

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

HEALTH HAZARD EVALUATION DETERMINATION REPORT  
HE 79-114-717

EARL SCHEIB AUTO PAINTING INC.  
DENVER, COLORADO

JULY 1980

I. SUMMARY

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Earl Scheib Auto Paint Shop in Denver, Colorado, on August 8, 1979, to evaluate possible hazards from lead, chromium, nuisance dust, and paint solvent in the work environment. Environmental samples were taken for these substances. Blood samples were drawn and analyzed for lead and free erythrocyte protoporphyrin (FEP).

Results of this evaluation indicate that, on the day of sampling, two employees were overexposed to airborne chromium. Neither these employees nor others had blood lead or FEP levels above normal.

Environmental data obtained in this evaluation indicate that atmospheric concentrations of chromium were above the evaluation criteria. Due to the infrequency of the exposure and the use of respirators, medical data did not indicate an increased body burden of lead. Recommendations on improved work practices and ventilation are presented on page 5.

II. INTRODUCTION

Under the Occupational Safety and Health Act of 1970\*, NIOSH investigates the toxic effects of substances found in the workplace. The manager of the Earl Scheib Auto Painting Co., Denver, Colorado, requested such an investigation from NIOSH to determine the hazards presented by lead, chromium, nuisance dust, and organic solvents in his shop.

\*Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health and Human Services, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

Subsequent to the on-site portion of this investigation, employees were individually notified by letter of the results of their blood sample analysis. On October 30, a preliminary report was sent to the employer with the results of the environmental testing as well as a summary of the blood sample results.

### III. BACKGROUND

This shop paints and does minor bodywork on automobiles and small trucks. Approximately 10 employees, including the manager, are involved in these operations. The bodywork includes hammering, sanding, and heating. These operations can create airborne dust and fumes. Prior to painting, the cars are sanded and areas which are not to be painted are masked with paper and tape. Sanding is a possible source of dust. The car is driven into a paint spray booth for the painting operation. The paint solvent is a combination of toluene, methyl ethyl ketone (MEK) and mineral spirits. The pigments vary with color, some containing lead and chromium. The painter is the only person exposed during this operation, and he wears a half-mask respirator.

### IV. EVALUATION DESIGN AND METHODS

Personal breathing zone samples were taken on the painter, the body man, and several other employees. Area samples were also taken in three locations. Lead, chromium, and particulate samples were collected on mixed cellulose ester filters using battery-powered sampling pumps operated at 1.5 liters per minute. Organic vapor samples were collected on activated charcoal using battery-powered sampling pumps operated at 50 cc per minute. Sampling pumps were worn by the workers (or placed at a location) for most of their work time.

Ventilation measurements in the paint spray booth were taken with a thermal anemometer.

Medical questionnaires were obtained from all current employees. Questions were directed to obtain information on work history, general health, symptoms of lead toxicity, personal hygiene, and other potential sources of lead exposure.

A limited physical examination was performed on all employees by the NIOSH physician. This examination included testing of biceps and Achilles tendon reflexes, wrist and ankle strength, and evaluation of tremor of the outstretched hands.

After obtaining informed consent, 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. FEP was determined by method of Chisolm and Brown.

V. EVALUATION CRITERIA

Lead

Inhalation of lead dust and fumes is the major route of lead exposure in industry. A secondary source of exposure may be from ingestion of lead dust contamination on food, cigarettes, or other objects. Once absorbed lead is excreted from the body very slowly. The absorbed lead can damage the kidneys, peripheral and central nervous systems, and the blood forming organs (bone marrow). These effects may be felt as weakness, tiredness, irritability, digestive disturbances, high blood pressure, kidney damage, mental deficiency, or slowed reaction times. Chronic lead exposure is associated with infertility and with fetal damage in pregnant women.

Blood lead levels below 40  $\mu\text{g}/100\text{ ml}$  whole blood are considered to be normal levels which may result from daily environmental exposure. However, fetal damage in pregnant women may occur at blood lead levels as low as 30  $\mu\text{g}/100\text{ ml}$ . Lead levels between 40-60  $\mu\text{g}/100\text{ ml}$  in lead exposed workers indicate excessive absorption of lead and may result in some adverse health effects. Levels of 60 to 100  $\mu\text{g}/100\text{ ml}$  represent unacceptable elevations which may cause serious adverse health effects. Levels over 100  $\mu\text{g}/100\text{ ml}$  are considered dangerous and often require hospitalization and medical treatment.

