

# 1997/98 Annual Compendium of Articles and Research

Associated with

The National Institute of Environmental Health Sciences'  
Worker Education and Training Program

Compiled by

The National Clearinghouse for Worker Safety and Health Training  
for Hazardous Materials, Waste Operations, and Emergency Response

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"Can Protecting Human Health and the Environment be Justified on Cost-Benefit Grounds?," Ruth Rutenberg, Ph.D., Reprinted from *Preventative Strategies for Living in a Chemical World*, Vol. 837 of the *Annals of the New York Academy of Sciences*, December 26, 1997.

"Does Collateral Duty Require Less protection: Workers, Hazardous Materials Emergency Response, and OSHA's Failure to Protect," Craig Slatin and Eduardo Siqueira, Reprinted from *New Solutions*, Vol. 8, No. 2. Copyright Baywood Publishing Company, Inc.; in press.

"Evaluation of Training: Worker Safety and Health in the Workplace," Snigdha Mukherjee, Ph.D., Post Doctoral Fellow; Lynn Overman, M.A.; Laura Leviton, Ph.D.; and Barbara Hilyer, M.S.P.H., University of Alabama, Birmingham, 1998.

"Measurements of Oxygen Concentration of Air Within Totally-Encapsulating Chemical-Protective Suits," D. Alan Veasey, University of Alabama, Birmingham.

"Social and Economic Impact of Neurotoxicity in Hazardous Waste Workers in Lenoir, North Carolina," T.J. Callender, M. Ristovv, M. Guerra, and R. Rutenberg, Reprinted from *Environmental Research*, Vol. 73, Article No. ER973698, 1997.

"The Work Experience of New Jersey/New York Pre-Apprentice Environmental Worker Training Consortium Post-Graduates, Student Employment Patterns: April 26, 1996 through November 30, 1997," Daniel Kass, MSPH, Hunter College, January 1998.

"Worker Health and Safety Training: Assessing Impact Among Responders," B. Louise Weidner, Ph.D.; Audrey R. Gotsch, Dr.PH; Cristine D. Delnevo, MPH; Jennifer B. Newman, BA; and Bill McDonald, MA, Reprinted from *American Journal of Industrial Medicine*, Vol. 33, 1998.

"10 Years of Accomplishments," Transcript from the Panel, Comments of Denny Dobbin, Marianne Brown, and Mitch Warren, October 1997 NIEHS Awardee Meeting, Research Triangle Park, North Carolina.

"10 Year Perspective/Future Direction," Transcript from the Panel, Comments of John Dement, Donald Elisburg, and Steven Deutsch, October 1997 NIEHS Awardee Meeting, Research Triangle Park, North Carolina.

Two articles by people associated with the NIEHS Worker Education and Training Program were not available for reprint, but are published in *Occupational Health & Safety*:

Madland, John, (HMTRI) "Effective Confined Space Training," *Occupational Health & Safety*, February 1998, pp. 32-37.

Skaar, Theodore, (Ulster Community College / CCCHST) "The Hot Zone", *Occupational Health & Safety*, Volume 67, Number 4, April 1998, pp. 30-32.

## **1997/98 ANNUAL COMPENDIUM OF ARTICLES AND RESEARCH**

### **Associated with**

## **The National Institute of Environmental Health Sciences'**

### **Worker Education and Training Program**

#### **Introduction**

Included in this compendium are articles and reports by those associated with the National Institute of Environmental Health Sciences' (NIEHS) Worker Education and Training Program. The articles discuss issues important to hazardous materials training and the safety and health of workers.

The 1986 Superfund Amendments and Reauthorization Act of 1986 (SARA) authorized a program of grants for health and safety training for workers involved with hazardous materials and waste removal, containment, and emergency response. NIEHS was assigned responsibility for administering the grants program with recipients to be non-profit organizations with demonstrated experience and ability in reaching target populations and operating worker health and safety programs. The Department of Energy also has a cooperative agreement with NIEHS to make training grants. In addition, Congress appropriated additional money for a Minority Worker Training Program. This appropriation established a series of national pilot programs to test a range of strategies for the recruitment and training of young persons who live near hazardous waste sites or in communities at risk of exposure to contaminated properties for work in the environmental field.

