Lead Exposures Among Lead Burners — Utah, 1991

In July 1991, concerns about lead exposure among lead burners—workers who solder or weld with lead and, therefore, are exposed to potentially high levels of lead—at a construction site in Utah prompted the national office of the lead burners' local union to contact CDC's National Institute for Occupational Safety and Health (NIOSH) for assistance. On July 10, 1991, NIOSH, under the health-hazard evaluation program, initiated an environmental survey of the workplace and medical evaluations of the lead burners working on-site.

The evaluation focused on a crew of 17 lead burners who had been contracted to line the interior of two large steel tanks with lead sheets. The lining operation involved grinding the surface of the tank to remove steel oxidation products followed by tinning—the application of a lead/tin solder paste heated with a torch. After the grinding and tinning processes had been completed, workers used torches to bond lead sheets to the tank; the seams between the lead sheets were then sealed with molten lead solder.

To document the workers' lead-exposure status before they started work at the site, blood specimens from each worker were collected by the employer and analyzed for baseline blood lead levels (BLLs) by an Occupational Safety and Health Administration (OSHA)-certified laboratory (Table 1). Ten of the 16 tested workers had baseline BLLs ≥30 μg/dL, indicating they had had substantial exposure to lead before beginning work on this project (a baseline BLL was not obtained from one worker, a supervisor).

TABLE 1. Blood lead levels (BLLs) of 17 lead burners at preemployment* and at 5–10 weeks after employment†, and number of years employed as lead burners — Utah, 1991

Employee	Preemployment BLL (μg/dL)	During employment BLL (μg/dL)	Years as a lead burner
1	42	82	10
2	44	61	48
3	40	51	17
4	41	51	21
5	33	40	19
6	29	40	25
7	—§	36	29
8	29	34	19
9	30	33	10
10	36	33	<1
11	30	33	<1
12	30	31	16
13	32	27	40
14	24	21	5
15	10	13	<1
16	5	11	<1
17	6	11	<1
Mean	**29**	**36**	

*BLL analyzed by the employer.
†BLL analyzed by CDC's National Institute for Occupational Safety and Health.
§Supervisor, no preemployment BLL analysis performed.

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During the environmental survey, personal-breathing–zone air samples were collected for eight employees. The mean time-weighted–average (TWA) airborne lead exposure was 270 $\mu g/m^3$ (range: 140–460 $\mu g/m^3$).* Short-term air samples were collected to evaluate the relative contribution of each process to the employees' cumulative exposures. For the four samples obtained during the grinding process, the mean lead exposure was 32 $\mu g/m^3$ (range: 0–46 $\mu g/m^3$). For the three samples obtained during the tinning process, the mean exposure was 287 $\mu g/m^3$ (range: 280–290 $\mu g/m^3$). For the 12 samples obtained during the bonding/burning process, the mean exposure was 260 $\mu g/m^3$ (range: 50–530 $\mu g/m^3$). All employees wore respiratory protection (either half- or full-facepiece respirators) with high-efficiency particulate filters and organic vapor/acid gas cartridges.

During the NIOSH site visit (5–10 weeks after the baseline data were gathered) all 17 employees completed a questionnaire about symptoms and provided a blood specimen for blood lead determination. Although no employees reported symptoms suggestive of lead poisoning, the overall mean BLL was 36 $\mu g/dL$ (range: 11–82 $\mu g/dL$), a significant increase from the mean preemployment BLL ($p<0.05$, Kruskil-Wallis test) (Table 1). In four (24%) employees, BLLs were ≥ 50 $\mu g/dL$—levels potentially requiring medical removal.[†] Among the 12 employees with ≥ 1 year of lead-burner experience, the mean BLL was 42 $\mu g/dL$ (range: 21–82 $\mu g/dL$); in comparison, among the five employees with less than 1 year of experience, the mean BLL was 20 $\mu g/dL$ ($p<0.05$, Kruskil-Wallis test).

