

MNWR

MORBIDITY AND MORTALITY WEEKLY REPORT

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Epidemiologic Notes and Reports

Fatalities Attributed to Entering Manure Waste Pits — Minnesota, 1992

In August 1992, four farm workers in Minnesota died in two separate incidents after entering manure waste pits: two were poisoned by hydrogen sulfide gas, and two were asphyxiated. The Minnesota Fatality Assessment and Control Evaluation (FACE) program was notified of the incidents by the state Occupational Safety and Health Administration and the Minnesota Farming Health Project, respectively. This report summarizes the investigations of these two incidents by the Minnesota FACE program and CDC's National Institute for Occupational Safety and Health (NIOSH) FACE personnel.

Incident 1

On August 8, a 27-year-old employee of a hog farm and his 46-year-old uncle, who co-owned the farm, died after entering an outdoor manure pit. On August 7, the farm employee and a coworker had attempted to pump out the 12-foot-deep, 49-inch-diameter pit but could not because of a clogged pump intake in the pit. When they attempted to extract the pump from the pit with an attached 1/4-inch wire rope, the rope broke. The following morning, although cautioned by his coworker about the possible presence of poisonous gases in the manure pit, the employee indicated he had entered the pit in the past without trouble and descended a ladder 9 feet into the pit to attach a new rope to the pump. While attempting to attach the rope, he was overcome and fell off the ladder into the pit. The coworker summoned rescue personnel and the farm co-owner.

Although the co-owner also was warned of possible poisonous gases in the pit, and despite efforts to physically restrain him, he descended the ladder into the pit 10 minutes after the nephew had entered; he also was overcome and fell into the pit. Twenty minutes after the initial entry, both men were removed from the pit by rescue personnel equipped with appropriate respiratory protection (self-contained breathing apparatus). Cardiopulmonary resuscitation was initiated, and the men were transported to a hospital where both were pronounced dead on arrival. The death certificates listed hydrogen sulfide poisoning as the cause of death for both men.

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Atmospheric readings in the pit on September 2 during the FACE investigation detected no measurable levels of hydrogen sulfide or methane and an oxygen level of 20.4% (normal: 19.5%–21.0%). However, the weather conditions on the day the readings were taken (cool and breezy) differed from those on the day of the incident (hot and humid).

Incident 2

On August 11, a 43-year-old dairy farm owner and his 23-year-old son died from asphyxiation after entering one of two adjacent manure waste pits underneath a barn. The 8-foot-deep pits were connected by a tunnel so that both could be pumped from one pit. Although the incident was unwitnessed, an investigation of physical evidence and interviews with rescue personnel suggested the following series of events: The two men were using a pump located outside the barn to pump manure from the pits into the tank of a manure spreader. They pumped the manure from the first pit but apparently were unable to pump manure from the adjacent pit because of an obstruction in the connecting tunnel. The father then removed a steel grate cover, descended a ladder into the nearly empty pit, and was overcome as he began to clear the tunnel obstruction. His son was found lying on top of him, apparently overcome during a rescue attempt. The men were discovered approximately 2½ hours later, based on the coroner's estimated time of death for the men.

The men were removed from the manure pit by rescue personnel equipped with appropriate respiratory protection and were pronounced dead at the scene by the coroner. The coroner attributed the cause of death for both men to asphyxiation due to hypoxia.

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Editorial Note: A manure waste pit, by its design, meets the criteria established by NIOSH for a confined space (i.e., a space with limited openings for entry and exit, with unfavorable natural ventilation that could contain or produce dangerous air contaminants, and that is not intended for continuous worker occupancy [1]). The fermentation and decomposition of waste can create oxygen-deficient, toxic, and/or explosive atmospheres; the anaerobic bacterial action that decomposes the manure can generate methane, hydrogen sulfide, carbon dioxide, and ammonia. Death can result either from oxygen deficiency or from the direct toxic effects of these gases (2).

