

MMWRTM
**MORBIDITY AND MORTALITY
WEEKLY REPORT**

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**Hypertrophic Pyloric Stenosis in Infants
Following Pertussis Prophylaxis with Erythromycin —
Knoxville, Tennessee, 1999**

In February 1999, pertussis was diagnosed in six neonates born at hospital A in Knoxville, Tennessee. Because a health-care worker at hospital A was most likely the source of exposure, the local health department recommended on February 25, 1999, that erythromycin be prescribed as postexposure prophylaxis for the approximately 200 infants born at hospital A during February 1–24, 1999. In March 1999, local pediatric surgeons noticed an increased number of cases of infantile hypertrophic pyloric stenosis (IHPS) in the area, with seven cases occurring during a 2-week period. All seven IHPS cases were in infants born in hospital A during February who were given erythromycin orally for prophylaxis following possible exposure to pertussis, although none had pertussis diagnosed. The Tennessee Department of Health and CDC investigated the cluster of IHPS cases and its possible association with use of erythromycin. This report summarizes the results of the investigation, which suggest a causal role of erythromycin in this cluster of IHPS cases (1).

Case Review

IHPS cases occurring during 1997–1999 were ascertained by reviewing medical records in the two area hospitals that provide IHPS treatment. IHPS was defined as a hospital diagnosis of pyloric stenosis (*International Classification of Diseases, Ninth Revision, Clinical Modification*, code 750.5) that required pyloromyotomy in an infant born in one of the six birthing facilities in the region during 1997–1999. The rate of IHPS cases per 1000 live-born infants for each month was calculated using the number of live-born infants at the six birthing facilities as the denominator. The incidence of IHPS among infants born at hospital A peaked during February 1999 with seven IHPS cases among 217 live-born infants (rate: 32.3 cases per 1000 live-born infants) (Figure 1), a rate that was nearly seven times higher than during 1997–1998 (relative risk=6.8; 95% confidence interval [CI]=3.0–15.7). No additional IHPS cases were reported among infants born during March–May 1999 at hospital A, and the risk for IHPS in the region returned to the background rates following the peak in February 1999.

To compare the clinical characteristics of the seven index IHPS cases with those of historical IHPS cases, a detailed chart review of IHPS cases from January 1998

Carbon Monoxide Poisoning Associated with Use of LPG-Powered (Propane) Forklifts in Industrial Settings — Iowa, 1998

In 1998, the Iowa Department of Public Health (IDPH) and Iowa State University (ISU) Extension Department, with the assistance of local health departments, investigated a series of carbon monoxide (CO) poisonings associated with the use of liquified petroleum gas (LPG)-powered forklifts in light industry. In each episode, forklifts emitting high CO concentration levels were operated in inadequately ventilated warehouse and production facilities, which resulted in high CO accumulations. Employees at each site developed symptoms of CO poisoning, and some employees received inadequate or inappropriate medical care. This report summarizes the investigations and provides recommendations to prevent such incidents.

Incident 1

On August 17 and 18, 1998, during three consecutive 8-hour shifts, 34 (45%) of 75 plastic manufacturing plant employees experienced symptoms of CO poisoning (primarily headaches) while at work. Ten ill employees were evaluated at three local emergency departments (EDs). Of five employees seen at one ED, possible CO poisoning initially was diagnosed in three workers. However, because of high pulse oximeter readings, this diagnosis was dismissed erroneously, and the three employees were discharged and returned to work. The other two employees had "possible poly vinyl chloride inhalation" and "syncopal episode" diagnosed, respectively; one was admitted to the hospital, and one was discharged home. Of four employees seen at a second ED, the first two had "migraine headache" and "torticollis" diagnosed, and the second two were suspected to be CO poisoned and had carboxyhemoglobin (COHb) levels of 3.8% (1 hour after leaving work) and 10.7% (2 hours after leaving work), respectively.* One employee was seen at a third ED, and a headache of undetermined cause was diagnosed.

A local physician notified IDPH when several plant employees sought follow-up treatment the next day. Overall, 25 (38%) of 65 plant employees interviewed by IDPH had illnesses that met the case definition of CO poisoning (i.e., headache and at least one of the following: weakness, dizziness, or nausea). Illness rates increased with each shift, and no substantial associations were found between illness and age, sex, recent illness such as cold or influenza, illness in family members, hay fever, asthma, or smoking.