The new OSHA standard for lead in air is 50  $\mu\text{g}/\text{M}^3$  on an eight-hour time-weighted average for daily exposure. The standard also dictates that in four years workers with blood lead levels greater than 50  $\mu\text{g}/100\text{ ml}$  must be immediately removed from further lead exposure and in some circumstances workers with lead levels less than 50  $\mu\text{g}/100\text{ ml}$  must also be removed. At present medical removal of workers is necessary at blood lead levels of 70  $\mu\text{g}/100\text{ ml}$  or greater. Removed workers have protection for wage, benefits, and seniority for up to eighteen months until their blood levels adequately decline and they can return to lead exposure areas.

Determination of free erythrocyte protoporphyrin (FEP) is an indirect method of evaluating lead exposure. The correlation between lead exposure and the log FEP is well documented for continuous chronic exposure. However, the 120-day period required for red cell turnover in the human body results in a latent period of at least several weeks before a change in body lead burden produces a corresponding change in FEP. The normal range for FEP in unexposed individuals is from 220 to 870  $\mu\text{g}$  FEP per liter of red blood cells.

#### Nuisance Dust

The evaluation criteria for airborne particulate or "nuisance dust" is based on its ability to reduce workshop visibility, create unpleasant deposits in the eyes, ears and nasal passages, or cause injury to the skin or mucous membranes by chemical or mechanical action per se or by the rigorous cleansing procedures necessary for its removal. The American Conference of Governmental Industrial Hygienists has recommended a concentration of 10 mg/M<sup>3</sup> as a maximum acceptable level for particulate in air. OSHA enforces a standard of 15 mg/M<sup>3</sup>.

#### Chromium

Chromium, especially in the hexavalent state, has been shown to cause effects such as contact dermatitis, skin ulcers, irritation and ulceration of the nasal mucosa, and perforation of the nasal septum. Some chromium (VI) compounds, including lead chromate, have been associated with an increased incidence of lung cancer. NIOSH recommends that chromium of this type be controlled in the workplace so that time-weighted average breathing zone concentrations are not greater than 1 µg/M<sup>3</sup>. The recommendation for noncarcinogenic chromium is 25 µg/M<sup>3</sup>. OSHA enforces a standard of 500 µg/M<sup>3</sup>.

#### Paint Solvent

NIOSH recommends a 100 ppm maximum eight-hour time-weighted average concentration for toluene (OSHA enforces a 200 ppm standard). Primary effects of overexposure to toluene are seen in the central nervous system.

The NIOSH and OSHA standard for MEK is 200 ppm. Exposure to higher concentrations can result in eye, nose, and throat irritation.

The NIOSH criteria used for mineral spirits in this evaluation is 350 mg/M<sup>3</sup>. Overexposure to mineral spirits by inhalation affects the nervous system.

## VI. EVALUATION RESULTS

Samples taken for paint solvents (see Table I) indicate concentrations are within safe levels. Most samples were so low as to be below the limit of detection of analytical methods. The highest sample was less than 40% of the allowable concentration.

Measurement of airborne lead, chromium and dust (see Table II) indicate an overexposure of the painter and body man to chromium when the most restrictive criteria is used, although both exposures were below the OSHA standard. The painter was also exposed to lead during the time of the sample (approximately 3 hours) but his 8-hour time-weighted average exposure was within safe limits.

While the painter was exposed to concentrations of lead and chromium above the recommended criteria during the spraying of paint, he was wearing a half-mask respirator at that time. Although this respirator evidently provided adequate protection against inhalation of metals, as indicated by the results of the blood samples, its use is not encouraged in situations like this where improved work practices and ventilation would reduce airborne concentrations of contaminants and eliminate the necessity of a respirator (See Section VII).

Ventilation measurements indicated an airflow of from 100 to 130 feet per minute (fpm) through the twenty 18" square filters into the auto paint spray booth. A range of 100 to 150 fpm was measured through the eighteen exhaust filters (also 18" square). This is a total flow of approximately 5,000 cubic feet of air per minute (fpm) through the booth.

