fluoride to reliably determine the manner of death through forensic analysis. It is better to have more specimens, including ones that show chronic use such as hair, than an insufficient number of specimens to examine.

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