Since the NIEHS Worker Education and Training Program began in 1986, more than 100 organizations from across the country have trained workers to better protect themselves, their colleagues, and the communities in which they work from the dangers of hazardous materials. As a result of these programs, trained employees work more effectively at their job sites to promote safer processes and procedures. Twenty awardee groups and consortia, representing labor-management, labor, and academia, have developed model curricula and delivered training to more than half a million workers.

**Evaluation of Training: Worker Safety and Health in the Workplace**

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## Abstract

Few studies of worker training have addressed the impact on participant's health and safety behaviors and efforts to change health and safety conditions at the workplace. The present study is an evaluation of these impacts as reported by workers and managers. The UAB/CLEAR program has trained over 1,000 participants since 1992. A survey mailed to a sample of workers and all participating managers revealed that both groups increased personal safety and health behavior: both contributed to emergency preparedness; and both influenced the elimination of hazardous chemicals. Managers were more likely to report greater influence on health and safety, which is explained by their position of power and influence. However, an impressive percentage of workers reported influencing changes. This pattern indicates that when the environment supports joint decision making by workers and management, initiating changes becomes easier.

## **Evaluation of Training: Worker Safety and Health in the Workplace**

### **INTRODUCTION**

Safety and health training programs for workers are conducted at an annual cost in the U.S. of more than \$40 billion<sup>1</sup>, while attempts to quantify the workplace effectiveness of the training continue to frustrate companies and training providers<sup>2</sup>. Worker training programs have evolved to meet the challenges of today's diverse workforce whose participants in training courses vary widely in their experiential and work backgrounds, language preference, literacy levels and commitment to safety<sup>3,4</sup>. Investigators have identified characteristics of training programs that predict success; however, success has been defined in many ways and has not always included measurable changes in the safety of the workplace<sup>5,6,2,78,9</sup>.

The evaluation of worker training programs has focused primarily on process measures (what happens in the class) since these are relatively easy to measure. They include assessments of trainee satisfaction with the training (utilizing a scaled form or comment sheet), knowledge gain (Frequently through pre-posttests or simply end-of-course exams), increases in positive attitudes regarding safety (worker self-report on completion of training), and instructor assessment of trainees' specific skills performance or an analysis of trainees' activities captured on videotape<sup>10</sup>. Forty eight studies analyzed by Johnston<sup>8</sup> utilized assessments of changes in knowledge, attitude and behavior as measures of training effectiveness. Post-training outcomes have been studied as well, many through interviews with participants. Many training providers have compiled cases

of successful applications of knowledge; anecdotal evidence abounds of improved spill preparedness, as well as response to and avoidance of unsafe situations<sup>11,12,8,13</sup>. In a post-training survey to evaluate the long term effects of training, respondents reported significant use of written resource materials introduced during training; success in fostering improvements in company programs, practices and equipment; and improved preparedness for and response to chemical spills<sup>14</sup>. All these measures can be considered intermediate outcomes that should facilitate prevention of injury and exposures.

While there is no doubt that the primary goal of providing workers with training is to improve safety and health in the workplace, direct measurement of this outcome has proven difficult<sup>15,16</sup>. A variety of indicators have been investigated that are presumed to be associated with improved health and safety: improved workplace, an increase in observed “safe acts” behavior by workers, a decrease in reported accidents and injuries, decreased sick leave, decreased MSHA violations, and a reduced financial outlay for lost time injuries and medical treatment<sup>17,18,19</sup>. However, a number of synergistic factors affect all these indicators, and without a controlled design it has not been feasible to demonstrate that training causes improvements. It has even been suggested that utilizing accident and injury rates as measures of improved workplace conditions can be deceptive since some safety promotion efforts involving rewards result in under-reporting of accidents<sup>20</sup>.

Another surrogate measure has been to examine whether organizational changes occur that are conducive to making the workplace safer. Many organizations providing worker



training would assert that a safety culture is required, and that to achieve it, workers must be provided with the skills and knowledge to be equal partners with management on safety issues<sup>21,20,22,23</sup>. Some worker training programs, notably those developed by union safety and health departments and university-based trainers associated with labor education centers, provide trainees with the knowledge and skills to work actively for improved workplace safety through the incorporation of a system of values, attitudes, procedures and work practices<sup>24</sup>.

