U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. HE 79-120-662

ROCKY MOUNTAIN RADIATOR
BOULDER, COLORADO

FEBRUARY 1980

I. SUMMARY

In July 1979 the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate occupational exposures to lead (Pb) at Rocky Mountain Radiator, Boulder, Colorado. A limited physical examination and a medical questionnaire directed towards potential sources of lead exposure were completed on all three workers. Venous blood samples were obtained for whole blood lead analysis.

The three workers had lead levels of 25, 41, and 52 micrograms of lead per 100 grams of whole blood (ug Pb/100 g). All three were monitored for breathing zone air levels of lead. General room air samples for lead analysis were also obtained. Four (4) of six (6) air samples exceeded the Occupational Safety and Health Administration (OSHA) standard of 0.05 mg/M^3.

On the basis of environmental and medical data, a potential health hazard existed from overexposure to lead. Recommendations on ventilation, work practices, and biological monitoring procedures necessary to control these hazards are included on page 4.

II. INTRODUCTION

NIOSH received a request from the owners and operators of Rocky Mountain Radiator at Boulder, Colorado, to determine if there was a health hazard from lead during the repair of automobile radiators.[1] An environmental and medical survey was conducted on July 18, 1979, and August 10, 1979, to evaluate lead exposures.

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[1]Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 19 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative to employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

III. BACKGROUND

Automobile radiators are repaired in this shop. During the repair, radiators are disassembled using oxygen acetylene torches. After the radiators are cleaned, they are reassembled using soldering wire composed of lead and tin. During these processes lead fumes become airborne. Workers are also exposed to lead by handling the soldering wire and the lead contaminated radiators.

IV. METHODS AND MATERIALS

A. Environmental

Lead breathing zone air samples were collected on 37 mm AA filters using vacuum pumps operated at 1.5 liters per minute and analyzed according to NIOSH Method P&CAM No. 173.

B. Medical

Venous blood samples were obtained in vacuum tubes containing EDTA for blood lead determination and free erythrocyte protoporphyrin (FEP). Blood lead levels were analyzed by cup method. (References 1, 2) FEP was determined by the method of Chisolm and Brown. (Reference 3)

V. EVALUATION CRITERIA

A. Environmental

The source of criteria used to assess the workroom concentration of lead was the Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.1025), January 1978.

	Permissible Exposures 8-Hour Time-Weighted Exposure Basis (mg/M^3)
Lead.....	0.05 (OSHA)

mg/M^3 = milligrams of substance per cubic meter of air

Occupational health standards are established at levels designed to protect individuals occupationally exposed to toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

B. Toxicological

Lead -- Although capable of causing acute toxicity when absorbed in large amounts, lead exposure is usually associated with chronic toxicity due to absorption of lesser amounts over prolonged periods of time. The major route of entry of lead into the body is the lung, although slight amounts may be ingested.

The early effects of lead toxicity are non-specific, and except for laboratory determination of lead in the blood, are difficult to distinguish from the symptoms of minor seasonal illness. The symptoms are decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive system symptoms (particularly constipation), abdominal pains and decreased appetite. These symptoms are reversible, and complete recovery is possible on removal from exposure.

The three systems most commonly affected are the bone marrow (producer of red blood cells), the nervous system, and the kidneys.

Because of more efficient material handling methods and biological monitoring, serious cases of lead poisoning are rare in industry today.

Inorganic lead has been shown to be mutagenic and teratogenic. It can cross the placental barrier and can affect embryological and fetal development. Lead is eliminated from the body via urine and feces. NIOSH recommends that a blood lead value of 60 micrograms per 100 grams whole blood (60 ug Pb/100 g blood) be the maximum occupational blood lead level. When this value is exceeded, the employee should be removed from the lead exposure to allow his body to reduce its lead burden.

Lead is a highly toxic metal, but long experience in industry has shown that good engineering controls in the workplace and good personal hygiene among employees can make lead a safe material with which to work.

The OSHA lead standard (29 CFR 1910.1025) states: The employer shall make available medical examinations for all workers that are exposed to inorganic lead at levels exceeding 30 ug/M^3 over an 8-hour work period. This level (30 ug/M^3) is called the action level. Each worker at or above 40 ug/100 grams shall also have an annual physical according to OSHA 1910.1025.

