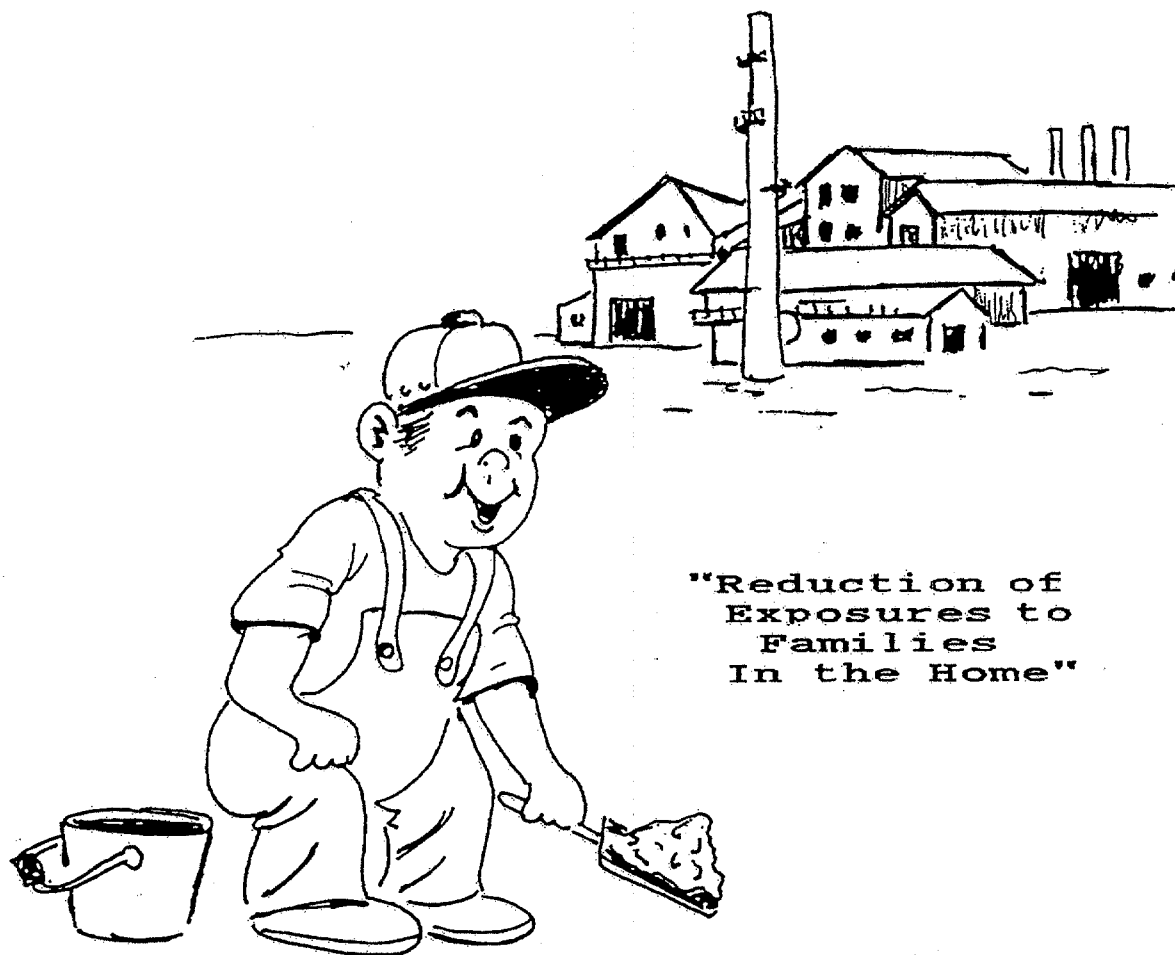




"Reduction of
Exposures to
Families
In the Home"

An East Helena Study
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ABSTRACT
"REDUCTION OF EXPOSURES TO
FAMILIES IN THE HOME"
AN EAST HELENA STUDY

