BLOOD LEAD SCREENING
HEALTH CONSULTATION
RAYMARK INDUSTRIES, INC
STRATFORD, CT

Prepared by the
CONNECTICUT DEPARTMENT OF PUBLIC HEALTH AND ADDICTION SERVICES
ENVIRONMENTAL EPIDEMIOLOGY AND OCCUPATIONAL HEALTH
Under Cooperative Agreement With
the Agency for Toxic Substances and Disease Registry

BACKGROUND AND STATEMENT OF ISSUE

In May of 1993, the Agency for Toxic Substances and Disease Registry (ATSDR) issued a Public Health Advisory for the town of Stratford, Connecticut (See Appendix A). Raymark Industries, Inc. operated a facility at 75 East Main Street in Stratford from 1919 to 1989. The facility produced brakes, clutch parts and other friction based products. During the manufacturing process the facility generated wastes including solvents, adhesives, lead, asbestos, polychlorinated biphenyls (PCBs) and dioxins and furans. From 1919 to 1984 a system of on site lagoons was used to dispose of lead and asbestos wastes. As the on site lagoons filled up with sludge material, they were often dredged and the material was used as fill in areas throughout Stratford. ATSDR concluded in the Health Advisory that an imminent public health hazard existed in the town of Stratford due to past, present, and potential future exposure to Raymark waste containing asbestos, lead and PCBs. At the time of the Health Advisory, waste had been identified in surface soil at eight sites easily accessed by the public including a Jr. High School playing field and two other recreational sites.

Since lead was a primary component of the waste, one of the findings of the Public Health Advisory was to conduct blood lead testing among Stratford residents. The Stratford Health Department instituted free voluntary blood lead testing in conjunction with the Connecticut Department of Public Health and Addiction Services (DPHAS). Because of continued widespread exposure of children to lead paint in homes, the DPHAS encourages blood lead testing for all children in Connecticut. In Stratford, the presence of lead containing waste presented a possible additional exposure to lead. The purpose of the blood lead screening program was to: 1) identify cases of lead poisoning so that further investigation could occur to identify probable sources of lead, 2) provide a tool to evaluate the association between known lead risk factors and lead poisoning and 3) to target prevention activities.

Eleven clinics were offered between June and August of 1993. The clinics were advertised through local media including newspapers, radio and television. In addition, flyers were distributed throughout the town and a newsletter, sent to every household in Stratford, printed clinic schedules.

During the blood lead screening clinics, capillary blood was drawn from the finger using the finger stick method. Filter paper was used to collect the sample of blood. The DPHAS Laboratory analyzed the filter paper samples for lead. Trained personnel were used for specimen collection. The finger stick/filter paper method of blood lead collection and analysis is widely accepted as an appropriate screening technique, however, this method may result in false positive results if there is contamination of the filter paper or the finger during the test. Therefore, any screening blood lead of 10 micrograms of lead per deciliter of blood (ug/dL) or greater was followed for a confirmatory blood lead test that analyzed blood drawn directly from the vein. The DPHAS Laboratory consistently meets the Centers for Disease Control and Prevention's Proficiency Performance Evaluation for lead analysis. This evaluation is done quarterly.

During the clinics, participants or their parents were asked to complete a questionnaire (See Appendix B). The questionnaire was used to gather information on the person's age, address and time lived in Stratford as well as other information regarding exposure to lead including the age of housing the participant lives in. The questionnaires were administered with the assistance of trained nurses who volunteered during the clinics.

DISCUSSION

During the eleven clinics, approximately 1500 Stratford residents had their blood lead levels analyzed (see Table 1). Of these, 1287 participants satisfactorily completed questionnaires and were included in this analysis. Questionnaires were satisfactorily completed if blood lead results were successfully matched to the corresponding questionnaire and respondents gave complete information regarding name, address and age. Of the 1287 participants, 342 were children less

than age 6. Children in this age group are most susceptible to the adverse health effects of lead due to increased hand-to-mouth activities and increased absorption of lead.

