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## Lead Poisoning Among Battery Reclamation Workers -- Alabama, 1991

In March 1991, the Alabama Department of Public Health lead surveillance program received a report from a participating laboratory of an elevated blood lead level (BLL) in an employee of a company engaged in a battery-breaking operation. The health department referred the case to the Occupational Safety and Health Administration (OSHA), which initiated an investigation of company medical-monitoring records and identified 13 workers with elevated BLLs. In May 1991, OSHA requested technical assistance from CDC's National Institute for Occupational Safety and Health (NIOSH) to evaluate the workers for lead intoxication. This report summarizes the findings of the investigation.

The company processes automobile and industrial batteries to reclaim their lead and plastic content. Exposures to lead fumes and dust routinely occur during the procedures in which metallic lead plates coated with lead oxide and lead sulfate are removed from the plastic cases. Automotive battery decasing requires manual labor and mechanical activities to cut open the batteries and remove their contents. To decase industrial batteries, which typically are larger than automotive batteries, torches are used to cut through an outer steel case, creating additional lead fumes.

Personal air sampling measurements, based on a 9.5-hour shift, obtained at the worksite during March 1991, indicated that time-weighted average exposures ranged from 30 ug/m<sup>3</sup> to 156 ug/m<sup>3</sup>; the OSHA permissible exposure limit (PEL) for lead in general industry is 50 ug/m<sup>3</sup>. At the time of this investigation, battery-breaking operations were considered a remand industry\* and were granted a variance, allowing a PEL of up to 200 ug/m<sup>3</sup> with the use of engineering controls but requiring reduction of individual worker exposures below 50 ug/m<sup>3</sup> through a combination of respiratory protection and work practices (1). \*\*

None of the employees examined reported symptoms suggestive of lead intoxication. On physical examination, five had gingival discoloration consistent with a "lead line." Of the 15 battery-breaking workers from whom blood samples were obtained, BLLs were greater than 60 ug/dL in 12 persons (Table 1). When the NIOSH BLL data were analyzed in conjunction with company BLL data (collected monthly from April 1989 through April 1991), 13 (87%) workers were identified whose three most recent BLLs averaged greater than or equal to 50 ug/dL (elevated BLLs ranged from 50 ug/dL to 82 ug/dL; mean value: 66 ug/dL). \*\*\* Review of the company blood-monitoring data showed a gradual increase in BLLs from January 1989 through May 1991 (Figure 1). In 14 workers, zinc protoporphyrin (ZPP) levels were greater than 100 ug/dL (reference range: 0-79 ug/dL), values consistent with moderate lead poisoning; in three of

these workers, ZPPs were greater than 600 ug/dL, levels often associated with severe lead poisoning. Because employees rotated through all jobs according to production needs and the availability of personnel, differences in BLL and ZPP associated with the various work stations were not analyzed.

Serum creatinine levels were measured for all 15 workers and ranged from 0.8 ug/dL to 1.6 ug/dL (reference range: 0.8-1.3 ug/dL) (Table 1). For seven workers, calculated creatinine clearance rates were outside the referent (i.e., less than 90 mL per minute) and ranged from 67 mL to 170 mL per minute; two had evidence of mild impairment of renal function (less than 80% of predicted normal).

The environmental investigation and BLLs indicated that employees were inadequately protected from lead exposure because of poorly designed equipment that permitted excessive generation of sulfuric acid mist and lead dust, improper use of respirators, and inadequate hygiene practices (i.e., employees failed to shower at the end of the shift or change into clean clothes before leaving the worksite). In addition, there was no respirator fit-testing program.

Because of inadequate hygiene practices at the facility, the Jefferson County Department of Public Health evaluated the effect of lead exposure on families of workers. BLLs among workers' children ranged from 6.0 ug/dL to 42.0 ug/dL (mean: 22.4 ug/dL); in comparison, BLLs among a group of neighborhood children ranged from 2.0 ug/dL to 18 ug/dL (mean: 9.8 ug/dL) and were significantly different ( $t=2.1$ ;  $p=0.05$ ).

As a result of this investigation, OSHA obtained a court order requiring the employer to remove all workers with elevated BLLs from the premises. This is the first time OSHA has required an employer to remove an entire workforce because of health violations.

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### Editorial Note

Editorial Note: OSHA classifies battery-breaking facilities under the standard industrial classification (SIC) code 5093, which includes scrap and waste materials establishments "primarily engaged in assembling, breaking up, sorting, and wholesale distribution of scrap and waste materials (3). The Bureau of the Census reported that, in 1987, the 8248 establishments in the United States classified in this code together employed more than 93,000 workers (4). However, the total number of these sites where workers are actually engaged in battery-breaking jobs and potentially exposed to excessive amounts of lead is unknown. Currently, the U.S. Environmental Protection Agency provides 26 secondary smelters (SIC code 3341) with permits to operate battery-breaking operations in the United States (G. Streit, EPA, personal communication, 1991). The SIC codes do not specify operations engaged solely in battery reclamation. Sixteen states have enacted legislation regulating battery recycling, which may assist with identification and enumeration of workers at battery reclamation facilities.

One national health objective for the year 2000 targets elimination of occupational lead exposures associated with BLLs greater than 25 ug/dL (objective 10.8). Workers at increased

risk for lead toxicity include those in primary and secondary lead smelters, storage-battery-manufacturing plants, plastic-compounding factories, and nonferrous foundries (5). Other jobs characterized by excessive amounts of lead include construction workers who cut through lead-coated metal structures, workers who repair and disassemble ships (6) and roofs (7), and those who dismantle subway lines and demolish or strip paint from bridges (8). In 18 states, including Alabama, the state health departments require the routine reporting of elevated BLLs.

## References

1. Department of Labor, Occupational Safety and Health Administration. Occupational exposure to lead. Federal Register 1989;54:29142-275. (29 CFR section 1910, section 1915, section 1917, and section 1918).
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  3. Office of Management and Budget. Standard industrial classification manual. New York: Prentice Hall Information Services, 1987.
  4. Bureau of the Census. County business patterns, 1988. Washington, DC: US Department of Commerce, Bureau of the Census, 1988; publication no. CBP-88-01.
  5. Seligman PJ, Halperin WE, Mullan RJ, Frazier TM. Occupational lead poisoning in Ohio: surveillance using workers' compensation data. Am J Public Health 1986;62:221-47.
  6. Zenz C. Occupational medicine: principles and practical applications. 2nd ed. Chicago: Year Book Medical Publishers, 1988.
  7. Campbell BC, Baird AW. Lead poisoning in a group of demolition workers. Br J Ind Med 1977;34:298-304.
  8. Fischbein A, Daum SM, Davidow B, et al. Lead hazard among ironworkers: dismantling lead-painted elevated subway line in New York City. NY State J Med 1978;78:2150-9.
- As a remand industry, this facility is exempted from certain requirements of the OSHA lead standard regarding airborne lead levels but is not exempted from the other provisions of the lead standard, such as those requiring medical monitoring and training of employees. \*\* A recent district court ruling in the District of Columbia, which takes effect in July 1993, requires battery reclamation operations to meet the PEL of 50 ug/m<sup>3</sup> solely through engineering controls. \*\*\* The OSHA lead standard requires medical removal of an employee from the worksite when the employee's BLL is greater than or equal to 60 ug/dL on a single occasion or an average of greater than or equal to 50 ug/dL on three separate occasions during a 6-month period (2).

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