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In 1983, an integrated epidemiologic study was conducted in the Helena Valley of Montana to assess children's blood lead levels and the relationship of those levels to the levels of lead in different environmental media. Blood samples, environmental samples and questionnaire data were collected for 396 children living at various distances from an operating primary lead smelter in East Helena. Analyses of these samples demonstrated that children who lived close to the smelter had higher blood levels (13 ug/dl) than children who lived farther away (6 ug/dl), although both groups had similar erythrocyte protoporphyrin levels. Multiple regressions identified dust lead levels, air lead levels, residence near the smelter and having a household member who smokes as major contributors to the dependent variable of blood lead. One child living near the smelter had lead toxicity, i.e., a blood lead level greater than or equal to 25 ug/dl and an erythrocyte protoporphyrin level greater than or equal to 35 ug/dl. The blood lead levels of all other children tested, however showed no cause of public health concern as stated by Center for Environmental health/Center of Disease Control. No health risk assessment was made from the study for any substance other than lead. (1)

Follow-up child lead and Environmental studies were again performed fourth quarter 1987 and third quarter 1988. The study area was decreased at this time to a 2.5 mile radius of the smelter (as compared to a 5 mile radius to the smelter in the 1983 study). 432 households were eligible (eligible persons were children from birth to six years of age and women who were pregnant or who planned to become pregnant), 296 households participated or 68%. Of these individuals samples: a) there were no women with elevated blood lead levels or ZPP levels; and b) Four children with elevated lead levels (two confirmed samples). Following these studies intense family evaluations with blood samples, environmental sampling (to include soil-lead and yard-grass coverage, house dust-lead, lead-related hobbies, storm windows, neighborhood-grown produce, dietary supplements, play surface-type, sibling analysis) were performed. Second quarter 1990 studies were to have been performed but community participation levels were decreased to the point that the efficacy of this study was in question.

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FAMILIES IN THE HOME"
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A study is not complete without recommendations for follow-up actions. It has been determined that for people to safely live near the smelter the following are essential:

- 1) Ambient air-lead concentrations must be decreased to comply with the National and Montana ambient air standard of 1.5 ug lead/cubic meter quarterly average;
- 2) Residents in and around East Helena should wash and limit their consumption of local broad-leafed garden vegetables;
- 3) Children should be strongly discouraged from eating snow which accumulates high concentrations of toxic heavy metals;
- 4) Young children put things other than food into their mouths as part of their normal playing activity. Because of this, parents should be instructed about the possibility of lead exposure from contaminated soils and house dusts and what precautions parents can take to minimize this exposure.
- 5) Area physicians should continue their awareness for potential cases of lead toxicity and report such cases to the Department of Health and Environmental Sciences.

- 1) East Helena, Montana, Child Lead Study - Summer 1983. Final report July, 1986

PARTICIPATING AGENCIES IN THE 1983 STUDY:

- 1) Lewis and Clark County Health Department
- 2) Montana Department of Health and Environmental Sciences
- 3) Center of Environmental Health / Center of Disease Control
- 5) United States Environmental Protection agency

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PROTECT YOURSELF FROM LEAD

Blood lead tests, such as that which are performed in the East Helena Community, are like a snapshot of lead exposure. These tests cannot protect your children from future lead exposures. Therefore, we at ASARCO encourage you and your family to participate in the Community Blood lead screening programs to make sure that blood lead and /or ZPP levels stay within the normal ranges.

Below are listed things you and your family can do to help "Protect Yourself from Lead."

- Wash hands often, always before meals
- Participate in blood screening studies
- Encourage schools to educate children about lead
- Observe children's mouthing habits including painted surfaces, items from outdoors and items left on floors
- Never eat snow or icicles
- Maintain grass; keep children away from bare areas in yards and playgrounds
- Import sand in sand boxes; change every two to three years
- Keep windows closed during wind and dust storms
- Keep house and household belongings dust-free
- Pet hair and claws are a very serious source of lead
- A balanced diet and supplemental vitamins are highly encouraged for children and pregnant women living in a leaded environment
- Avoid foods known to contain high levels of lead such as leafy vegetables, liver and kidneys
- Peel and wash root vegetables and the fruiting bodies of plants such as peas, corn, beans, etc.
- Wash fruits thoroughly
- Smoking in the home complicates the problems of lead in the household environment
- Test tap water and suspect old (before 1960) plumbing.