Sources of data to study work-related confined space fatalities, such as those described in this report, include the FACE program and the National Traumatic Occupational Fatality (NTOF) surveillance system. The FACE program collects epidemiologic data from the investigation of selected occupational fatalities, identifies factors that might increase the risk for work-related fatal injury, and develops and disseminates preventive recommendations to address these risks. Minnesota is one of 12 states* that receive funding from NIOSH for state FACE programs. NIOSH's Division of Safety Research monitors overall numbers of acute traumatic occupational deaths in the United States using the NTOF surveillance system, a census of fatal

*Alaska, California, Colorado, Georgia, Indiana, Iowa, Massachusetts, Minnesota, Missouri, New Jersey, Wisconsin, and Wyoming.

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work-related injuries based on death certificate information collected from the 52 U.S. vital statistics reporting units[†] (3).

As described in this report, incidents involving entry into confined spaces often result in multiple fatalities when coworkers or others die during attempts to rescue initial victims; on farms these are often family members. For 1980–1989, the NTOF surveillance system identified a yearly average of 89 occupational deaths that occurred in any type of confined space. Of these, approximately 20 (22%) occurred each year during rescue attempts (3). Similarly, from 1982 through 1992, as part of the FACE program, NIOSH personnel investigated 68 confined-space incidents that resulted in 104 fatalities; of these, 36 (35%) were workers who died during rescue attempts (4), and two were public safety personnel. Persons who died during rescue attempts were more likely to be coworkers than public safety or emergency medical service (EMS) personnel (5). Asphyxiation by atmospheric hazards was the primary cause of rescuer death, although the exact mechanism of death is often difficult to determine. In general, findings of autopsies performed on manure pit fatality victims are nonspecific and do not identify the specific gas(es) likely to have caused death.

Rescue operations in confined spaces present unique hazards, and proper training and specialized equipment are required to protect rescuers from injury and death. Public safety and EMS personnel should be able to recognize confined-space hazards and should be familiar with the use of proper rescue equipment and techniques (1,6–8).

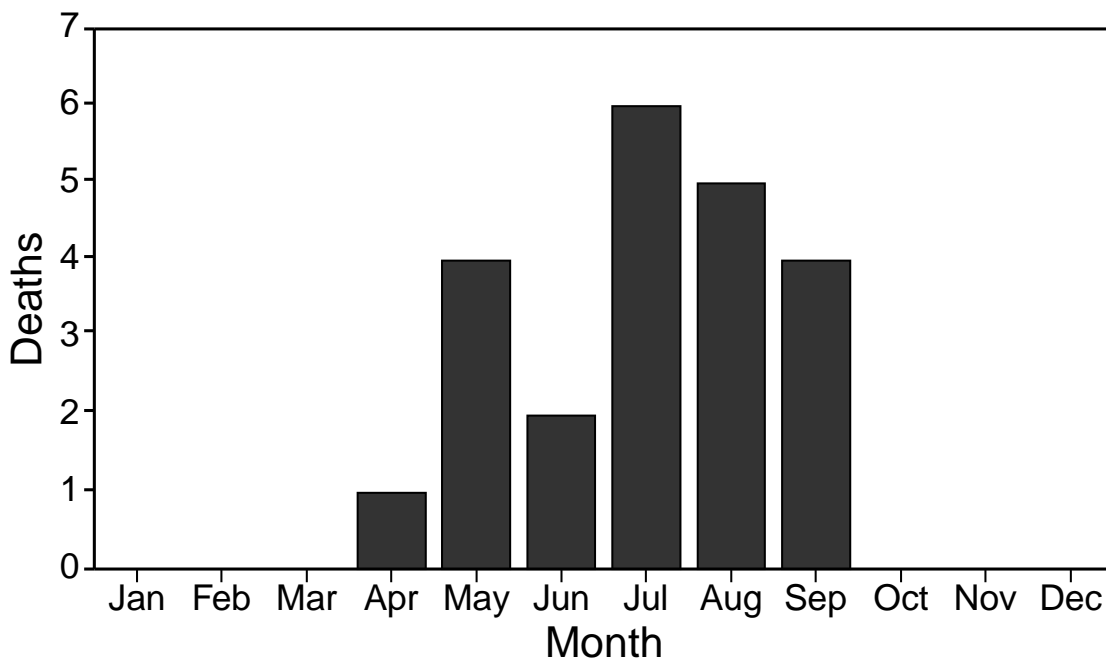
In the two incidents described in this report and in similar incidents investigated by NIOSH (9,10), hot, humid weather may have contributed to the generation of gases in the manure pits, an association also suggested by NTOF data (Figure 1). The 22 deaths during 1980–1989 identified by NTOF data[§] that were attributed to asphyxiation of workers in manure pits or similar waste tanks occurred in 13 states^{||} during April through September. Although manure pit gases are potentially present at all times, farm workers should be particularly aware of the hazards of entering manure pits during summer months, when conditions are optimal for the microbial activity that can result in increased gas generation. Manure pits that have previously been entered without incident may become toxic and/or oxygen deficient, and this change would not be detected without testing the atmosphere of the pit.