When measured by investigators, the plant's two forklifts each emitted concentrations of CO in excess of 40,000 ppm (recommended guidelines range from 2000 to 10,000 ppm [1-3]). On August 17, the plant's air-conditioning system had been shut down for servicing, and an exhaust fan had malfunctioned, reducing the effective ventilation rate. However, the forklifts emitted such excessive amounts of CO that no practical level of ventilation could have maintained CO concentrations below recommended exposure limits.† Neither employees nor managers were aware that the

*Normal COHb concentrations are <2% in nonsmokers and 5%–9% in smokers.

†CDC's National Institute for Occupational Safety and Health recommends that CO exposure not exceed 35 ppm as an 8-hour time-weighted average and that point exposure should never exceed 200 ppm.

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symptoms they experienced were related to CO poisoning, which delayed recognition and response.

Incident 2

In November 1998, after experiencing headaches, nausea, and dizziness over several days, employees of a warehouse brought conventional residential CO detectors to work; these detectors registered CO concentrations of 30–136 ppm. In the adjacent office area, concentrations as high as 76 ppm were recorded before employees inactivated the detectors to silence the continuous alarms. Employing industrial CO detectors, the investigation by IDPH determined that the facility's LPG-powered forklifts (producing from 40,000 to 70,000 ppm of CO) and inadequate plant ventilation allowed accumulations of CO up to 267 ppm in the warehouse. No employees reported seeking medical treatment.

Incident 3

From December 1998 through January 5, 1999, employees of an embroidery company experienced headaches and fatigue, and an employee's puppy became somnolent when brought to work. A local energy company was called to investigate. The company measured CO concentrations of 100–200 ppm in the embroidery offices. While attempting to find the source of CO, investigators found levels of 200–450 ppm in a wooden pallet manufacturer located in the same building one floor below the embroidery offices.

One symptomatic office employee, a pregnant woman, consulted her obstetrician and reportedly was told that no postexposure treatment existed. Approximately 24 hours after her last exposure to CO and after seeking medical advice from experts in CO poisoning, she and another symptomatic employee were treated with hyperbaric oxygen (4). At the time of treatment, their COHb levels were within the normal range but both were still having symptoms. Both employees demonstrated substantial subjective improvement after treatment. The since-delivered child is being monitored for CO-related complications such as neurologic conditions and growth abnormalities.

In the subsequent investigation, 23 workers were interviewed; two (29%) of seven embroidery employees and four (25%) of 16 pallet company employees had illnesses that met the case definition for CO poisoning. Investigators found an association between illness and proximity of the person's work station to areas where the forklifts were operated. The pallet manufacturer's forklifts emitted up to 75,000 ppm of CO into the inadequately ventilated warehouse. The embroidery office's furnace was vented properly with satisfactory combustion. However, the furnace was in the warehouse of the pallet company and pulled high CO-content ambient air from the warehouse into the heating system and distributed it to the embroidery office.

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Editorial Note: CO poisoning associated with indoor combustion sources has long been recognized but continues to be a problem in the United States. The events described in this report illustrate factors that result in failure to adequately prevent CO poisoning and to promptly recognize such incidents when they occur. Timely and

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correct clinical diagnosis of acute CO poisoning remains elusive because of the non-specific and protean nature of its signs and symptoms (i.e., headache, nausea, lethargy, weakness, abdominal discomfort/pain, confusion, dizziness, visual disturbances [including blurred vision], numbness and tingling, ataxia, irritability, agitation, chest pain, dyspnea on exertion, palpitations, seizures, and loss of consciousness). In incident 1, failure to diagnose illness correctly in the first employees evaluated resulted in some CO-intoxicated employees being sent back to work and further exposure and in continued exposures to other workers at the plant. Correct diagnosis can be achieved by determining COHb levels in the patient. However, screening can be performed by breath analyzer instruments. Pulse oximeter testing does not reflect tissue hypoxia and cannot be used to screen or diagnose (5). Correct identification of the CO source requires specific resources (i.e., proper monitoring equipment; time for thorough investigation; and knowledge about potential CO sources, such as LPG-powered forklifts); these resources often may be unavailable on site, particularly in small business or light industrial settings but are frequently available through local utility companies.

Treatment for acute CO poisoning varies. The Undersea and Hyperbaric Medical Society provides guidelines to physicians for treating CO poisoning (6). These guidelines recommend that patients who manifest signs and symptoms of intoxication (e.g., altered mental status or neurologic signs, cardiovascular dysfunction, pulmonary edema, or severe acidosis) be referred for hyperbaric therapy regardless of their COHb levels (4).

In June 1998, the Council of State and Territorial Epidemiologists (CSTE) adopted a surveillance case definition for acute CO poisoning (7) that delineates criteria for categorizing reported acute CO poisonings. However, no commonly accepted clinical case definition nor consistent constellation of signs or symptoms exists that would unequivocally identify a case. All cases described in this report met the CSTE surveillance criteria for classification as confirmed cases.

