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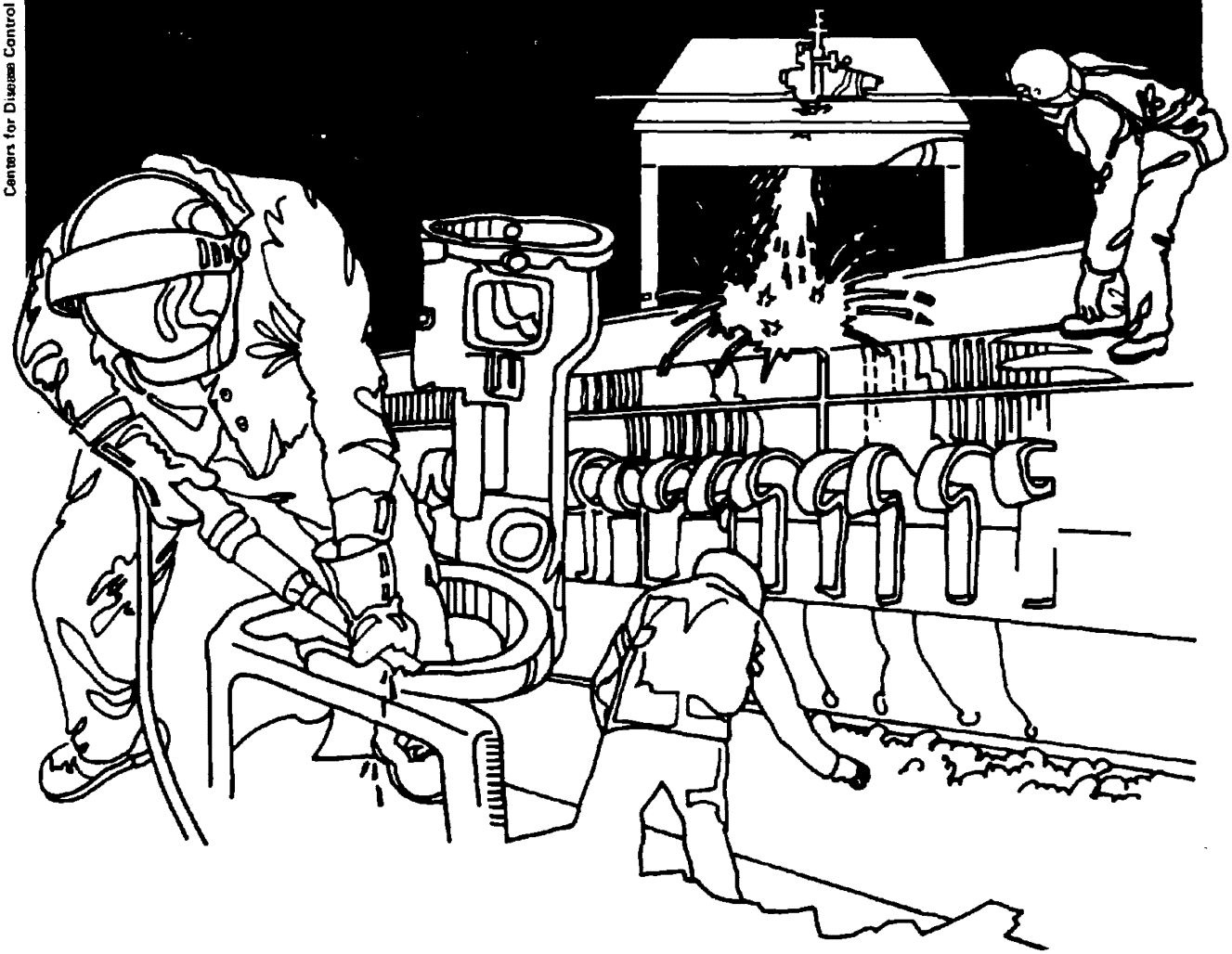

Health Hazard Evaluation Report

HETA 82-246-1275
SWISSVALE AUTO
SURPLUS PARTS, INC.
PITTSBURGH, PENNSYLVANIA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from 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.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 82-246-1275
MARCH 1983
SWISSVALE AUTO SURPLUS PARTS, INCORPORATED
PITTSBURGH, PENNSYLVANIA