Since 1992, a joint university-union training program has sought to improve workplace safety, and to measure the improvement with a post-training survey of participants. The United Paperworkers International Union, an industrial union representing approximately 240,000 members in the United States and Canada, arranged two-day classes each year in each of its eleven geographical regions. Classes were developed and taught by instructors at the University of Alabama at Birmingham (UAB) center for Labor Education and Research (CLEAR) and funded by a grant from the National Institute of Environmental Health Sciences (NIEHS). Designers of the program set forth two goals. Each participant would be trained to the First Responder Awareness Level as described by OSHA Standard 29 CFR 1910.120(q), training that essentially duplicates OSHA-mandated Hazard Communication Standard training that employers must provide to all employees who work with or around hazardous chemicals. This curriculum acquaints workers with chemical hazard recognition and protection measures. Secondly, the training program would also result in the emplacement of a cadre of peer trainers, in each local union, workplace, or geographic region who would train others to the same level and would work to recognize and remediate hazardous working conditions. To facilitate

the second goal, the classes fostered participants' abilities to solve problems and devise strategies to improve health and safety conditions in the workplace.

The curriculum included topics required for certification under the OSHA standard described above, as well as information about adult learners and practice with effective methods for training them. Participatory methods were used throughout the classes, and trainees were encouraged to choose participatory methods when they trained. CLEAR made available to member-trainers a catalog of training materials for a variety of health and safety topics, and supported their onsite training efforts through telephone contact and a quarterly newsletter. "Super Trainer" classes, providing three days of training theory and practice, were held at the end of the instructional year. As in the hazmat classes, participatory training methods were stressed at all times.

Process measures indicated the classes were successful in achieving the stated goals. Performance-based learning objectives were met, as evaluated through performance checklists, questionnaires, and verbal reports. Trainee satisfaction was high, as measured by course evaluations. Follow-up calls and written requests for information indicated that some UPIU member-trainers trained large numbers of others in their workplaces and local union halls. The question remained, "Does this training lead to an improvement in workplace safety according to accepted indicators as listed above?"

A mailed in survey was designed to evaluate participant self-reported perceptions of the effects in the workplace resulting from the training offered by the UAB/CLEAR Health

and Safety Training Program. Specifically the survey examined the degree to which the stated goals of the program were achieved: (1a) the degree to which participants identified and recognized hazardous material; (1b) the degree to which they personally avoided hazardous situations; (2a) the degree to which participants trained other workers in health & safety in the workplace; and (2b) the degree to which respondents participated in decision making about health and safety conditions in the workplace.

## **METHODS**

### **STUDY POPULATIONS**

Between 1992 and 1997, 859 men and 65 women were trained by UAB/CLEAR. Of these, 92 percent of males and 73.4 percent of females were White, 4.2 percent of males and 15.4 percent of females were African American, 1.5 percent of males and 3.1 percent of females were other racial groups, and 2.3 percent of males and 6.2 percent of females did not provide the information. As might be expected, there are relatively more minority females in this blue-collar population. (Survey respondents were not asked for demographic information).

Two groups were surveyed: a sample of workers, and the total number of managers who participated in training. A random sample of 300 workers was selected from a mailing list containing all participants in the UAB/CLEAR Health and Safety Training from 1992 through 1996. The UPIU international president provided a cover letter asking the workers to respond to the survey. This letter was included in all survey mailings to the

workers. Three rounds of surveys were mailed; reminder post-cards were twice mailed to respondents to mail in the surveys.

Every manager who had participated in UAB/CLEAR training was identified from the mailing list. Managers and workers received similar surveys except that the questions pertaining to training others were omitted from manager surveys. As in the case of the worker surveys, three mail-outs were sent to the managers. The cover letter that accompanied the manager survey was provided by UAB/CLEAR program director.

One hundred thirty nine workers responded, for a moderate response rate of 48.4 percent.

Sixteen managers responded for a moderate response rate of 53.5 percent.