VI. RESULTS

A. Environmental

Four (4) of six (6) air samples taken for lead exceeded the OSHA standard. The plant owners have already initiated a program to improve and install general and local ventilation in areas where the radiators are being disassembled by use of oxygen acetylene torches. All workers are practicing better personal hygiene. Results may be reviewed in Table 1.

B. Medical

Blood lead levels and FEP concentrations of the three workers at this repair shop are summarized in Table 2. Blood lead levels were highest in the two radiator repair persons and both levels only slightly exceeded the upper limits of normal. FEP concentrations were normal with the exception of one radiator repairman who demonstrated a significant elevation. These results suggest

that although there is no biologic evidence of excessive lead absorption at the present time at least one individual may have had excessive exposure in the past.

Questionnaire data revealed no other potential sources of lead exposure and none of the employees had signs or symptoms of lead toxicity by physical examination or clinical history.

VII. DISCUSSION AND CONCLUSIONS

A potential health hazard exists at this work place. This conclusion is based on the minimally elevated whole blood lead levels and a significantly elevated FEP in one worker suggesting excessive exposure to lead in the recent past. Four of six air samples taken exceeded the OSHA standard of 0.05 mg/M^3.

VIII. RECOMMENDATIONS

1. Smoking, eating, and drinking must be prohibited in the work area.

2. Workers should wash hands thoroughly before eating, smoking, and snuff usage.

3. Local ventilation should be installed over the booths where the radiators are being melted down by use of oxygen acetylene torches.

4. Workers should be given clean clothes at the beginning of each shift. These clothes should be removed and left at the facility at the end of the work tour.

5. It would be advisable for workers to have blood leads checked annually.

IX. REFERENCES

1. Delves, H.T. Analyst, 95:431, 1970.

2. Barthel, W.F. J.A.O.A.C., 56, No. 5, 1973.

3. Chisolm, Brown. Clinical Chemistry, Vol. 21, No. 11:1169-1681, 1975.

X. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

Bobby J. Gunter, Ph.D.
Regional Industrial Hygienist
NIOSH - Region VIII
Denver, Colorado

John C. Harris, M.D.
Medical Toxicologist
Medical Section, Hazard Evaluation and Technical Assistance Branch (HETAB)
NIOSH - Cincinnati, Ohio

Evaluation Assistance:	Hazard Evaluation and Technical Assistance Branch (HETAB) Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS) NIOSH, Cincinnati, Ohio
Report Typed By:	Marilyn K. Schulenberg NIOSH - Region VIII Denver, Colorado

XI. DISTRIBUTION AND AVAILABILITY

Copies of this determination report are currently available upon request from NIOSH, Division of Technical Service, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office, at the Cincinnati address.

Copies of this report have been sent to:

1. Rocky Mountain Radiator
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Colorado Department of Health
5. State Designated Agency

For the purpose of informing all employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE 1

Breathing Zone and General Room Air Concentrations of Lead

Rocky Mountain Radiator
Boulder, Colorado
July 18, 1979

Sample Number	Job Classification	Sampling Time	mg/M^3 Lead
114	General Room	7:55 AM - 1:45 PM	0.03
102	Radiator Mechanic	7:57 AM - 1:45 PM	0.004
107	Radiator Mechanic	7:58 AM - 1:45 PM	0.21
105	Radiator Mechanic	8:00 AM - 1:00 PM	0.05
99	General Room	8:04 AM - 1:45 PM	0.11
112	General Room	8:05 AM - 1:45 PM	0.15
	EVALUATION CRITERIA		0.05
	LABORATORY LIMIT OF DETECTION		0.003

TABLE 2

Blood Lead and FEP Concentrations

Rocky Mountain Radiator
Boulder, Colorado

August 10, 1979

Job Classification	Blood Lead Concentration	FEP Concentration
Radiator Mechanic	25 ug Pb/100 ml	714 ug FEP/liter RBC
Radiator Mechanic	41 ug Pb/100 ml	1600 ug FEP/liter RBC
Radiator Mechanic	42 ug Pb/100 ml	700 ug FEP/liter RBC
Normal Range	Below 40 ug Pb/100 ml	220-870 ug FEP/liter RBC