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I. SUMMARY

On April 29, 1982, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Allegheny County Health Department to evaluate exposures to polychlorinated biphenyls (PCBs) at the Swissvale Auto Surplus Parts, Incorporated, Pittsburgh, Pennsylvania. This is a metal scrap yard where previous work on transformers containing PCBs had been done. The Environmental Protection Agency (EPA) documented the presence of PCBs at the site in 1980. Environmental sampling by NIOSH on July 28, 1982 showed presence of PCBs for surface wipe samples at the scrap yard and wipe samples from scrap yard workers' hands. Total PCB concentrations on workers' hands ranged from 8.0 to 190 nanograms per square centimeter (ng/cm^2) with a mean of 62 ng/cm^2. PCBs were also detected in the soil and surface dirt within the scrap yard premises.

Five current workers were interviewed and none gave a history of liver disease, eye or gastrointestinal disorders. One worker had recurrent pustules on both forearms which was apparent on examination of the skin. However, these pustules had been present for two years before this worker started working at the scrap yard. No acne, skin thickening, hyperpigmentation or other skin abnormalities were noted.

Blood samples were taken from all five current workers for serum PCB levels. The results showed Aroclor 1254 at a concentration of 14 ppb (detection limit 10 ppb) in the serum of one scrap yard worker, and Aroclor 1260 at a concentration of 11 ppb in another worker. The other three workers had no detectable Aroclor 1242, 1254, or 1260 in the serum. Six county health department workers provided blood samples for comparison of PCB levels. One sample only showed Aroclor 1254 at a serum concentration of 15 ppb. Studies suggest that serum PCB levels in individuals without unusual PCB exposure range up to around 30 ppb.

On the basis of the data collected, NIOSH has determined that surface and soil contamination exists in the scrap yard. Continuing exposure with a potential for PCB absorption is documented by the presence of PCB on hand wipe samples. However, serum levels do not indicate any excessive PCB absorption in the current scrap yard workers. Recommendations include cleaning up the scrap yard, improving hygiene measures, and removing the contaminated soil.

KEYWORDS: SIC 5093 (Scrap and Waste Materials), polychlorinated biphenyls, PCBs, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, metal scrap yard.

II. INTRODUCTION AND BACKGROUND

Swissvale Auto Surplus Parts, Incorporated, Pittsburgh, Pennsylvania is a metal scrap yard dealing with auto wrecking and demolition of scrap motors for retrieval of metal components. Work on scrap transformers was done some years ago, with storage of transformer oil containing some polychlorinated biphenyls (PCBs) in fifteen 55-gallon drums. These drums were not appropriately labelled and were stored in a section of the scrap yard. An attempt was apparently made to burn a portion of this oil for heating purposes without much success. The Environmental Protection Agency (EPA) in 1980 confirmed the presence of PCBs in the transformer oil. The drums of transformer oil were then removed for disposal in early 1981. The Allegheny County Health Department requested assistance from NIOSH to evaluate the health effects from the PCB exposure.

III. MATERIALS AND METHODS

A. Environmental

Bulk samples of soil, soot, and dirt from the scrap yard were collected and analyzed for PCBs, polychlorinated dibenzodioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs). The samples were extracted with benzene and analyzed by gas chromatography-mass spectrometry.

Surface contamination of PCBs was studied by obtaining wipe samples from the hands of the workers, and from various work surfaces and hand-held tools at the workplace. The surface area sample size was approximately 75 cm^2 for the palmar surface of the right hand of each person seen, and 100 cm^2 for each work surface.

The wipe samples were collected on Whatman smear tabs moistened with pesticide quality cyclohexane. Cross contamination was avoided by use of disposable vinyl gloves which were changed after each sample was taken. Samples were extracted with toluene and analyzed by gas chromatography according to NIOSH method P&CAM 244.[3] The accuracy and precision of this wipe procedure are limited due to variations in surface characteristics that affect sampling efficiency, thus, the results should be considered as rough measures of relative surface contamination.

Due to the ubiquity of PCB's in industrial societies, wipe samples also were collected from other locations around the Pittsburgh area for comparison purposes. The county health department staff members who provided blood samples for comparison of PCB levels also had wipe samples taken from the hands.

