

Lead Exposure in Stained Glass Workers

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To evaluate lead exposure in stained glass workers, we measured blood lead levels in 12 professional glass workers, in 5 hobbyists, and in 4 workers' family members. Professional workers lead levels (mean 20.7 $\mu\text{g}/\text{dl}$) were higher than hobbyists' (11.6 $\mu\text{g}/\text{dl}$) ($P = 0.02$) or family members' (11.3 $\mu\text{g}/\text{dl}$). Levels increased with years worked, hours worked per week, and percentage of work involving lead. The mean lead concentration in settled dust samples from a stained glass workshop was 11,000 parts per million. Stained glass workers are at increased risk of lead exposure.

Key words: lead, occupational health, arts and crafts

INTRODUCTION

Artisans and hobbyists are exposed to a wide range of toxic hazards [McCann, 1980]. Jewelry workers may inhale cadmium fumes [Baker et al, 1979], lead dust, trichloroethylene vapors, or asbestos [Martin, 1978]; furniture strippers may be exposed to dimethylformamide [Burroughs, 1976] or to benzene [Otterson et al, 1971]; silk screen printers are exposed to solvent vapors [Vongrungsemon, 1979]; tie-dyers may absorb benzidine-based dyes [Carnow, 1976]; sculptors [Siedlecki, 1968] may inhale welding fumes, silica, asbestos or resin dusts, and depending upon their techniques and media may be exposed to high noise levels or to laser beams; photographers have potential for contact with photosensitizing compounds.

Lead is the principal hazard of stained glass work [Feldman and Sedman, 1975]. The characteristic brilliant tracery of stained glass is formed and supported by a network of thin strips of lead termed came [Isenberg and Isenberg, 1972]. Artisans must heat, draw, bend, solder, and polish came. They perform those tasks in intimate contact with lead and frequently for long hours in poorly ventilated

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shops. They have multiple opportunities for inhalation of airborne lead dust, and during high-temperature soldering they may occasionally be exposed to lead fume. Workers' family members may be exposed to lead particulates transported home on contaminated skin, hair, shoes, and clothing [Baker et al, 1977].

Although lead poisoning has been described in stained glass work [Feldman and Sedman, 1975], the extent of the hazard has not been studied. Thus to evaluate lead exposure in a group of stained glass workers, we conducted a clinical and epidemiologic survey.

METHODS

In April 1979, we interviewed and obtained samples of venous blood from members of the Atlanta Glass Art Guild and from members of their households. The interviews sought data on duration and intensity of stained glass work, on work practices including the use ratio of lead came to copper foil, on ventilation and personal hygiene, and on the occurrence in the three preceding months of symptoms including headache, abdominal pain, irritability, or tremor, which could have been caused by increased lead absorption. The blood samples were obtained in lead-free vacuum tubes and were analyzed for lead content by atomic absorption spectrophotometry [Barthel et al, 1973], for erythrocyte protoporphyrin (EP) by a micromethod [Piomelli, 1973], and for hematocrit. During the investigation, we visited a stained glass studio to observe work practices, and we obtained samples of settled interior dust there and from the home of a worker. The dust samples were analyzed for lead content by atomic absorption spectrophotometry.

RESULTS

We interviewed and obtained blood from 17 stained glass workers and four family members. Workers categorized themselves either as professional stained glass workers or as hobbyists.

We found that blood lead levels (Table I) (Figure 1) were higher in the professional glass workers than in the hobbyists or family members; the difference between the professionals and hobbyists was statistically significant ($t = 2.04$; p (one-tailed) = 0.02). The highest blood lead level encountered in a professional was 35 $\mu\text{g}/\text{dl}$. EP values were slightly higher in professional glass workers than in hobbyists (Table I), but the difference was not statistically significant ($p > 0.1$). All hematocrit values were within the normal range, and means did not differ among the groups. We found no associations between blood lead levels and the distribution of symptoms.