To prevent serious or fatal exposures such as those described in this report, NIOSH recommends that manure waste pits be identified as confined spaces and that warning signs be posted at all entrances to these pits. Farm workers should be instructed never to enter manure waste pits, even to attempt a rescue, unless appropriate safety measures are employed; these include the use of appropriate respiratory protection and adherence to safe confined-space entry procedures. In addition, where possible, manure waste systems should be designed to provide access to all serviceable parts from outside the pit. Manufacturers of equipment designed for use in manure waste

[†]The 50 states, Washington, D.C., and New York City.

[§]Because NTOF data include only deaths of workers aged ≥ 16 years that are clearly identified as being work related and because death certificates often do not include sufficient information to identify specifically deaths occurring in manure pits, this enumeration may underestimate asphyxiation fatalities that occurred during this period among those working in manure pits.

^{||}Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Nebraska, New York, Ohio, Pennsylvania, South Dakota, Tennessee, and Utah.

*Manure Waste Pits — Continued***FIGURE 1. Work-related deaths in manure pits, by month — United States, 1980–1989**

systems should include warnings of the potential hazards associated with worker entry into manure waste pits.

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*Current Trends***Update: Investigations of Persons Treated
by HIV-Infected Health-Care Workers — United States**

Previous reports have described transmission of human immunodeficiency virus (HIV) to five persons (patients A, B, C, E, and G) during receipt of care from an HIV-infected dentist in Florida (1–3) and other investigations of patients who were treated by HIV-infected health-care workers (HCWs) (4). This report updates these investigations and presents evidence that a sixth patient (patient I) became infected with HIV while receiving care at the Florida dental practice, the only practice in which HIV transmission from an infected HCW to patients has been documented.

Investigation of Patients of HIV-Infected HCWs (Excludes Florida Dental Practice)

As of March 31, 1993, HIV tests were completed for 19,036 persons treated by 57 HIV-infected HCWs. These results include findings in published reports (4–7) and unpublished investigations reported to CDC.

No seropositive persons were reported among 11,529 patients tested from the practices of 46 HCWs, including 23 dentists and dental students, 12 physicians and medical students, seven surgeons and obstetricians, and four others. For the remaining 11 HCWs (six dentists and five surgeons and obstetricians), 7507 patients were tested, and 92 seropositive patients were identified. Follow-up investigations have been completed for 86 (94%) of these 92 patients: eight patients were documented to be infected before receiving care from the HIV-infected HCW; 54 had established risk factors for HIV; 19 may have had other opportunities for exposure to HIV (i.e., exchange of sex for drugs or money and/or multiple sex partners); and five had no risks identified. Investigations are in progress for six patients of two HCWs.

Genetic sequencing was performed on HIV strains from 29 of the 92 seropositive patients from the practices of three HCWs. Eleven of these 29 had established risks, 15 had other opportunities for exposure to HIV, and three had no identified risk. Sequencing was not performed on the isolates for the remaining two of the five patients with no identified risk because one patient died before a blood sample could be collected, and the other refused to provide a sample. The degree of genetic similarity of viruses from the patients and the infected HCWs was in the range previously reported for persons with epidemiologically unrelated infections (5,6; CDC, unpublished data). Thus, follow-up to date has not demonstrated transmission from an HCW as a source of HIV infection for any of the patients tested.

Epidemiologic and Laboratory Investigation of Patient I

Patient I, a teenaged female, was HIV seropositive when tested as an applicant for military service in late 1992. She had not previously been tested for HIV infection, although she was notified in December 1990 by the Florida Department of Health and