B. Medical

All five workers at the scrap yard were seen. They include the owner, who also works on scrap motors, a foreman, and three general laborers. A brief questionnaire covering symptoms, chemical exposures, past medical history, and occupational history was administered. A limited physical examination of exposed areas of the skin (face, neck, arms, and hands) was done. Blood samples were taken for determination of serum PCB levels. For comparison of results, a similiar procedure was carried out for six workers from the county health department not occupationally exposed to PCBs. An attempt was made to contact previous employees of Swissvale Auto Surplus Parts, Incorporated, but this was not successful due to nonresponse and incomplete data on the present whereabouts of previous employees.

Analyses of the blood samples for PCB levels were performed using P&CAM 329[1] with one modification. This was the use of a capillary column for quantification instead of a packed gas chromatographic column. Capillary columns produce outstanding resolution of individual components from complex mixtures of PCBs in human serum.[2] Blood samples were screened for Aroclors 1242, 1254, and 1260. The detection limit is 10 ppb. Quality control procedures include the analysis of spiked fish tissue and spiked aqueous solutions.

IV. EVALUATION CRITERIA

A. Polychlorinated Biphenyls (PCBs)

PCBs are chemically stable mixtures of chlorinated biphenyls that do not conduct electricity and can withstand long periods of high temperature and pressure. These properties have made them useful in electrical transformers and capacitors.

Data obtained from animal experimentation suggest that the acute toxicity of PCBs is low.[4] Animal toxicity studies have shown that PCBs may decrease immunity and increase susceptibility to infection, are carcinogenic in rodents, and impair fertilization in female rodents and rhesus monkeys.[4,5,6]

The toxicity of PCBs depends on the number and locations of the chlorine atoms in the PCB molecule, and on the duration of exposure. Absorption is primarily through the skin or gastrointestinal tract, but inhalation can be an important route of absorption if the PCBs are heated or if one is exposed to PCBs in a confined space. The NIOSH recommended standard for occupational exposure to PCBs is a time-weighted average (TWA) of 1.0 micrograms total PCB's per cubic meter of air, for up to a 10-hour workday, 40-hour workweek.[7] PCBs are lipid soluble, and thus are poorly excreted.

Knowledge of human toxicity is limited and has been gathered largely from workers chronically exposed[4] or populations accidentally exposed to massive amounts of PCBs (Yusho incident).[8]

PCBs have been demonstrated to have the following toxic effects in humans:[4,9]

1. Chloracne: a persistent skin eruption, similar to acne but more severe and with different distribution, generally found on exposed areas of the body

2. Eye, nose, and throat irritation

3. Swelling of the miebomian glands in the upper eyelid

4. Gastrointestinal disturbances

5. Skin rashes, thickening, and hyperpigmentation

6. Liver toxicity, which may manifest as fatigue, abdominal pain, nausea, vomiting, loss of appetite, jaundice, and edema

7. Abnormalities in offspring of women heavily exposed

8. A variety of other symptoms, including weakness, headaches, cough, numbness and pain in extremities, swelling and pain in joints

While mixtures of PCB's tested in mice and rats have consistently been shown to induce liver tumors, there have been no reports that adequately address the question of carcinogenicity of PCBs in humans. Materials which have been demonstrated to cause cancer in animals should, however, be treated as potential human carcinogens, and it would be judicious to limit exposure to those materials to the minimum level possible.

Dietary PCB exposure, the major source of general population exposure, occurs especially through eating fish, but PCB residues are also found in milk, eggs, cheese, and meat. It has been estimated that the average daily dietary intake of PCBs does not exceed 10 micrograms.[9] Although there are no widely accepted normal values for serum PCB concentrations, levels can be compared to published values both for occupationally exposed groups and community groups without any known unusual exposure. Previously published studies have demonstrated that PCBs can be found in the serum of most non-occupationally exposed persons. Such studies have reported serum PCB values ranging from 0 to 42 parts per billion (ppb), with mean concentrations ranging from 2.1 to 24.4 ppb.[10] In the largest study involving 616 individuals, the

range of serum PCB was 0 to 29 ppb.[11] Based on these findings in a group without unusual exposure to PCBs, a reasonable acceptable upper limit value for serum PCB would appear to be around 30 ppb.

Higher PCB serum levels have been found among occupationally exposed groups. A study measuring PCB serum levels in populations with and without occupational exposure in Bloomington, Indiana found the following levels:[12]

	Mean Serum PCB (ppb)
Sludge workers	17.4
Workers with occupational exposure	75.1
Workers' families	33.6
Community controls	24.4

No chloracne or systemic symptoms were discovered.

More recently, Maroni et al. reported results of PCB measurements done on whole blood of 80 electrical workers exposed for many years to PCB mixtures in a plant in Italy.[13] They reported that mean PCB recovery from serum is approximately 60%[13] of the recovery from whole blood. Their results were as follows:

	ppb (Mean ± SD)	Range
60 currently exposed workers	377±258	88-1319
17 past exposed workers	292±161	94-631
3 workers with occupation exposure	110±31	88-146

B. Dioxins[14]

The possible presence of polychlorinated dibenzodioxins and polychlorinated dibenzofurans should be considered when evaluating PCB exposures because: (1) PCDDs and PCDFs are sometimes present as trace contaminants in PCB fluid mixtures, (2) they may be formed during thermal decomposition of PCBs, and (3) several isomers of these compounds are highly toxic. Isomers of PCDFs and PCDDs vary widely in their acute toxicity, with 2,3,7,8-TCDD being the most toxic and the most widely studied. On a molecular basis, this compound is the most poisonous synthetic chemical known. Human exposure to 2,3,7,8-TCDD has induced chloracne, polyneuropathy, liver dysfunction, and enzyme elevations. Animal studies have shown the compound to be teratogenic, embryotoxic, carcinogenic, and cocarcinogenic.

One epidemiologic study found an increase in the proportion of primary liver cancer amongst all cancer patients admitted to Hanoi hospitals following the spraying of Herbicide Orange (2,4,5-T).[15] This herbicide is often contaminated with dioxins.

The dioxin isomer found in this study, octachlorodibenzodioxin (OCDD), has demonstrated a much lower degree of acute toxicity than 2,3,7,8-TCDD. However, the chronic effects of OCDD have not been fully investigated.

V. RESULTS

A. Environmental

Five of the six bulk samples taken at the scrap yard contained PCB's (Table I). Various PCB isomers from Cl_3 to Cl_8 were detected at levels ranging from 0.2 to 25 parts per million (ppm) per isomer. In addition, 8 ppm of octachlorodibenzodioxin was present in a soil sample taken near the area where transformer oils used to be stored. This compound may have been present as a contaminant in some of the transformer fluids.

Polychlorinated biphenyls contamination was detected on all personal and surface wipe samples that were taken at the scrap yard (Table II). Total PCB concentrations on workers' hands ranged from 8.0 to 190 nanograms per square centimeter (ng/cm^2) with a mean of 62 ng/cm^2. Surface PCB concentrations ranged from 18 ng/cm^2 on the scrap yard bathroom sink to 100 ng/cm^2 on the handle of a hand-held chipping power tool. The mean surface concentration of total PCBs at the scrap yard was 50 ng/cm^2.

PCB concentrations in all of the control wipe samples were below the analytical detection limit of 0.5 ng/cm^2.

B. Medical

The characteristics of the five metal scrap yard workers and the six county health department workers were as follows:

Characteristics of Scrap Yard Workers and Comparison Group

	No. of Workers	Age	Race	Smoking Status
Metal scrap yard workers	5	Range: 24-69 yrs Median: 56 yrs	2 whites 3 nonwhites	4 smokers 1 nonsmoker
County health department workers	6	Range: 30-52 yrs Median: 36 yrs	6 whites 0 nonwhites	5 smokers 1 nonsmoker

The median duration of employment at Swissvale Auto for the scrap yard workers is 10 years (Range: 3 wks - 38 yrs). The county health department workers have not had any direct contact with PCBs, aside from occasional inspection of sites that may have contained some PCBs.

1. History

No past history of liver disease, swollen eyelids, eye irritation or discharge, or gastrointestinal symptoms were elicited. No one had a past history of rashes or skin problems except one scrap yard worker who gave a history of having had recurrent pustules on both forearms. He has had these pustules for varying periods over the past five years. He has been in his present scrap yard job for only three years.

2. Physical Examination

Examination of the skin showed the one worker with a few pustules on both forearms. No cases of acne, skin thickening, hyperpigmentation, or other skin rashes were noted.

3. Serum PCB Levels

Eleven blood samples were analyzed; five from the scrap yard workers and six from the county health department workers. The detection limit is 10 ppb.

a. Aroclor 1242

None of the scrap yard or county health department workers had any detectable serum levels of this PCB.

b. Aroclor 1254

Two blood samples showed the presence of Aroclor 1254 just above the detection limit. The level was 14 ppb for one scrap yard worker and 15 ppb for one county health department employee. The other nine blood samples had no detectable Aroclor 1254.

c. Aroclor 1260

One of the 11 samples showed detectable Aroclor 1260 at 11 ppb. This was in a scrap yard worker with no detectable Aroclor 1242 or 1254.