To evaluate the potential for workers' bringing lead from the workplace into the home, wipe samples were collected from several sources. Concentrations were highest on the floor of the changing room (60 $\mu g/cm^2$), the sole of one employee's work boot (20 $\mu g/cm^2$), the toe of a different employee's work boot (4 $\mu g/cm^2$), and the floor under the gas pedal of a worker's car (4 $\mu g/cm^2$). For two of the workers, family members who resided with the workers consented to BLL determinations. For one worker, BLLs in all five household members were <4 $\mu g/dL$. For the other worker, a 7-month-old child had a BLL of 17 $\mu g/dL$; a home inspection revealed no likely environmental source of lead exposure other than the father's employment.

Within 1 month of the NIOSH survey, the company 1) initiated additional engineering controls, 2) reassigned employees with BLLs ≥ 50 $\mu g/100$ g whole blood to tasks not involving lead exposure, 3) enhanced the respirator program, and 4) provided additional hygiene measures (i.e., lockers, facilities for changing clothes, and shower facilities).

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Editorial Note: BLLs are the best available indicator for lead exposure in workers. Although workplace environmental monitoring can identify areas of high lead exposure, this method alone cannot assess day-to-day fluctuations in lead exposures,

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*The OSHA permissible exposure limit (PEL) for lead in general industry is 50 $\mu g/m^3$, as an 8-hour TWA (*1*); the OSHA PEL for lead in the construction industry is 200 $\mu g/m^3$ (*2*). In July 1991, the Utah state legislature approved legislation requiring the construction industry in Utah to comply with the OSHA lead standard for general industry.

†The OSHA lead standard requires that employees with an average BLL ≥ 50 $\mu g/dL$ (measured on three occasions during 6 months) be removed from the areas where airborne lead concentrations exceed 30 $\mu g/m^3$ (*1*).

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the efficacy of personal protection equipment (e.g., respirators, gloves, or work clothes), or the effects of work practices and personal hygiene measures.

In the circumstances described in this report, if the respirators used by workers were properly fit-tested, maintained, and worn, the workers' actual inhalational exposures probably would have been less than the concentrations measured during the worksite investigation. In addition, the levels of contamination detected on the workers' street shoes and other clothing exceeded background levels and indicated that substantial amounts of lead were conveyed from the workplace, resulting in exposure for workers' families as well as additional exposure for the workers. Previous reports have documented lead poisoning among family members of lead-exposed workers in this way (*3*), and recent information regarding the adverse effects of even low BLLs in infants and young children (*4*) underscores the need to address the public health hazards of industrial lead contamination of the home.

Programs to prevent work-related lead poisoning require two basic components: 1) surveillance efforts to identify potential cases of lead poisoning and 2) use of the surveillance information to target intervention efforts to reduce or eliminate the lead exposure. The OSHA lead standard for general industry requires BLLs to be determined annually for any employee exposed to airborne lead levels $\geq 30\ \mu g/m^3$ (*1*). In many states, laboratories performing blood lead analyses are required to report elevated levels to the state health department for potential follow-up activities (*5*). The effectiveness of such surveillance efforts depends both on routine biologic monitoring of employees with known exposure to lead and enforcement of timely laboratory reporting of elevated levels to appropriate state authorities.

In July 1991, Utah OSHA removed the construction industry exemption in its general industry lead standard; this measure should enhance efforts to prevent lead poisoning among lead-exposed construction workers and members of their families by 1) reducing the workers' airborne lead exposure, 2) requiring annual BLL analyses, and 3) requiring workplace hygiene and housekeeping provisions. The federal OSHA construction industry standard maintains a permissible exposure limit (PEL) of 200 $\mu g/m^3$ of airborne lead and has no requirement for routine environmental or biologic monitoring or workplace hygiene and housekeeping provisions (*2*). The federal OSHA is updating PELs for chemicals (including lead) in the construction industry and, in conjunction with NIOSH, has issued a hazard information booklet describing ways to avoid lead exposure in the construction industry (*6*). In addition, NIOSH has published an alert on lead poisoning among construction workers (*7*). Additional information on obtaining these publications is available from the Information Dissemination Section, Division of Standards Development and Technology Transfer, NIOSH, 4676 Columbia Parkway, Cincinnati, OH 45226; telephone (513) 533-8287.

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