Review paper  
Postmortem Examination Cases of Cyanide Poisoning  
A Biological Hazard

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Abstract
Hydrocyanic acid and various cyanides are relatively common poisons both in suicide, accident and occasionally homicide. Acute poisoning with cyanide is most often self administered as the swift and sure action is generally known. Accidental poisoning from inhalation of vapours due to fires in buildings or by the free gas liberated from some commercial processes is also known to occur. The preparations are rarely used with homicidal intent. Whatever be the manner of poisoning, in medical settings the persons involved in postmortem examination of cases of death of cyanide poisoning are exposed to significant degree of cyanide remaining in the body cavities and tissues of the deceased. This risk is not only for the persons attending postmortem examination but also for the first respondents like police, rescue persons and also persons extending emergency care both outside and within hospital. Hydrocyanic acid is rapidly absorbed from all mucous surfaces and even from unabraded skin. Hence attending a case of cyanide poisoning involves a hazard of inhalation of cyanide gas from the victim. The hazards involved in such situations are briefly reviewed.

Key Words: Cyanide, Postmortem Examination, Biological Hazard

Introduction:  
Hydrogen Cyanide (HCN) is one of the most toxic gases. It has been responsible for an extensive number of poisonings in a variety of settings including chemical warfare, suicides, murders, occupational exposures, judicial executions and environmental exposures. Because cyanide salts are readily available, they are used in intentional poisonings and such suicide cases represent the most common cyanide exposure in our country.

The bitter almond smell of hydrocyanic acid can be detected by sixty percent of population [1]. The threshold for those persons who can sense the odor is estimated to be 1 to 5 ppm concentration in air. It is important to note that the sense of smell is rapidly paralyzed and those able to detect cyanide becomes insensitive to it after a short exposure [1]. It should be stressed that even at high concentration; some individuals cannot smell HCN. The persons involved in transportation, management or postmortem examination of cases of poisoning by ingestion of cyanide salts develop clinically significant cyanide concentration by inhalation of cyanide gas from the body of victim. Such significant cyanide exposure and their implications are briefly reviewed here.

Cautions concerning the theoretical risk of the inhalation of toxic concentration of fumes by persons involved in the postmortem examination of cyanide poisoning victims are occasionally mentioned in the articles and standard texts. [2, 3]

Such warnings typically refer to victims in which poisoning was the result of ingestion of cyanide salts which, in reaction with gastric acid, could theoretically liberate hydrogen cyanide in sufficient amounts to pose hazards not only to the forensic pathologists or assistants but also for the first responders (police men and members of emergency department). Inhalation of HCN produce a tightness of the throat, nasopharynx and the taste of hydrocyanic acid is noted on moist mucous membrane. [1]

Full recovery usually follows non fatal exposure of hydrogen cyanide. The author could appreciate the smell in suspected cases of cyanide poisoning as that of crushed tapioca leaves and he used to develop headache and pharyngeal irritation which gets relieved on the next day. They all confirmed as cases of cyanide poisonings by chemical analysis.

A former colleague of Bernard knight became ill and was temporarily disabled shortly after conducting an autopsy on a suicide case who had swallowed a massive amount of potassium cyanide. [4] Presumably he had inhaled HCN from the stomach contents when examining the viscera.

A case study was reported in the literature which studied the degree of biohazard from cyanide remaining in body cavities or tissues or both of the deceased. [5] The toxicology analysis of blood of the deceased was done and revealed a blood cyanide concentration of 29.5 microgram per ml. Blood samples were also taken from three persons who attended
the postmortem examination ten minutes after completion of examination.

The only symptom occurred in these persons was a lightheadness experienced by one individual who could appreciate the cyanide odour. Blood examination revealed cyanide concentration of 1.0 microgram per ml in medical examiner, 0.4 microgram per ml in autopsy assistant (smoker) and 0.3 microgram per ml in the resident (non smoker). The study also says that the relative concentration of cyanide in the blood of examining persons correlated with the duration of their close proximity to the deceased during postmortem examination. Fatal cyanide poisoning has been reported with blood concentration greater than 3 microgram per ml. (Normal Cyanide blood level <0.2 microgram) [6]

Thus, it is shown that persons involved in the postmortem examination of cases of poisoning by ingestion of cyanide salts can develop clinically significant cyanide concentration by inhalation of cyanide gas from the body of the victim, even many hours after the victim’s ingestion of cyanide and death.

Another interesting case is that of a wife who attempted mouth to mouth resuscitation on her cyanide poisoned husband developed strange taste in her mouth. [3] Since blood cyanide concentrations were abnormally high in the persons attended postmortem examination, the possibility of risk to individuals who performed mouth to mouth resuscitation cannot be excluded.

It is estimated that about fifty percent of absorbed cyanide may inactivated within one hour after exposure, being converted to thiocyanate by the liver enzyme rhonadase and excreted in the urine. [7] This suggests that blood concentration in persons exposed to nonfatal level of cyanide concentration declines slowly and full recovery occurs. At this juncture it is worth note that a cadaveric renal transplantation was done successfully from a donor who suffered irreversible brain damage due to cyanide poisoning. This indicates that injury to non neural organs in cyanide poisoning can be reversible. [8]

Conclusion:
It is important for Forensic Pathologists and mortuary staff that a corpse dead of HCN poisoning can present a health hazard. Persons exposed to such situations upon development of symptoms and signs of cyanide poisoning should be managed by supportive measures. An immediate blood sampling for the concentration of cyanide could also be appropriate, precaution should be taken to reduce further exposure. Full recovery follows non fatal exposure to HCN.

This hazard is equally important for persons managing cases of cyanide poisoning in emergency department as well as those attending the patient in the initial stage. Decontamination of cyanide poisoned patients occurs concurrently with initial resuscitation. Exposure to cyanide may takes place by multiple routes including ingestion, inhalation, dermal or parenteral. The route of exposure determines which decontamination method is to employ. No matter which modality is used, always protect the health care provider from potential contamination by utilizing protective devices such as water impervious gowns, gloves and eye wear.

References: