PREVENTION OF HIGH LEAD LEVELS THROUGH EMPLOYEE TRAINING PROGRAMS

Lee Norman, Director
Industrial Safety and Health Consultants
Jackson, Tennessee

ABSTRACT

Extensive analyses of blood lead levels in smelter workers with and without initial employee training programs has lead to the conclusion that initial blood lead levels can be controlled by special training, briefings, and follow-up meetings with new employees. Prevention is much more effective than trying to reduce levels once they are elevated. The pre-employment physical presents an opportunity to identify individuals with initial high blood lead. Blood lead data is presented to show the trends in new employee levels during their first months with and without worker training programs in effect. Guidelines are presented for administering a suitable worker training program. For the program to be maximally effective, accurate blood lead analyses are required to prevent fluctuations in accuracy of the analyses from confusing the periodic evaluation of the worker's performance or incorrectly signalling the need for medical removal.

NEED FOR TRAINING NEW EMPLOYEES

I recognize the purpose of this symposium is to present technical information concerning control methods for reducing worker exposure to air contaminants and that, for the most part, the presentations made here today will all have to do with engineering control technology. However, I would like to discuss the opportunity the smelting industry has to prevent high blood lead levels by using effective training techniques during the employee's first sixty days on the job.

After reviewing approximately 10,000 blood lead analyses of new employees over the past three years, I am convinced that initial blood lead levels can be controlled by special training, briefings and follow-up meetings with new employees.

I realize that what I am suggesting is a complete reversal of the approach many employers have been taking up to this time. I am aware that employers spend a great deal of time with those workers who have already experienced high levels of lead in their total body system and I am also aware of the work employers do to reduce these levels. Sooner or later, however, it is necessary to "prevent" rather than "cure".

The new employee's blood lead level must be an important issue from the first pre-employment physical. The initial blood lead level should be in line with the normal lead level in the area. Without prior industrial lead exposure a new worker in Chicago may have an initial lead level of 26µg/100ml, whereas the initial blood lead level of a person who has spent the last 10 years in the rolling hills of Nebraska may be as low as 8µg/100ml. Once the normal range for new employees in an employment area has been established any abnormally high lead levels on pre-employment physicals should be questioned. Careful consideration should certainly be given to any potential employee who has not had any significant contact with lead in the past but who has an initial lead level greater than 30µg/100 ml. Such levels may indicate the employee's inability to discharge lead from his or her system.

There have been only a very limited number of clinical studies concerning lead exposure for new employees. Most of this research was performed by Kehoe in the late 40's and early 50's. In all reported cases, the blood lead levels of subjects appeared to rise rather rapidly after the initiation of the lead exposure, then stabilize as the worker adjusted, and finally slowly fall after the end of the exposure period.

My experience with more than 10,000 blood lead samples from new employees has indicated the same trend. However, I recently began to see a change in this trend as certain employers began to implement strong employee briefing and training programs for new workers. I now believe the rapid increase of new employee's lead levels can be controlled by strict enforcement of employee training programs that include careful follow-up sessions for the first sixty days the employee is on the job.

The new OSHA lead standard requires an employer to provide information and training programs for all employees exposed to lead. At the minimum the employer must inform employees of specific hazards associated with their work environment and of protective measures which can be taken. If worker training is approached as a program to control high lead levels rather than just to satisfy minimum requirements, I know that good results will be achieved.

LEAD LEVEL MEASUREMENTS

I will now present a few samples of what happens to controlled and uncontrolled blood lead levels for new employees. Table 1 shows actual analyses of blood lead levels during the first several months on the job for employees of two secondary lead smelters before training programs were implemented.

The first group of smelter workers (Smelter 1, Table 1) had average pre-employment lead levels of 25 µg%* which quickly jumped to highs of 50 - 60 µg% after only one month on the job. The second case (Smelter 2, Table 1) shoes similar large increases during the first month with exceptional jumps in two cases up to 78 and 98µg% levels.

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*µg% is synonomous with µg/100ml.

Table 1. Blood lead levels of new workers in the first months of employment at two smelters without training programs.

	Month of employment				
Employee	1	2	3	4	5
Smelter 1					
A	16µg%	50µg%	51µg%		
B	27µg%	63µg%			
C	21µg%	53µg%	57µg%		
D	26µg%	49µg%	54µg%	53µg%	54µg%
E	16µg%	37µg%			
F	29µg%		66µg%	68µg%	56µg%
G	25µg%	39µg%	38µg%		
H	17µg%		29µg%	55µg%	
I	26µg%	58µg%			
J	21µg%	54µg%	63µg%		
Smelter 2					
A	14µg%	54µg%	53µg%	50µg%	
B	16µg%	78µg%	121µg%		
C	22µg%	35µg%	43µg%		
D	18µg%	98µg%	75µg%	72µg%	
E	14µg%	50µg%	48µg%	48µg%	
F	11µg%	47µg%			
G	24µg%	34µg%			
H	10µg%		28µg%	35µg%	

Table 2 shows the results of blood lead levels in new employees taken both before and after a smelter instituted a good training program.

ELEMENTS OF THE TRAINING PROGRAM

Each employee should receive an initial briefing session including a description of the hazards of working with lead, explanation of preventive methods, and the symptoms of lead poisoning. The worker should be both told and shown how to use all of the protective equipment he or she will be issued and have the engineering controls demonstrated at the work station.

The initial briefing is only one part of the overall program and this can be done verbally or with slides or films. The more important part of the program is the follow-up with each employee. After the third day on the job, the immediate supervisor should reaffirm to the new worker points from the initial briefing and answer any questions the employee may have.

An appraisal of the probationary employee should be made at the end of two weeks and a written report prepared by the supervisor on the ability of the new employee to handle a job in a contaminated area.

The supervisor must make daily checks to observe hygiene habits and to be sure the new employee is observing company policy of washing before eating, drinking or smoking and of restricting these activities to the approved areas.

The personnel department should hold a follow-up briefing at the end of each 30 day period for the first three months, and conduct a training session when the employee's blood lead levels are received from the lab, repeating at each session those items the employee can do to reduce lead levels.

In summary, I recommend the following guide for your use in setting up a training program:

-Pre-employment briefing and training format.
-Two-day follow-up by supervisor.
-14 day re-briefing by safety director, nurse, or personnel director.
-30 day appraisal of probationary employee with discussion of blood lead levels.
-45 day employee appraisal by supervisor.
-60 day re-briefing and discussion of blood lead results.

It should be manditory for all new employees to attend a safety program for one hour each month for the first three months on the job in addition to te the schedule listed above.

It is my belief that such a program can prevent employees from rapidly developing high lead levels. Lead levels can be more adequately controlled during the first six months on the job than at later periods.

Table 2. Blood lead levels of new workers in the first months of employment at a smelter before and after a training program was implemented.

	Month of employment				
Employee	1	2	3	4	5
Before implementation of training program					
A	19µg%	52µg%		49µg%	
B	19µg%	56µg%		66µg%	55µg%
C	18µg%	64µg%	52µg%		
D	26µg%	54µg%	40µg%		
E	16µg%	63µg%			
F	5µg%	43µg%			
G	17µg%		44µg%	50µg%	49µg%
H	15µg%	27µg%	51µg%	59µg%	61µg%
I	10µg%	56µg%	52µg%		93µg%
After implementation of training program					
A	13µg%	18µg%		39µg%	
B	22µg%	33µg%	37µg%	34µg%	
C	29µg%		33µg%	34µg%	
D	20µg%	20µg%	51µg%		
E	18µg%	29µg%	45µg%	53µg%	
F	19µg%	66µg%	43µg%	32µg%	37µg%
G	16µg%	26µg%	65µg%	47µg%	
H	17µg%			40µg%	
I	19µg%	26µg%			

There are good resource materials that can assist an employer in establishing an adequate training program. Visual aid materials include films such as Lead in Motion and Lead Poisoning - it needn't be by the Lead Industry Association (LIA)*, or Recite Industrial Training Program by Resource Consultants**. An employer could even develop an in-house color slide/tape program.

IMPORTANCE OF LABORATORY SELECTION

The data which the above recommended training program relies on to provide information about the program's effect as well as the effectiveness of all the exposure control measures in the smelter is the measurement of blood lead level. It should be obvious that the accuracy of these measures is very important to prevent peaks and valleys from month to month which add confusion to the employee training program results.

Currently there are 145 certified laboratories involved in the Center for Disease Control (CDC) blood lead proficiency testing program. In the third quarter of 1979 only 57% of these labs had satisfactory proficiency testing results. Ten labs failed to get within plus or minus 50% of the target value.

Less than 30% of the certified laboratories are able to produce sample results that meet OSHA's lead standard requirement of 95 percent accuracy. OSHA recently attempted to change these requirements when it published the following statement in the Federal Register on October 23, 1978: "Under CDC standards, 75% of blood lead determinations are not to vary from reference values by more than 6µg/100ml".

I urge you to continue to require laboratories to meet the 95% accuracy goals rather than be satisfied with 75%. This difference could be significant in the medical removal program when the levels drop to 70µg/100ml on March 1, 1980.

QUESTIONS, ANSWERS AND COMMENTARY

Question (S. Smith, OSHA):

In your examples of elevated blood lead levels in the first sixty days on the job, were those employees wearing respirators?

