REPORT ON CHROMIUM SAMPLING IN JERSEY CITY
Summer and Fall 1986

NEW JERSEY DEPARTMENT OF HEALTH

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INTRODUCTION

This report summarizes and interprets the results of samples taken by the New Jersey Department of Health (NJDOH) in the summer and fall of 1986 at several locations in Jersey City, New Jersey. The samples were analyzed for chromium content by the NJDOH Laboratory by April 1987.

BACKGROUND

From 1900-1970, chromium ore processing in Hudson County, New Jersey, was a major industrial activity which produced an estimated 291 billion pounds of waste slag containing 2-5% chromium. Much of the chromium remaining in the waste after processing existed as calcium chromate, an inorganic compound in which the chromium ion is in the hexavalent state. Thus some percentage of the chromium was water soluble and highly toxic. Prior to the 1980s, the waste was viewed as useful "fill dirt". Contractors used fill in residential, industrial and recreational areas.

Concern about the toxicity of the chromium slag and the impact on the health of people, animals, environmental quality and the structural integrity of buildings began to emerge in the decade of the 1980s. Chromium sites were located. Soils tested to confirm observations, initial remediation efforts, and efforts to identify the scope of the problem and define effective remediation were begun.

In 1985, the New Jersey Department of Environmental Protection (NJDEP) initiated a program to investigate the need and feasibility of remediation activities at the 42 sites then identified as having chromium contamination. In 1985, NJDOH was asked to review the ambient air sampling activities being planned

by ESE Inc., the NJDEP contractor for the Remedial Investigation / Feasibility Study (RI/FS).

Because soil contamination appeared to be a potential source for contamination of the indoor environment through environmental transport mechanisms, NJDOH agreed to assist NJDEP by performing an evaluation of the potential for indoor exposure including the sampling of dusts, walls and indoor air for total and hexavalent chromium.

METHODS

Ten structures near or adjacent to known chromium contaminated sites were selected for inclusion in this sampling. The sampling protocol involved the gathering of air and surface wipe samples from first floor and below ground floor locations within these structures. Seven buildings in the Dwight St. neighborhood were sampled, including five residences, one commercial establishment, and the Whitney Young School. Three other residences were also sampled, one each on Grand St., Pacific Ave., and Pine St. The school was sampled in June 1986; residences and the commercial establishment were sampled in September 1986.

Samples were also obtained in September and October 1986 from four residential sites outside of Hudson County (Roselle and Hillsboro), to be used as controls or comparisons.

Air samples were taken using methods developed by the National Institute for Occupational Safety and Health (NIOSH) for occupational levels of exposure. NJDOH used NIOSH methods 7024 for total chromium and 7600 for hexavalent chromium. Before and during the sampling period, considerable discussion occurred between NJDOH, NJDEP, and NIOSH regarding the appropriateness of certain details of the hexavalent method (filter type and pore size) for the expected air chromium levels. As a result of these discussions, the samples taken at the Whitney Young School utilized the standard 5.0 micron PVC filters, while at the remaining sites, 0.8 micron filters were used.

Surface wipe samples were taken using Whatman smeartabs moistened with distilled water.

Samples were transported to the NJDOH Laboratory where they were processed and analyzed for total and hexavalent chromium. Sample analyses were completed by April 1987 and quality control data indicate acceptable levels of analytical accuracy.

Samples for hexavalent chromium appeared to have exceeded

recommended holding times before analysis, but the NJDOH Laboratory performed extractions and stabilizing procedures immediately, extending the sample holding time.

RESULTS

Conversations with residents participating in the study revealed that crystals, thought to be chromium, had been observed on inside walls below and above ground level. In addition, the residents of one house complained of severe skin irritation. The results from sampling at all locations is presented in Table 1. In summary:

Air Sampling

Quantifiable levels of hexavalent chromium were detected in air samples collected in the basement of House B, and total chromium was detected in the basement of House E. Trace levels of total chromium were detected in air samples collected in the basement and kitchen of House C, the hallway of House G, and in the new cafeteria and first floor stairwells of the school. No chromium, total or hexavalent, was detected in indoor air samples collected at control houses outside Hudson County.

An outside air sample collected near the steps of the Whitney Young School was found to contain traces of total chromium.

Quality control samples indicated trace levels of contamination in some of the filters used to collect air samples. The impact of this problem is uncertain; false negatives are unlikely, but the number of samples with trace concentrations found may have been increased.

Dust Sampling

Dust collected from the new cafeteria and first floor area of Whitney Young School showed total chromium ranging from 5 to 6% of the dust. Dust sampled outside the school showed total chromium up to 11%.

Surface Wipe Sampling of Walls

Wipe samples taken from all Jersey City structures included in the study confirmed the presence of at least trace levels of chromium on inside walls at both basement and first floor levels. In two of four control homes, trace levels of total chromium were detected in either the basement or first floor. The presence of hexavalent chromium was confirmed on the inside basement wall of the commercial establishment.