ASARCO, INCORPORATED
EAST HELENA PLANT

ZINC PROTOPORPHYRIN (ZPP)
WHAT DOES IT MEAN TO YOU?

Zinc protoporphyrin (ZPP) tests are similar to blood lead level tests in that they both are a measurement of body lead absorption.

On the other hand, zinc protoporphyrin tests measure the adverse metabolic effect of lead and as such are a better indicator of lead toxicity than the level of blood lead by itself. The level of zinc protoporphyrin may reflect lead absorption over the preceding three to four months and therefore is a better indicator of lead body burden.

Elevated ZPP levels have been known to occur in workers with blood lead levels as low as 30 to 30 ug/100g. But once the blood lead level reaches 40 ug/100g, there can be a marked increase in the ZPP value.

The American Conference of Governmental Industrial Hygienists have set an upper limit of 100 ug/100 ml of zinc protoporphyrin in blood lead exposed workers.

It should be noted that elevated ZPP levels have been registered in non-exposed workers who have a history of iron deficiency in their diets. Also, limited data on blood lead to ZPP levels which are associated with adverse health effects are not known. In some instances, correlating ZPP levels with occupational lead exposure may be affected by individuals of different ages and sex.

If you are concerned with your past or present ZPP values, you should consult your professional medical personnel or industrial hygienist at the East Helena Plant for answers to your questions.

The following parameters serve as guidelines for ZPP levels:

Class I - Normal	Below 65
Class II- Minimally Elevated	66 to 120
Class III-Moderately Elevated	121 to 208
Class IV- Extremely Elevated	Above 208

METHODOLOGY COMPARISONS FOR LEAD
EXPOSURE SCREENING IN THE
GENERAL POPULATION

Criteria for the exclusion for lead toxicity are more rigid today than in the past. Individuals at risk, both children and adults, can be more readily identified.

The developments in analytic instrumentation and methodologies over the years have made trace metal determinations of greater value in the diagnoses of metal toxicities. Exposure can be confirmed or excluded on the basis of metal levels found in the blood or urine of subjects.

Currently, normal blood lead levels are considered to be 20 ug/dl or less. Smokers of American cigarettes usually exhibit blood lead levels of approximately 30 ug/dl. A blood lead level above 40 ug/dl is considered to be indicative of increased lead exposure, and frequent monitoring of the subject is justified. Blood levels above 60 ug/dl are considered to be diagnostic of lead poisoning in children. Hospitalization is advised when blood lead levels reach 80 ug/dl.

There appears to be wide variation in the levels at which toxicity becomes manifest. Age and nutritional status are among the contributing factors to toxicity. For example, we have seen many workers in the lead industry who were apparently asymptomatic at blood lead levels of approximately 150 ug/dl. On the other hand, children with blood lead levels of 150 ug/dl are severely symptomatic, with some exhibiting signs of lead encephalopathy.

Urinary ALA measurement can serve as an index of longstanding severe exposure to lead. However, this test can be very misleading in assessing a population of children at risk, since many lead-intoxicated children will not be detected. A study group of 20 children with lead encephalopathy who were hospitalized at Cook County Hospital Illinois in 1966 demonstrated only one with an elevated urinary ALA level.

Examination of a blood film for the presence of basophilic stippling of erythrocytes is merely a supplementary test that can be used in the "workup" of lead poisoning cases. Stippled red cells are seen in only 25% of individuals with severe lead poisoning, and they are observed also in any condition that causes increased destruction of erythrocytes. Massive streptococcal infections and exposure to blood hemolysins are examples of such conditions.

METHODOLOGY COMPARISONS
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Measurement of the inhibition of ALA dehydratase activity has been proposed as a very sensitive indicator of lead exposure. More recent investigators consider this test to be of doubtful value in screening population for evidence of increased lead absorption; for example, it has been demonstrated that ALAD activity can be inhibited also by copper, mercury and ethanol.