## SURVEY CONTENT

The survey questions focused on the three objectives of UAB/CLEAR training. The first set of questions pertained to recognition and identification of hazardous chemicals, workers' personal exposure avoidance and control, and whether workers discussed health and safety with other workers, family and friends. The second set of questions related to the Train-the Trainer goal: whether the respondent has taught courses in health and safety at work and at the union local, and whether materials disseminated at the UAB/CLEAR classes were used. The third set of questions focused on participants' proactive efforts to bring about changes in chemical use and safety at the work place. The questions assessed the following changes since training: whether hazardous chemicals had been replaced with safer chemicals; whether chemical processing had changed; whether emergency plans had been written or improved; and whether

emergency plan training had been improved or instituted. For all these questions, respondents were also asked whether they had influenced decision-making. Respondents were encouraged to make additional comments and a content analysis was conducted on those responses.

**Table 1. Recognizing, Identifying and Avoiding Hazardous Chemicals since UAB/CLEAR Participation**

<b>Recognizing and identifying hazardous chemicals:</b>	Workers (N=139)	Managers (N=16)
	%	%
About the same	12.2	43.8
Easier than before training	84.2	56.3
More difficult than before training	2.9	0.0
Don't know	0.7	0.0
<b>Personal avoidance exposure to chemicals:</b>	Workers (N=139)	Managers (N=15)
	%	%
Less likely than before training	6.5	0.0
About the same	13.7	40
More likely than before	79.1	60
Don't know	0.7	0.0
<b>Discuss health and safety issues with workers:</b>	Workers (N=139)	Managers (N=14)
	%	%
Less often than before train	1.4	0.0
About the same	25.2	21.4
More often than before	73.4	78.6
<b>Discuss of health and safety issues with friends and family:</b>	Workers (N=139)	Managers (N=15)
	%	%
Less often than before	2.2	0.0
About the same	40.3	53.3
More often than before	56.8	46.7
Don't know	0.7	0.0

## RESULTS

Objective 1: Recognizing, identifying, and avoiding hazardous chemicals

As seen in Table 1, the large majority of workers and managers felt the training had made it easier for them to identify and recognize hazardous chemicals. A large majority of both workers and managers reported that they were more likely to avoid personal exposure to chemicals after training. However, a sizeable minority of managers indicated no change, as they had been avoiding personal exposure previously.

Additional comments by workers suggested that some workplaces had good training programs that led workers and possibly, managers to gain prior exposure to information and knowledge about hazardous chemicals. For most items, relatively few participants mentioned negative results after training, and from written comments it is clear that most of these responses were due to the workers being fired or laid off, or to the plant being shut down.

In general, participating in the training also leads to heightened awareness in terms of discussion of health and safety issues with other workers and family. Both workers and managers show sizeable changes in this regard.

**Table 2. Status of Emergency Plans since UAB/CLEAR Participation**

	Written or improved		Training or practice	
	Workers %	Managers %	Workers %	Managers %
Yes, it occurred	51.1	87.5	57.6	68.8
Participant influence	33.8	75	25.2	50.0

Objective 2 (a): Initiating changes at the workplace

The survey responses related to emergency plans are seen in Table 2. The survey asked whether emergency plans for the plant had been written or improved since the respondent's UAB/CLEAR participation. Comments by workers suggest that OSHA regulations regarding emergency plan requirements were generally being met. Most managers and over half the workers reported that an emergency plan had been written or improved since training. Of these, only about a third of workers, but fully three quarters of managers, maintained that they themselves influenced the issue. Some respondents mentioned, a plant had an emergency plan in place, but not in writing.

To be in compliance with OSHA, training and practice of the emergency plan are required. Respondents were also asked whether emergency plan training and practice, had occurred since UAB/CLEAR participation. A majority of workers and managers responded in the affirmative. Of workers, one quarter who replied in the affirmative felt they influenced the decision to implement an emergency training and practice module, while fully half of the managers perceived that they had influenced changes. Some of the comments suggest reasons why practice and training did not occur: companies may not have backed the idea; time may have been constrained; the company used outdated materials for training purposes; or that the emergency plan was still being developed.