Table 1

SCREENING PARTICIPATION IN RELATION TO STRATFORD POPULATION

	STRATFORD POPULATION 1990 CENSUS	BLOOD LEAD SCREENING PARTICIPANTS*
Total Population	49,389	1287
Male	23,384	602
Female	26,005	685
Total Population Less than Age 6	3,442	342
Minority Population	4,906	179**

***includes only those participants that completed the questionnaire**
****38 participants did not report their race/ethnicity**

Three percent of the total population of Stratford and 10% of the children in Stratford younger than age 6 participated in the voluntary blood lead screening program. Children, younger than age six, represented only 27% of all participants. The participants reflect the approximate racial mix of Stratford according to the 1990 census.

Six percent of the participants reported living in Stratford for one year or less. Forty-two percent reported living in Stratford for more than one year but less than five years. Fifty-two percent reported living in Stratford for more than five years.

Forty-six percent of the participants reported living in housing built prior to 1950, 42% reported living in housing built after 1950 but before 1978 and 12% reported living in housing built after 1978. Of the children participating in the clinic, 45% lived in homes built prior to 1950, 41% lived in housing built between 1950 and 1978 and 14% lived in housing built after 1978. Lead-based paint was widely used on the interior and exterior walls of homes through the 1940's.

The manufacture and use of lead based paint declined after 1950 and was banned in 1978.

Participants were asked if they had visited any of the eight known waste sites. Eleven percent reported not visiting any of the sites. Twenty-nine percent reported visiting one site, 41% reported visiting 2 sites, 12% reported visiting 3 sites, and 7% reported visiting more than 3 sites. Of the children younger than age 6, 15% never visited any of the sites, 41% visited only 1 of the sites, 35% visited 2 of the sites, 7% visited 3 sites and 2% visited more than 3 sites. The eight sites identified in the Health Advisory include: Wooster Junior High School, Short Beach Park, 4th/5th Avenue vacant lot, Spada Property, Morgan/Francis Area, Lot K/Elm Street, Housatonic Boat Club and Raybestos Memorial Field.

Table 2

BLOOD LEAD RESULTS AND AGE OF PARTICIPANTS

	ALL PARTICIPANTS	PARTICIPANTS LESS THAN AGE 6
Total Screened	1287	342
Screening Blood Lead Levels Above 9 ug/dL	129	43
Confirmed Blood Lead Levels Greater Than 9 ug/dL	13	6

Of the 1287 blood lead screening clinic participants, 10% (129) had screening blood lead levels of 10 ug/dL or greater (see Table 2). Of the children younger than age 6, 12% (43) had screening blood lead levels of 10 ug/dL or greater. Seventy-seven percent (99) of the participants with elevated screening results did have confirmatory blood tests done. Of the confirmatory tests, a total of 13, representing approximately 10% of the elevated screening results, were confirmed to be 10 ug/dL or greater. Six of the confirmed elevated blood leads were in children younger than age 6.

Visits to known waste sites was looked at to see if we could find an association between the number of site visits and blood lead levels. All of the participants with confirmed elevated blood

lead levels reported visiting at least one of the known waste sites. Ninety-four percent of the participants who had elevated screening blood lead levels but not elevated confirmatory blood lead tests reported visiting at least one of the known waste sites. Sixty one percent of the participants with confirmed elevated blood lead levels reported visiting more than one of the known waste sites compared to 66% of the participants that did not have confirmed elevated blood lead levels. The questionnaire did not provide any information on the number of times someone may have visited any one site or the duration of a visit.

Age of housing was evaluated to determine if a higher percentage of participants with elevated blood lead levels lived in older housing, likely to have lead based paint (see Table 3).

Table 3

CONFIRMED BLOOD LEAD LEVELS AND AGE OF HOUSING

	Blood Lead Level Greater than 9 ug/dL	**Blood Lead Level 9 ug/dL or Lower**
Housing Built 1950 or Earlier	10	37
Housing Built After 1950	1	41

Ninety percent of the participants with confirmed elevated blood lead levels reported living in homes built prior to 1950 compared to 47% of the participants who did not have confirmed, elevated blood lead levels and who also reported living in homes built before 1950. (Two of the respondents with confirmed elevated blood lead levels did not report the age of their housing.) All six of the children with confirmed elevated blood lead levels reported living in housing built prior to 1950.