Answer (L. Norman):

Yes.

Question (S. Smith):

Although you didn't mention it, do you recommend that employees wear respirators in the beginning when they're setting up the work practices and procedures of doing a job?

Answer (L. Norman):

Yes

Question (F. Boelter, OSHA):

If a person has greater than 30µg% (blood lead level) and has had a prior lead exposure, does this automatically prevent this individual from becoming an employee?

Answer (L. Norman):

If the potential employee has an answer for his high lead levels, i.e., if this person has worked for another lead facility or in a situation which would explain the above thirty blood lead levels, then I think this should be taken into consideration and, if all things fall into line, employment offered.

Question (F. Boelter):

Do you feel that people who have never had a prior lead exposure at 30µg% should be informed of this or how do you go about treating that information?

Answer (L. Norman):

In the discussion with the employee after the return of the pre-employment blood lead level measurements, the personnel director should take some time to find out why the employee's lead levels were elevated over thirty. The person may have been involved in a job that gave the person lead exposure that the person was not aware of. I think that:

1. The employee needs to know that.
2. Some effort should be made to determine what created the excessive lead levels.

Question (F. Boelter):

When somebody retains your services to set up a program for doing blood monitoring as well as employee training, do you find that management itself is always fully cognizant of the problems that it is faced with? And, secondly, what type of efforts do you do to train management as to what it should be doing and what is its responsibility?

Answer (L. Norman):

I'm fortunate that most of my clients have been longtime clients, and we have been dealing with this problem for quite a while. But I recognize where your question is leading. There are many, many people in the lead industry today who aren't even aware that a lead standard has been published. These people certainly need some assistance in that area.

Question (F. Boelter):

Where do the partially or at least presently stayed sections of the lead standard dealing with ALAD and ZPP fall into your recommended programs for monitoring an employee's health?

Answer (L. Norman):

My laboratory does a zinc porta porphyren (ZPP) test on every blood sample we receive in our lab regardless of whether it's requested from the client company or not. We do this as a crosscheck for ourselves to determine if there is a potential problem.

Of course, we also automatically do complete blood counts (CBC) in our lab to determine if anemia is a problem. We feel that you don't get all the answers simply by doing a blood lead level determination.

Question (M. Bergner, OSHA):

Have your observations of the fluctuations in blood levels taken into account bone deposition of lead as a total body burden or are you just looking at the free-lead levels in blood? Do you measure hemoglobin? I think you had just mentioned that in one of your answers.

Answer (L. Norman):

Yes. In the data that I presented earlier, we were looking only at lead levels found in the blood at the time of testing. However, I feel confident that, should we go back and check zinc porta porphyren levels, we would not see the rapid advancement of zinc porta porphyren as we would see in blood lead levels. I seriously doubt that we would start to see advancement of zinc porta porphyren in new employees until the worker had been on the job four to six months.

Question (M. Bergner):

What recommendations do you make to your clients as far as hiring women to work in lead contaminated areas?

Answer (L. Norman):

My recommendation is that they not hire women to work in lead contaminated areas. I agree with OSHA in their findings at the hearings that they must protect the fetus, not only the adult worker. Recognizing that the two hundred microgram level* may or may not be safe, depending on interpretation, for the adult worker either male or female, when we have the fetus to contend with we must aim towards that fifty microgram level of air exposure**. In today's smelters we may or may not be at the fifty microgram level at work stations. However, we have until 1984 in which to get down to the fifty microgram level. I feel that until we reach that fifty microgram level we should not expose the fetus of the woman at the workplace.

Question (D. Lynam, International Lead-Zinc Research Organization):

I have a question with regard to the zinc porta porphyren evaluations. Do you use the hematofluorimeter?

Answer (L. Norman):

Yes.

Comment (D. Lynam):

For the benefit of the audience I think it should be pointed out that there is good indication that the hematofluorimeter gives bad results on old blood and that the results are only reliable on fresh blood. If samples of old blood are being transported by mail then you should be using a wet chemical digestion process.

Response (L. Norman):

I recognize this. And along with this, I'll say that we've run the same sample every day for a thirty-day period, and found no drastic change. We are getting change, but we're not getting any drastic change in the first fourteen days. The difference may be twelve to twenty points, e.g., a zinc porta porphyren test that may be 296 on the first day might go to 319-320 on the fourteenth day.

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*Former OSHA Permissible Exposure Limit (PEL) of 200$\mu g/m^3$ in the worker's breathing zone.

**New OSHA PEL of 50$\mu g/m^3$ in the worker's breathing zone.

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NIOSH Project Officer: Dennis O'Brien
Project Manager: Robert C. Scholz

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