CONCLUSIONS

1) Structures adjacent to chromium sites showed evidence of chromium contamination indoors. As a result, there is the potential for human exposure through contaminated indoor air or dermal contact with dusts.

2) The methods available for detecting chromium in air were insufficiently sensitive to quantify the apparently low levels present in most samples. The higher exposure levels observed in some occupational settings were not occuring at the time of sampling. However, the concentration of chromium detected in limited dust sampling suggests that dust accumulation should be prevented or minimized.

3) It is not possible to determine the chromium intake and health risk to any individual or population from the data collected in this study. Personal behavior and human traffic in these indoor environments is complex, and these factors determine the actual amount of chromium inhaled, ingested or absorbed through the skin.

4) In the absence of information to the contrary, human exposure to chromium should be assumed where it is observed, and efforts to remediate or otherwise stop exposure should be undertaken.

UPDATE

In 1988, increased attention at the state and local level has been directed to the chromium contamination problem. A joint NJDEP/NJDOH working group was convened to address systematically the potential public health impact of the over 100 sites now known, and to complement the NJDEP remediation efforts underway.

NJDOH and NJDEP have undertaken a series of public health initiatives in coordination with the NJDEP remediation efforts and in cooperation with local health officials. These efforts include:

* production of informational materials for the public, workers at sites contaminated with chromium, and physicians in Hudson County (completed in winter 1989)
* visits to all chromium sites to assess the potential for human exposure
* conducting appropriate medical evaluations of persons

or populations thought to be exposed to high levels of chromium

* further environmental monitoring to define the extent and spread of contamination

* industrial hygiene evaluations of workplaces contaminated with chromium

* a research program designed to evaluate low-level exposure to chromium as a means of determining effectiveness of remediation

Table 1. Results of Air and Surface Wipe Sampling for Chromium

SAMPLE LOCATION	AIR LEVELS (UG/M3) CHROMIUM		WALL SURFACE WIPE (UG/CM2) CHROMIUM		COMMENTS
	HEX	TOTAL	HEX	TOTAL	
DWIGHT ST. AREA					
House A					
basement	ND	ND	ND	Trace	
living room	ND	ND	ND	Trace	
House B					
basement	1.3	Trace	ND	0.002	
kitchen	ND	ND	ND	Trace	
House C					
basement	ND	Trace	ND	Trace	
kitchen	ND	Trace	ND	Trace	
House D					
basement	ND	ND	ND	Trace	
hallway	ND	ND	ND	Trace	
House E					
basement	ND	8.3	ND	0.001	
kitchen	ND	ND	ND	0.001	
Commercial Establishment					
basement	ND	ND	6.8	0.003	visible crystals inner walls
School					
basement					
old cafeteria			ND	0.006	
boiler room	ND			0.001	
new cafeteria	ND	Trace		0.060	Cr = 5% of dust
1st floor stair 4	ND	Trace		0.001	
1st floor stair 5	ND	Trace		0.001	Cr = 6% of dust
outside school	ND	Trace		0.001	Cr = 5 and 11% of dust

Table 1, Page 2.

SAMPLE LOCATION	AIR LEVELS (UG/M3) CHROMIUM HEX	AIR LEVELS (UG/M3) CHROMIUM TOTAL	WALL SURFACE WIPE (UG/CM2) CHROMIUM HEX	WALL SURFACE WIPE (UG/CM2) CHROMIUM TOTAL	COMMENTS
OTHER JERSEY CITY AREAS					
House F					severe skin
basement	ND	ND	ND	0.001	irritation,
dining room	ND	ND	ND	0.004	soil contam.
House G					
basement/kitchen	ND	ND	ND	0.001	visible crystals
basement exit			ND	0.005	indoors/outdoors
1st floor hall	ND	Trace	ND	0.003	
House H					crystals outdoors
basement	ND	ND	ND	0.003	
hall entrance	ND	ND	ND	0.005	

Table 1, Page 3.

SAMPLE LOCATION	AIR LEVELS (UG/M3) CHROMIUM HEX	AIR LEVELS (UG/M3) CHROMIUM TOTAL	WALL SURFACE WIPE (UG/CM2) CHROMIUM HEX	WALL SURFACE WIPE (UG/CM2) CHROMIUM TOTAL	COMMENTS
CONTROL AREAS					
House J					
basement	ND	ND	ND		
1st Floor	ND	ND	ND	-0.003	
outside	ND	ND	ND	ND	
House K					
basement	ND	ND	ND		
outside	ND	ND	ND		
1st Floor	ND	ND			
House L					
1st floor	ND	ND			
basement	ND	ND		-0.002	
House M					
basement	ND	ND			
1st floor	ND	ND			
DETECTION LEVELS:	0.6 to 2.1	0.2 to 0.8	0.001 to 0.002	0.001	