With regard to changes in chemical use, about two-thirds of workers and a large majority of managers responded with definitive changes after UAB/CLEAR participation as seen in Table 3. Of these, about a quarter of workers and most managers believed that they influenced the changes. Furthermore, almost half of workers and most managers reported

that the changes increased safety after training. The rest of the respondents felt the changes in process were about the same. No change was less safe than before training. A majority of the workers and almost all the managers responded that since training, hazardous chemicals had been replaced by safer chemicals. Of those who reported changes, about a third of workers and most of the managers felt that they had influenced the change to safer chemicals.

Also of interest, was the fact that most workers and managers responded that changes were made in the composition of the safety committee or its activities. Of those reporting changes, a sizeable minority of both workers and managers believed that they influenced these changes and further, most managers but less than half of workers, considered that the changes were good.

**Table 3. Changes in Chemicals use and Replacement with Safer Chemicals since UAB/CLEAR Participation**

<b>Changes in chemical use or processes:</b>	<b>Workers</b>	<b>Managers</b>
	<b>%</b>	<b>%</b>
Yes	61.2	87.5
Participant influence	28.1	62.5
Safety of new process	15.1	12.5
- about the same	47.1	75.0
- safer than before		
<b>Hazardous Chemicals Replaced by Safer Chemicals:</b>	<b>Workers</b>	<b>Managers</b>
	<b>%</b>	<b>%</b>
Yes	58.3	93.8
Participant Influence	35.8	68.8
<b>Changes in the makeup of the safety committee:</b>	<b>Workers</b>	<b>Managers</b>
	<b>%</b>	<b>%</b>
Yes	60.4	68.8
Participant influence	35.3	43.8



Good changes

48.9

62.5

- Yes

#### Objective 2 (b): Train-the Trainer

The questions applying to training at the workplace were confined to the workers alone. Forty six percent replied that they had taught health and safety classes. A total of 11,529 workers have been trained by these respondents. Additional comments made by the workers suggest three reasons why some workers trained at UAB/CLEAR have not trained other workers. First, some companies require that the safety director or other designated manager take control of worker training. Second, companies have discussed the issue but have not implemented it. Third, some companies already have their own safety training programs in place.

Thirty one percent of workers reported that they taught classes at the local union. These respondents taught a total of 3,554 trainees in the union setting. The comments suggest that workers tended to go to safety meetings at work, and so they did not feel the need to have training sessions at the union local. Finally, of those workers who trained others, 53 percent reported using ideas and materials from the UAB/UPIU class.

#### SUMMARY OF OPEN-ENDED COMMENTS

Comments accompanying the responses were content-analyzed to understand why training did or did not have impact on workplace safety. The comments received with the survey were grouped into themes. It is important to recognize that some respondents

reported no changes had occurred, because the level of health and safety standards were already high, and no improvements were needed. Because comments were voluntary, they can provide some insights, but do not indicate the prevalence of reasons.

- Company facilitation: Comments substantiate the idea that the companies were supportive of the worker's efforts to participate in health and safety training, and to contribute to planning of these programs in the workplace. Example comments included:

- “We have an excellent training program in our mill.”

- “We have safety team meetings and talk about unsafe items and chemicals.”

- “Company working on improving plan due to training.”

- Company barriers: Comments under the rubric of “company barriers” are divided into two subcategories, barriers due to lack of worker control; and barriers due to lack of company support. A lack of worker control often reflects policies within a company that have prevented workers from using the training. Examples of comments reflecting company barriers are:

- “Division rule that only supervisors will do the safety training.”

- “Our safety program is stagnant due to the constant change in management in the last year-and-a-half.”

A lack of company support often indicated that workers believed management was not interested in safety, as reflected in these comments:

- “ Safety not important to them anymore.”
  
- “Company dropped safety meetings.”
  
- “The company had and still has no use for my skills in this field.”
  
- Lack of appropriate setting: Comments described various issues, such as workers being laid off, mill closings, and changes in job status or position. In general, these comments indicate that the workers no longer had the opportunity to utilize training.
  
- Role of the local union: Respondent comments reported union local activities, such as:
  - “We have a local union safety director who actually does the teaching. He uses us (Hazmat) participants to help him develop his training program...”
  