Analysis of teeth and hair for lead yields information that is of historical interest at best, and little information pertinent to the problem at hand is obtained.

Blood lead content is probably the best index of current and recent lead absorption levels.

¹ Haeger-Aronsen, B., Abdulla, M., Fristedt, BI Effect of lead on aminoleuvulinic acid dehydrase activity in red cells. Arch. Environ. Health 1974;29:150

² Thompson, J., Jones, D.D., Beasley, W.W. The effect of metal ion on the activity of - aminolevulinic acid dehydratase. Br. J. Ind. Med. 1977;34:32

³ Chisholm, J.J. Screening techniques for undue lead exposure in children; Biological and practical considerations. J. Pediatr. 1971;79:719

Aren't they worth protecting?

This is a message designed to help insure your continued health, as well as your family's, while you work in a lead-related industry.

Lead is a natural part of food and drink. And, as a result, we all walk around with a certain amount of lead in our systems. But the problem starts when we are exposed to so much lead that our intake exceeds the amount our body can eliminate through excretion. Lead can get into our systems using either of two routes: It can travel into the mouth, through the entire digestive system where it can be absorbed into the blood stream; or lead can travel through the mouth and nose and into the lungs where it can be absorbed into the blood stream. This presentation is about some of the ways you can protect your health on the job and prevent lead from getting into your body. It is divided into three parts.

While most responsible companies in the lead industry have for years had programs to protect the health of their employees, the federal government, through OSHA, has recently set down detailed rules and recommendations for your continued health, and indirectly that of your family. In all cases, creating a safe working environment must be a mutual commitment of employer and employee alike.

Fatigue. Stiffness in joints. Weight loss. Lack of appetite. Headache. Abdominal pain. Nausea. Diarrhea or constipation. These are all common enough ailments, many of which we have all experienced at one time or another. Some of them are associated with virus or flu and as such as seldom more than temporary annoyances. But they can also be the early warning signs of lead poisoning, which unless treated can lead to severe and permanent brain and nerve damage.

Fortunately, due to more than fifty years of scientific study on the effects of lead on humans, none of you should ever

experience these ailments as symptoms of lead poisoning. By having your blood tested at regular intervals, changes can be detected before your blood lead rises to harmful levels. There is no predictable relationship between lead concentration in the air and lead concentration in your bloodstream. Therefore, even with your employer's best efforts to maintain an environmentally safe plant, and with your strictest adherence to correct hygienic practices, blood testing is still absolutely necessary to safeguard your health.

Since some people show a susceptibility to lead poisoning, two workers standing side by side doing the same job and taking the same precautionary measures can very likely have two entirely different absorbing rates. Because of this, each of you must be considered individually when determining how often your blood is tested. Any new employee or current employee switched to a new job in the plant should be tested much more frequently than most. For the rest of you, the frequency of blood testing should be determined on the basis of your individual absorption characteristics which is indicated by your previous blood lead level. If your blood test is done by the plant nurse, or by your family doctor, the sample analyzed by a competent laboratory, and the tests taken at the proper intervals, you will be warned of high lead levels soon enough to avoid lead poisoning and its symptoms. Just as you don't ignore the gas gauge of your car and keep driving until you've run out of gas, you can't ignore the importance of blood tests as a gauge to your level of safety. Remember, it doesn't matter how long you've been working in this industry or this plant. Just because you've never been affected before, doesn't mean it can't happen now or at some time in the future.

Protect yourself. For you and for those that depend on you.

Though it's nice to keep your place of work clean, there's a lot more to hygiene than just good looks.