Hence only two scrap yard workers and one county health department workers had any detectable serum PCB.

VI. DISCUSSION AND CONCLUSIONS

The soil samples and wipe samples showed PCB contamination above background levels at the Swissvale Auto Surplus Parts scrap yard at the time of the NIOSH investigation. This indicates a potential for continuing exposure to and absorption of PCBs.

The medical assessment however showed no indication of excessive acute or chronic absorption and effect of PCBs on the current Swissvale Auto scrap yard employees. Health concerns appeared to be expressed more so by residents in the area rather than the scrap yard workers. The presence of a scrap yard close to residential houses may be a contributing factor to residents concern and is a situation that the county planners may wish to review. The problem with the drums of transformer oil containing PCBs was dealt with by their removal in March 1981. There is no ongoing reclamation and refurbishing of old transformers. As long as this situation continues and as serum as the facility is cleaned up and the recommendations following implemented, no new PCB hazard to workers and residents in the area should arise.

VII. RECOMMENDATIONS

1. Some attempt should be made to clean up the facility. This may be difficult in view of the nature of the work in a scrap yard with the types of materials brought in and worked on. Surfaces where PCB's were detected, such as the sink, desk, tools, and other equipment should be thoroughly cleaned. The contaminated soil should also be removed.

2. Workers should be provided with suitable nonporous gloves and protective garments for work involving possible contact with oils and chemicals.

3. A clean wash area should be maintained for workers to clean up after work.

4. Provisions for separate storage of home and work clothes should be provided.

5. Consumption of food and drinks and smoking in the scrap yard is to be discouraged.

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Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. 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. Allegheny County Health Department
2. Swissvale Auto Surplus Parts, Incorporated
3. NIOSH, Region III
4. OSHA, Region III

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

TABLE I

Analyses of PCBs, PCDDs, and PCDFs in Bulk Samples

Swissvale Auto Surplus Parts, Incorporated
Pittsburgh, Pennsylvania
HETA 82-246

Sample Description	PCB Isomers Detected	PCB Concentration, Per Isomer (ppm)	PCDDs	PCDFs
Soot from portable oil-burning heater	ND	<0.3	ND	ND
Surface soil, near PCB storage area	Cl_3-Cl_7	0.7-7	ND	ND
Soil, one foot deep, near PCB storage area	Cl_4-Cl_8	0.2-10	8 ppm octachlorodibenzodioxin	ND
Dirt from floor of PCB storage area	Cl_3-Cl_8	5-25	ND	ND
Dirt from floor of large building	Cl_3-Cl_8	0.3-13	ND	ND
Dirt from floor of small building	Cl_5-Cl_7	0.6-0.8	2 ppm octachlorodibenzodioxin	ND
Surface soil (control) County Health Department	ND	<0.02	ND	ND
Surface soil (control) Pittsburgh International Airport	ND	<0.02	ND	ND

ND = none detected

TABLE II

Analyses of Polychlorinated Biphenyls in Wipe Samples

Swissvale Auto Surplus Parts, Incorporated
Pittsburgh, Pennsylvania
HETA 82-246

Sample Description	Concentration (ng/cm^2) Aroclor 1248	Aroclor 1260	Total PCB's*
A. Personal			
Worker No. 1 - Right hand	0.9	12	13
Worker No. 2 - Right hand	27	160	190
Worker No. 3 - Right hand	5.9	48	54
Worker No. 4 - Right hand	7.1	41	48
Worker No. 5 - Right hand	0.9	7.1	8
B. Work surface			
Manager's desk	1.6	20	22
Bathroom sink	2.4	16	18
Chipper power tool	8.6	93	102
Crane (Hand controls)	2.0	44	46
Two-wheel cart	13	48	61
C. Controls			
Hotel desk	ND**	ND	ND
County Health Dept.- Desk	ND	ND	ND
County Health Dept.- Stair railing	ND	ND	ND
Employees (6) - Right hand	ND	ND	ND

* Aroclor 1016, 1242, and 1254 were also analyzed. None were detected. (Detection limit = 0.5 ng/cm^2)

** ND = none detected. (Detection limit = 0.5 ng/cm^2)

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