- Some comments also suggested barriers within local unions:
  - “Not enough members attend meetings.”
  
  - “We had some serious problems at our local back then, and I never finished the (three-year) course.”
  
- Adequate safety and health activities: Comments reflected good training programs already in place and an emergency plan that is prepared and practiced:

- “Our mill has good training -- and I was one of the trainers so I had more exposure prior to your training than most people.”
- “Already had emergency plan in place.”

## **DISCUSSION**

There is every reason to believe, based on these data, that UAB/CLEAR is a successful program. This evaluation fills an important gap in knowledge regarding worker health and safety training and its impact on the work place. There are few evaluations in this area<sup>15,16</sup>. Therefore, we have very few quantified standards of comparison. However, certain groups are in a position to evaluate the outcome of training programs: both Regional Directors of Unions and those involved with worker training across the country, have mentioned that they are favorably impressed by the survey results. The three survey results that they found indicative of the participants’ greater awareness of health and safety issues in the worksite are:

- Results demonstrate the degree to which training made it easier to recognize and identify hazardous materials.
- The degree to which workers and managers were more likely to personally avoid exposure to dangerous chemicals.

- Since UAB/CLEAR participation, the degree to which trainees were more deeply involved in health and safety issues, informally (in discussion with others) and formally (through training of other workers).

Some other results are worth noting. As a result of training, emergency plans were written or improved to meet OSHA compliance. More emergency drills were also taking place. Safety committees, both union and joint labor-management, were changing to reflect the knowledge that chemical awareness training brought to the workforce. The results also indicate that UAB/CLEAR program has met with some success the objective of empowering the workers to control their own safety and health.

The percentage of positive responses was much greater than these experts expected, given their implicit baseline. Although it is true that the survey's response rate was modest, many mailed surveys have far lower response rates. Also, even if we were to assume that the 50% of non-respondents had nothing positive to say, the results would still be quite favorable to the program. Another potential caveat is that some changes may have been initiated due to government requirements or other policy decisions made, irrespective of training. However, these changes also occur in the context of training that produces far fewer changes.

There are several possible reasons for the successful results. First, the training is voluntary. In comparison, many on-site sessions in work safety are mandatory, or strictly for compliance. Participants are more likely to enroll in the training at UAB/CLEAR due

to interest and perceived need. Second, it may also be a function of the quality of the training. The university instructors design, develop, and deliver the courses. Further, to meet the needs of the trainees, class evaluations are analyzed, and the curriculum is constantly improved or revamped to meet the needs of the trainees and health and safety requirements. Finally, word-of-mouth has convinced participants that the training will be useful, which may motivate them to use the training. All of these forces may lead to a self-selection of highly motivated participants.

The contrast in the responses of the workers and managers deserves some comment. Managers tend to perceive greater personal influence upon changes in the work place. There are several reasons that the response of the workers is different from the managers. First, managers have more prior education, training and knowledge of chemicals, as well as health and safety issues. Second, managers have a vested interest in reporting change and due to their feeling of responsibility, may perceive things more positively. Finally, managers have greater control in the workplace and therefore have a greater opportunity to influence safety improvements.

The sense of influence and perceived control is termed high self-efficacy by behavioral researchers and is a strong predictor of action across many situations. Self-efficacy is the conviction that one can successfully perform the behavior required to produce desired outcomes<sup>25</sup>. Perceived self-efficacy has been shown to affect whether individuals consider changing their behavior, the degree of effort they invest in changing, and the

long-term maintenance of behavior change. It can be viewed as a personal resource to cope with the environment.

Participants for training come from a broad spectrum of experience in terms of company adherence to health and safety requirements, worker participation, and decision-making regarding health and safety issues. It is our belief that workers with high self-efficacy come from companies where there is greater worker-management cooperation and participation in decisions. A second group does not come from participatory workplaces, but they have reported success in initiating changes in the workplace. CLEAR is following through with them, with the goal of building up the CLEAR curriculum. Where decision-making is shared, anecdotal evidence indicates that health and safety may have greater protection.