The manner in which your work clothes and street clothes are kept separate will have a tremendous effect, not only on your health but that of your family, too, since lead dust carried home on your work clothes and shoes could expose all of you needlessly. To prevent this, the following are two of the most common methods of handling the clothing problem: The dual locker room setup with a shower in between, which keeps your street clothes separate from your work clothes. Here, in the street locker room, the street clothes are removed and put away until quitting time. In the work locker room, you would change into your work clothes and proceed into the plant. At the end of the day, the procedure would be reversed, except that after taking off your work clothes, a thorough shower should be taken to wash off the day's contaminants before you return to the street locker room to put on your street clothes. The second method is the single locker room, shower-supply room layout. Just as in the case of dual locker rooms, the street clothes go in the street locker at the start of the shift. But then, in the separate supply room, you would pick up freshly laundered work clothes. At the end of the day, the procedure reverses itself. But now the work clothes are deposited in an enclosed laundry hamper, showers are taken, and you return to the locker room to put on your street clothes. While these methods are two common ways of solving the clothing problem, there may be other solutions that work in your plant that are equally good. Whatever system is used, the main goal is to guarantee that your work clothes and street clothes never come in contact with one another, so that your street clothes remain free of lead contamination. The system should be designed so that you take a shower after removing your work clothes and before putting on your street clothes. And the plant should supply laundering service for your work clothes. You must never take home your work clothes. To do so would completely negate the effect of the separate changing rooms. And much worse, would expose your family to needless risk.

While it's no doubt obvious that you must wash your hands before eating or smoking, the way you wash can have a substantial effect on your lead intake. Don't just wash your hands - be sure to wash your forearm, as much of your upper arm as is exposed. Always scrub thoroughly with a nail brush and plenty of soap and water; wash out any lead particles trapped under your fingernails. Also, it is a good idea to keep your fingernails trimmed short. This makes it harder for lead dust to become trapped and easier to wash it out when it does. In addition to washing your hands and arms completely, it's very important that you wash your face before eating, drinking, or smoking. After all, what's the point of careful hand washing if you're going to put food and drink to lips that may have lead dust on them. Even though good practice dictates that work clothes are vacuumed before entering the cafeteria, it's still a good idea not to wipe your freshly washed hands on your work clothes before eating, drinking or smoking.

And as long as we're on the subject of smoking, did you know that smokers who work in a lead related industry have considerably higher blood lead levels than those who do not smoke? So if you feel you must smoke, don't carry your cigarettes into work areas where they can become contaminated with lead, and restrict your smoking to safe areas like the cafeteria. Just be sure to follow the same washing procedure you would before eating.

When handling lead compounds, caution must be used. Never dry sweep the floors, dust or use compressed air anywhere. Always use a vacuum scrubber or a wet scrubber if available. If not, at least dampen dry powdery material before removing them. Creating a safe place to work is a mutual responsibility of the employee and employer alike. While you must be responsible for your own personal hygiene, your employer must be responsible for in-plant conditions. Wherever possible, all lead containing vessels should be enclosed to prevent the escape of fumes, especially when heated or agitated. Where the fumes cannot be contained they should be extracted rather than letting them circulate through the plant. Dust and fume should

be removed at their source by means of local exhaust ventilation or by enclosed discharge and collecting systems. Operations which generate very high levels of airborne lead can be isolated in rooms by themselves. Even with all the precautions and engineering controls mentioned, to do a conscientious job, management should have an effective method of air sampling to make sure that these controls are functioning properly and that air lead levels are kept within OSHA prescribed limits. To accomplish this, you may occasionally be asked to wear a personal air sampler while you are working. By doing so, the air lead levels at your work station can be monitored. Since all of these precautionary measures are so important in protecting your health, let's quickly run through them again.

Never put your hands in your mouth or bite your nails.

Never smoke in a work area.

Avoid rubbing your nose or mouth with your sleeves or arm.

Never shake or brush dirt off clothing or other objects.

Never eat or drink in contaminated work areas.

And the same thing holds true for chewing gum or tobacco.

Never take your work clothes home.

Un-huh - not even your work shoes.

Remember, these practices are designed to protect you. Your adherence to them will also protect your family. By the way, blood lead levels that are acceptable for an adult lead worker may be too high for children and could be particularly hazardous for an unborn child.

Though potential health hazards involving lead will always be present, through a continuing effort on the part of management and you, the employee, neither you nor your family need ever suffer the effects of lead poisoning. If you follow these simple procedures, you'll be keeping lead in the plant and out of your system, your home, and your family.