TABLE I. Mean Blood Lead and Erythrocyte Protoporphyrin (EP) Levels in Stained Glass Workers and Family Members

	Number examined	Blood lead ($\mu\text{g}/\text{dl}$)	EP ($\mu\text{g}/\text{dl}$ RBC) ^a
Professional glass workers	12	20.7 (\pm 9.6) ^b	98.6 (\pm 45.4)
Hobbyists	5	11.6 (\pm 2.9)	81.0 (\pm 10.2)
Family members	4	11.3 (\pm 1.7)	—

^a EP results expressed as μg per deciliter red blood cell (RBC) mass.

^b Standard deviation in parentheses.

In evaluating work practices, we found that the professionals worked 20 to 50 hours per week (mean = 36.3 hours) and the hobbyists 3 to 21 hours (mean = 8.4 hours). The professional group had worked in stained glass for 1 to 14 years (mean = 3.7 years), and the hobbyists 1 to 4 years (mean = 1.6 years). Only five of the total group of 17 workers had installed any sort of fan in their studios, and only two reported having made use of local exhaust ventilation at their workbenches. Three reported wearing a mask while working, and one wore gloves. All but one reported that they ate and/or smoked while working.

We found that blood lead levels in the 17 workers were associated positively with duration (in years) of glass work (Spearman's correlation coefficient, $r = 0.43$, $p = 0.04$), as well as with the average number of hours worked per week ($r = 0.51$, $p = 0.02$), and with the percentage of work with lead came ($r = 0.53$, $p = 0.02$).

The mean lead content of three dust samples obtained in a stained glass workshop was 10,696 parts per million (ppm). The mean of two samples from a worker's home was 355 ppm.

DISCUSSION

In this study we developed data which indicate that stained glass workers appear to be at increased risk of exposure to lead. We found evidence of increased environmental lead exposure in a stained glass studio; the mean lead concentration in dust samples from a workshop was more than 30 times greater than the average dust lead concentration in a worker's home. Also, workers' blood lead levels were increased over background. Although the blood levels that we encountered were all within the range considered acceptable for occupational exposure [OHSa, 1978], we observed statistically significant, positive dose-response relationships between workers' blood lead concentrations and the duration and intensity (i.e., percentage of work with lead came) of their occupational exposure to lead.

Lead may be absorbed in stained glass work either by inhalation or by ingestion of lead-contaminated particles. Prevention of exposure thus requires

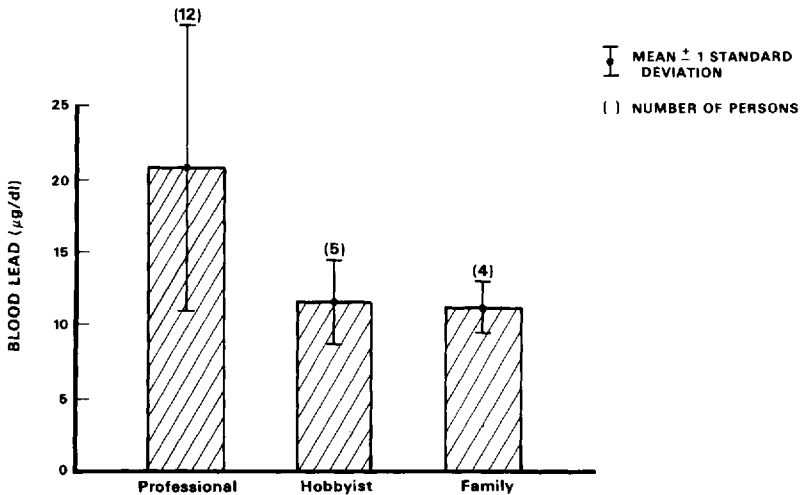


Fig. 1. Blood lead levels in stained glass workers and family members, Atlanta, 1979.

ventilation, particularly local exhaust ventilation of the type that has been recommended for artists' studios [McCann, 1978], and also requires attention to personal hygiene. There should, in particular, be no smoking or eating while working with lead. Contaminated work clothing should not be worn home and should be laundered separately from the clothing of other family members [Chisolm, 1978].

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