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## 1. Introduction

The Occupational Safety and Health Administration (OSHA) recognized the substantial health hazards faced by hazardous waste and chemical emergency response workers when it promulgated the Hazardous Waste Operations and Emergency Response Standard (1910.120) (U.S. Department of Labor, 1989b). OSHA's inclusion of detailed, mandatory worker training requirements within the standard recognized training's strategic importance in promoting regulatory compliance, safe work systems, and improved worker health and safety. Combined estimates by OSHA and National Institute of Environmental Health Sciences (NIEHS) have suggested that more than 2 million workers were in need of this training (Hughes, 1991) and that these enormous training needs may expand for the foreseeable future. While substantial progress has been made to develop the capacities necessary to provide this training, development of the parallel capacities needed to evaluate how and to what extent training has been effective remain as critical issues.

Recognizing the enormous need for institutionalized capacities to train workers vulnerable to the risks of hazardous waste and chemical emergencies, the U.S. Congress established within the NIEHS the largest worker training grants program in U.S. history (Superfund Amendments and Reauthorization Act, 1986). In ten years of operation, the NIEHS Worker Education and Training Program (WETP) fostered the creation of 20 training consortia comprised of nearly 100 organizations. Combined, these consortia have trained over 600,000 workers (NIEHS citation).

However, while the NIEHS WETP has been part of a broad-based growth in worker training, some have expressed caution regarding the lack of a parallel expansion

in the use of program evaluation to assess the effectiveness of this training (Ford and Fisher, 1994; Goldenhar and Schulte, 1994; NIOSH 1995, 1996). Addressing this concern, program evaluation has become an increasingly important issue for health and safety training programs in general (Johnston, Cattledge, & Collins, 1994; Goldenhar, & Schulte, 1994, 1996; Schulte, Goldenhar, & Connally, 1996) and for NIEHS WETPs in particular (Dement, 1989, **Dement, 1996—correct cite?**; Gotsch, & Weidner, 1994; Moran, & Dobbin, 1991).

A recent review of NIEHS WETPs evaluation studies examined over 50 reports and eight published articles from 18 grant consortia spanning eight years of programming (McQuiston, 1996). That review found extensive evidence of work site changes aimed at improving the health and safety of workers and communities across the U.S. The positive findings amongst this diverse group of NIEHS awardees and training populations suggested that these programs were highly valued by both workers and management, and that they had substantially affected hazardous materials related health and safety conditions. Thus, these programs and the studies of their impacts, provide a foundation upon which to build additional research and evaluation capacities and initiatives.

While McQuiston's review (1996) noted the strengths of the NIEHS WETPs and their evaluation, it also identified important methodological and design limitations among the studies. Additionally, a substantial majority of NIEHS WETP evaluations neither articulated nor examined theoretical frameworks regarding the sources of health and safety problems or the ways in which training was to address them. Several important themes related to program evaluation emerged in the review of NIEHS WETP evaluations and a subsequent needs assessment conducted among worker health and

safety program staff and trainers for the development of an evaluation resource guide (McQuiston, unpublished; George Meany Center for Labor Studies, 1997). These themes included: (a) worker training programs and their personnel were inadequately prepared to participate fully and meaningfully in program evaluation; (b) program personnel viewed program evaluation with skepticism and regarded it as an externally imposed burden carried out solely to satisfy the funding agency; (c) evaluation was not viewed as functionally integrated into the overall training program or as serving its core needs; and (d) evaluation studies had methodological as well as nonmethodological limitations consistent with reviews of evaluation practice in health and safety training (Goldenhar and Schulte, 1994; Goldenhar and Schulte, 1996; Votjecky & Berkanovic, 1984-5; Votjecky & Schmitz, 1986).

Some of these themes were consistent with critiques of research and evaluation practice both within and outside the area of health education. These critiques have characterized traditional social science approaches as elevating researchers' needs for rigor and control above the practical concerns of program participants and staff, as perpetuating detached and adversarial relationships between evaluators and programmers, and as emphasizing measurement of long-term outcomes in ways that may have little chance of detecting changes while ignoring the needs of programmers to understand *how* they are or are not having their desired impacts (Green, et al, 1995; Usher, 1995).

