CENTERS FOR DISEASE CONTROL

March 6, 1981 / Vol. 30 / No. 8

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Epidemiologic Notes and Reports

Sewer Collapse and Toxic Illness in Sewer Repairmen — Ohio

On February 19, 1981, a 30-foot-deep sewer in an industrial section of Cincinnati, Ohio, collapsed, bringing with it 20 tons of earth and leaving a hole 24 feet in diameter in the street. Three days later, several sewer workers were overcome by nausea, vomiting, dizziness, and eye and nose irritation while repairing the collapsed drain, and had to climb out of the sewer. Four other workers also experienced eye and nose irritation and headache. The supervisor of maintenance for the Metropolitan Sewer District notified the city health department and the National Institute for Occupational Safety and Health (NIOSH). Subsequent epidemiologic investigation and environmental mapping of underground sewer systems have implicated highly acidic effluent (wastewater) and volatile organic solvents discharged from a large pigment manufacturing plant as the cause of the sewer collapse and subsequent illness in the sewer workers. City health officials immediately closed the repair site, pending further investigation.

On February 23, NIOSH medical and industrial hygiene investigators visited the site of the collapse, interviewed the affected workers, and conducted environmental sampling. Exposed workers reported symptoms of eye and nose irritation, headache, and a metallic taste in the mouth; they also noted a solvent-like odor at the work site and that work equipment such as shovels and safety lines had turned a bluish-green color.

NIOSH industrial hygienists measured concentrations of explosive gases and of chlorine in the sewer work area, and with appropriate protective equipment, descended 18 feet into the first level of the vertical sewer shaft to conduct organic vapor testing and to collect bulk samples of industrial effluent. This same procedure was repeated at 3 other sites along a sewer conduit upstream from the work site, except that the investigators did not physically enter the conduits.

The pH was measured for all effluent samples. The pH of those samples taken from the sewer repair site ranged from 1.0 to 7.0. The pH varied as the effluent color changed. The bluish effluent had an acidic pH (range 1.0 to 3.0). Effluents of other colors generally had higher pHs. Samples were also taken from the main sewer line near the 2 wastewater discharge pipes of a nearby organic pigment manufacturing plant located along the main sewer line approximately 500 yards upstream from the sewer repair site. The samples taken near the discharge pipe for the blue pigment (phthalocyanine) wastewater had a pH ranging from 1.0 to 7.0. Samples taken near the discharge pipe for the red/orange pigment ranged from 8.0 to 9.4. The pH of all samples taken upstream above the plant ranged from 6.5 to 7.0. Chloride ion concentrations were also higher in the effluent at the repair site (8,000 to 24,000 parts per million [ppm]) than at the sampling site above the pigment plant (150 to 1,500 ppm).

Direct-reading instruments indicated the presence of significant amounts of volatile

Toxic Illness – Continued

organic substances (200 to 600 ppm) at the sewer repair site. Qualitative analyses of sewer air samples taken at the same time indicated the presence of several solvent compounds, including Stoddard solvent, 1,1,1-trichloroethane, trichloroethylene, toluene, perchloroethylene, xylene, and chlorobenzene. Initial quantitative analyses showed concentrations of Stoddard solvent of 780 ppm below the pigment manufacturing plant, and of 20 ppm above the plant. Further analytical work is under way to quantitate other compounds.

The pigment manufacturing plant was visited by the NIOSH investigators. The plant uses large amounts of Stoddard solvent and hydrochloric acid in its manufacturing processes. Although the company has a procedure to neutralize hydrochloric acid by adding caustic soda to a holding tank before effluent is discharged, pH and chloride measurements taken by NIOSH and by the city sewer department indicated that large amounts of unneutralized effluent were frequently discharged by the plant into the sewer line. No other source of acid could be identified in the area. Further investigation at the plant revealed that the firm's pH-monitoring equipment was inoperative.

On the basis of these findings, NIOSH determined that the sewer repair site was hazardous to workers' health and recommended that workers not re-enter the area until discharges of solvent and acid had ceased and residual levels dissipated (*1*). On March 3, company officials agreed to cease all discharges until repairs had been safely completed and to redesign their entire wastewater-discharge system.

Reported by D Miller, Dept of Sewers, A Jackson, Dept of Health, R Vanderhoof, Dept of City Maintenance, City of Cincinnati, Ohio; TJ Halpin, MD, State Epidemiologist, Ohio State Dept of Health; D Strayer, Environmental Protection Agency, Ohio; Hazard Evaluations and Technical Assistance Br, Div of Surveillance, Hazard Evaluations, and Field Studies, and Measurements Support Research Br, Div of Physical Sciences and Engineering, NIOSH, CDC.

Editorial Note: Sewer workers may be exposed to myriad chemical contaminants while working in industrial areas. Wastewater effluents from many different industries commonly channel into sewer conduits and, if not properly treated, can react to form hazardous contaminants and unhealthy conditions not only for sewer workers, but also for the general public (*2,3*).

In this incident, the sewer collapse was caused by erosion of concrete sewer pipe by acid discharged from the pigment plant. The sudden onset of symptoms in the sewer workers appears to have resulted from their exposure to the vapors of acidic and organic effluent which were discharged into the sewer lines.

References

1. National Institute for Occupational Safety and Health. Criteria for a recommended standard—working in confined spaces. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1980. (HEW publication no. (NIOSH) 80-106).
2. Kominsky JR, Wisseman CL, Morse D, et al. Hexachlorocyclopentadiene contamination of a municipal wastewater treatment plant. Am Ind Hyg Assoc J 1980;41:552-6.
3. Cannon SB, Veazey JM, Jackson RS, et al. Epidemic kepone poisoning in chemical workers. Am J Epidemiol 1978;107:529-37.

Raw-Milk-Associated Illness – Oregon, California

Raw milk has recently been associated with cases of campylobacteriosis in Oregon and salmonellosis in California.

Oregon: In the period December 22, 1980-February 20, 1981, 5 counties in Oregon