Circumstances surrounding the continuing occurrence of CO poisonings and related confusion about identification of disease symptoms and appropriate treatment of cases illustrate the need for 1) improved education for ED and primary-care physicians about symptoms of CO poisoning, appropriate testing, and treatment (4,6); 2) improved education for employers, employees, and forklift maintenance providers about the hazards of using improperly or poorly maintained LPG-powered forklifts indoors, CO poisoning symptoms, and the appropriate response to CO symptoms; and 3) improved forklift maintenance, ventilation, and CO-monitoring procedures when LPG-powered forklifts are used in enclosed settings.

References

1. McCammon JB, McKenzie LE, Heinzman M. Carbon monoxide poisoning related to the indoor use of LPG-fueled forklifts in Colorado workplaces. *Appl Occ Envir Hyg* 1996;11:192-8.
2. Michigan Department of Public Health. Industrial lift trucks: maintaining acceptable air quality in the workplace. *Michigan's Occupational Health* 1996;29:1-8.
3. American Council of Industrial Hygienists. *Industrial ventilation: a manual of recommended practice*. 22nd ed. Cincinnati, Ohio: American Council of Industrial Hygienists, 1995.
4. Ilano AL, Raffin TA. Management of carbon monoxide poisoning. *Chest* 1990;97:165-9.
5. Reisdorf EJ, Shah SM, Nelson R. Carbon monoxide poisoning: from crib death to pickup trucks. *Emergency Medical Report* 1993;14:181-90.
6. Hampson NB, ed. *Hyperbaric oxygen therapy: 1999 committee report*. Kensington, Maryland: Undersea and Hyperbaric Medical Society, 1999:9-12.

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7. Council of State and Territorial Epidemiologists. CSTE: position statement EH-1. Surveillance case definition for acute carbon monoxide poisoning. Atlanta, Georgia: Council of State and Territorial Epidemiologists, June 1998.

Global Measles Control and Regional Elimination, 1998–1999

In 1989, the World Health Assembly adopted the goal of reducing measles morbidity and mortality by 90% and 95%, respectively, by 1995, compared with estimates of the disease burden in the prevaccine era (1). In 1990, the World Summit for Children adopted a goal of vaccinating 90% of children against measles by 2000. Three regions of the World Health Organization (WHO) have targeted elimination: in 1994, the American Region (AMR) targeted elimination by 2000; in 1997, the Eastern Mediterranean Region (EMR) targeted elimination by 2010; and in 1998, the European Region (EUR) targeted elimination by 2007. This report updates progress since 1997 (2) toward global measles control and regional elimination of measles, and includes vaccination coverage and disease surveillance data received by WHO as of August 14, 1999. Data for 1998 suggest that routine measles vaccination coverage has declined in some regions, the number of countries reporting cases and coverage to WHO has decreased, and measles continues to be an important cause of morbidity and mortality.

Reported Routine Measles Vaccination Coverage

Global reported coverage with one dose of measles vaccine declined from 79% in 1997 to 72% in 1998 (Table 1). In 1998, 14 countries reported measles coverage below 50%: 10 in the African Region (AFR) (Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Ethiopia, Liberia, Nigeria, Togo, and Uganda), one in AMR (Haiti), two in EMR (Afghanistan and Somalia), and one in the South-East Asia Region (SEAR) (Democratic People's Republic of Korea).

Among regions focusing on measles control, AFR and SEAR reported the lowest routine vaccination coverage rates, 49% and 67%, respectively (Table 1). These regions reported the greatest decrease in coverage during 1997–1998. The Western Pacific Region (WPR) continued to report the highest routine vaccination coverage (93%).

Among regions with an elimination target, AMR reported the highest coverage rate (86%) (Table 1). In EMR, regional measles vaccination coverage was 78%, and 14 polio-free countries that began implementing measles elimination strategies reported routine coverage rates >85% (3). EUR reported a routine first dose coverage rate of 71% in 1998; 21 (41%) of 51 EUR countries* did not report vaccination coverage data to WHO.

Supplementary Vaccination Campaigns

Supplemental vaccination campaigns have been conducted in several countries targeting either measles morbidity and mortality reduction or elimination. In 1998 and 1999, 31 countries in AFR[†] and three countries in EMR (Djibouti, Egypt, and Sudan)

*Andorra, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Luxembourg, Monaco, Norway, Poland, San Marino, Spain, Sweden, Switzerland, the former Yugoslav Republic of Macedonia, Turkey, and Yugoslavia.

†Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Madagascar, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Togo, Uganda, United Republic of Tanzania, and Zambia.