Table III summarizes the results of blood tests for lead and FEP in the 10 employees evaluated. All results are within the normal range indicating no evidence of acute or chronic excessive lead exposure. Medical questionnaires as well as physical examinations likewise failed to reveal any evidence of lead toxicity.

#### VII. RECOMMENDATIONS

It is recommended that the painter plan his job so that the air blows the spray away from him and not into his breathing zone. Also, since ingestion (eating) is also a major potential source of heavy metal poisoning, employees should be discouraged from eating and smoking in the work area, and encouraged to wash their hands before eating and smoking.

Clean-up of dust should be with vacuum, wet mop, water spray or some other method that does not create an additional exposure by throwing dust into the air. This procedure should be repeated frequently so that dust does not accumulate.

#### VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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IX. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this report are currently available, upon request, from NIOSH, Division of Technical Services, 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 22161.

Copies of this report have been sent to:

- 1) Earl Scheib Auto Painting Inc.
- 2) U.S. Department of Labor, Region VIII
- 3) NIOSH, Region VIII

For the purpose of informing the approximately ten "affected employees," the employer shall promptly "post" the determination report for a period of 30 days in a prominent place near where exposed employees work.

Table I  
 AIRBORNE TOLUENE, MEK AND MINERAL SPIRIT CONCENTRATIONS

EARL SCHEIB AUTO PAINTING CO.  
 DENVER, COLORADO

HE 79-114

August 8, 1979

DESCRIPTION	DURATION	CONCENTRATION		
		TOLUENE	MEK	MINERAL SPIRITS
Area Sample - Inside Spray Booth	11:00 a.m. - 1:55 p.m.	14 ppm	ND ppm	130 mg/m <sup>3</sup>
Area Sample - Above Painters' Bench	11:45 a.m. - 1:55 p.m.	ND*	ND	ND
Personal Sample - On Helper	1:25 a.m. - 2:00 p.m.	ND	ND	ND
Personal Sample - On Painter	10:45 a.m. - 1:50 p.m.	9	2	50
Recommended Maximum Concentration (Time-Weighted Average)		100	200	350

\* Indicates this substance was not detected in this sample

Table II  
 AIRBORNE LEAD, CHROMIUM AND PARTICULATE CONCENTRATIONS

EARL SCHEIB AUTO PAINTING CO.  
 DENVER, COLORADO

HE 79-114

August 8, 1979

DESCRIPTION	DURATION	CONCENTRATION		
		LEAD	CHROMIUM	PARTICULATE
Sander	8:10 a.m. - 10:30 a.m.	20 ug/M <sup>3</sup>	----	----
Body Man	8:15 a.m. - 11:35 a.m.	ND	----	----
Body Man	11:35 a.m. - 12:30 p.m. 1:25 p.m. - 1:55 p.m.	10	10 ug/M <sup>3</sup>	2.7 mg/M <sup>3</sup>
Helper	9:30 a.m. - 12:10 p.m. 1:05 p.m. - 1:25 p.m.	ND*	----	2.2
Masker	10:00 a.m. - 12:30 p.m.	ND	----	1.1
Area Sample - on Post in Body Shop Area	8:25 a.m. - 2:05 p.m.	ND	----	0.4
Masker	10:40 a.m. - 1:45 p.m.	ND	----	----
Painter	10:45 a.m. - 1:50 p.m.	80	200	----
Area Sample - Above Painters' Bench	11:45 a.m. - 2:00 p.m.	ND	----	----
Recommended Maximum Concentration (Time-Weighted Average)		50	1	10

\* Indicates this substance was not detected on the sample

TABLE III

## Blood Lead and FEP Concentrations

EARL SCHEIB  
DENVER, COLORADO  
HHE 79-114

August 8, 1979

<u>Description</u>	<u>Blood Lead Level</u>	<u>FEP</u>
Painter	25 ug Pb/100 ml	490 ug FEP/liter RBC
Sander	23 " "	510 " "
Masker	20 " "	595 " "
Body Work	31 " "	851 " "
Masker	17 " "	761 " "
Sander	23 " "	645 " "
Manager	28 " "	632 " "
Sander	15 " "	498 " "
Painter	36 " "	784 " "
Sander	28 " "	385 " "

Normal Range

Below 40 ug Pb/100 ml

220-870 ug FEP/liter RBC