CONCLUSIONS

As previously stated, the first objective of the voluntary blood lead screening program was to

identify people with elevated blood lead levels. This screening program was effective in doing this for those who participated. However, this voluntary screening program should not be construed to represent all Stratford residents.

The Third National Health and Nutrition Examination Survey, NHANES,(JAMA July 27, 1994) indicated that nationally, 8.9% of children under the age of six have blood lead levels of 10ug/dL or greater. NHANES utilizes a sampling strategy to ensure that the results are reflective of the entire population. In Stratford only 1.8% of the children who participated were found to have blood lead levels of 10ug/dL or greater. A major limitation of the voluntary screening program offered in Stratford is that not everyone participates and those who do participate may not be representative of the entire population of Stratford. People with elevated blood lead levels may have chosen not to participate in the screening program and/or people who frequented the waste sites most may have chosen not to participate for whatever reasons.

Children under the age of six are most susceptible to the adverse effects of lead due to increased hand-to-mouth activities that expose them to lead in their environment and because children absorb more lead. Only 10% of children in this age group, in Stratford, participated in the voluntary screening clinic. It is not known whether those 10% are representative of all children in Stratford that may have accessed any of the known sites.

The voluntary blood lead screening program may not have identified people with elevated blood lead levels due to other factors. While other studies have demonstrated that exposure to lead in soil is known to contribute to blood lead levels, this contribution may have a seasonal effect. The clinics began in the spring when outdoor activities were just starting. During the colder winter months between November and April, it is less likely that people would be exposed to the waste because of frozen or snow covered ground conditions and reduced outdoor activities. In addition, access to the known lead contamination areas was being restricted to prevent contact with the waste. Lead has a relatively short half-life in the body, therefore, blood lead levels are representative of more recent exposures and are not likely to reflect exposures which may have occurred several months earlier.

Given these limitations of the screening program, the second objective, to evaluate the association between elevated blood lead levels and sources of lead, was not conclusive. Participants who reported visiting sites with lead in surface soil did not have higher blood lead levels than people who reported never visiting any of the lead contaminated sites. It was not possible, from the information gathered from the questionnaire, to evaluate an individual's degree of exposure to the contaminants at the eight waste sites. For instance, the activity that someone engages in while on the contaminated site affects the degree of exposure they might receive. As an example, a young child who plays in the soil is at greater risk of exposure than a child who rides a bike across the same area. In addition, the number of times and length of time that someone spends on a contaminated site may also affect the degree of their exposure. No information was available regarding the duration of exposure for the individuals participating in the screening. This type of exposure information is not easily obtained and was not available for the analysis. In addition, very few cases of elevated blood lead levels were identified as part of this screening making it difficult to compare against those without elevated blood lead levels.

Of the people that participated in the blood lead screening program, people with elevated blood lead levels are more likely to live in homes that were built before 1950 than people without elevated blood lead levels. That result is expected since leaded paint serves as a significant source of lead. However, this result does not eliminate the possibility that certain people have elevated blood lead because of exposure to lead in soil.

RECOMMENDATIONS

Based on the findings of this voluntary blood lead screening program, the following recommendations are made:

* All confirmed blood lead levels of 10 ug/dL or greater should be followed up. This should involve any necessary medical referral as well as environmental assessment. The local health department has responsibility for this type of follow-up to assist in the identification of the lead exposure and require abatement of lead paint if necessary.

* Community education regarding lead, the health effects associated with lead poisoning, the sources of lead and the importance of blood lead screening should occur.

* An evaluation of the voluntary blood lead screening program would be beneficial. This evaluation should include the use of Geographic Information Systems to further identify where the participants in the blood lead screening program came from in relation to the known waste sites and whether at risk populations were represented in the voluntary screening program.

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