In summary, these findings indicate that while research and evaluation capacities may be available to worker health and safety training programs, often they are underdeveloped relative to other aspects of programming, and are isolated among professionals who are external to the programs. Additionally, absent a useful integration

of research and evaluation into overall programs, available time and resources to study programs and their effects as well as the motivation to use them remains highly dependent on the demands of the funding agency.

## **1.1. Background**

In many ways, the research and evaluation capacities of NIEHS WETP awardees reflect the field of occupational health and safety in general. Schulte, Goldenhar and Connally (1996) noted in their overview that the field of occupational health and safety lacks a “rigorous history of research on what works and does not work to prevent and control occupational diseases and injuries” (p. 285). To strengthen the field’s research and evaluation capacities they recommended: (a) development and application of multidisciplinary approaches, (b) increasing the very limited number of skilled evaluators, and (c) exploration of the variety of tensions inherent in health and safety intervention research in order to develop effective strategies to address them. Concerning this last point, these authors stress that the developed strategies should be capable of: (a) effectively coping with demands for both practicality and rigor; (b) explicitly addressing the differing values held by various stakeholders (e.g., management, workers and their unions, and researchers); (c) creating an equitable distribution of decision-making and control among stakeholders regarding programmatic and research processes; and, (d) confronting and rectifying the historical overemphasis on individual behavior solutions and the corresponding neglect of other health and safety related systems.

In a related examination of the state of the occupational health and safety intervention research literature, Goldenhar and Schulte (1996) pointed out fundamental issues that need to be addressed if effective and efficient intervention methods and

models are to be developed, tested and spread. According to these authors, the scarcity of published research studies is compounded by the need for studies that: (a) use stronger research designs and **more [TMI] rigorous methods**; (b) make greater **use of theory in both program planning** and evaluation; (c) increase attention to, and document the ways in which programs are actually implemented; and (d) examine contextual factors potentially affecting interventions and their impacts. Goldenhar and Schulte made special note of the scarcity of published occupational health and safety studies using participatory action research, pointing to this approach as a potentially effective framework for creating collaboration among researchers and other organizational stakeholders.

The recent characterization of the underdevelopment of intervention research among occupational health and safety scientists resonates with findings a decade earlier in national surveys of routine evaluation practice of health and safety training programs in industry conducted by Votjecky and Berkanovic (1984-85) and Votjecky and Schmitz (1986). In combination, these researchers suggested that most evaluations inadequately assessed not only program design and implementation, but program effects. Further, they concluded that weak evaluations were unlikely to lead to training improvements that could reduce injuries and illness, and that the potential for strengthening evaluations was undermined by a scarcity of persons in the field trained in program evaluation. Consequently, like those a decade later, they argued that lessons from real world applications of “competent evaluators” need to be disseminated in the literature if the capacity to deliver effective training is to be expanded and the potential benefits of evaluation are to be realized and appreciated.



While the calls for increasing and improving evaluation practice in health and safety education may be compelling, the drive to fulfill these theoretical needs carries with it an untested assumption that findings will be applied, and that organizational learning and programmatic advances affecting worker health and safety will occur. Studies from other fields suggest that such an assumption may be unfounded. Notwithstanding intentions that evaluation findings should influence decision-making, Patton (1997) has called the question of evaluation use “a critical public issue” (p. 4) that needs to be met by “narrowing the gap between evaluation findings and actually using those findings for program decision making and improvement” (p. 6). While questioning the limited definition of “use” Patton nonetheless noted that much of the evidence is “overwhelming in concluding that evaluation studies exert little or no influence in decision making” (p. 80). While Patton gleaned from the research literature on evaluation use that “‘valuing evaluation’ is a necessary condition for evaluation use” (p. 26) he has also stated that such valuing must be cultivated. Similarly, recognizing the untapped potential of evaluation findings for programs and organizations, Cousins and Earl (1992) remarked, “the question becomes, how to make them [evaluation results] accessible and important to users and responsive to their needs while maintaining sufficient technical quality” (p. 399). Their examination of 31 reports related to actual use of evaluation results led them to develop a framework for “a theory of organizational learning and researcher-practitioner linkage.” This framework related to the use of evaluation findings includes: various conceptions of “use” (e.g., to guide program changes, to measure impact and persuade, or to develop shared understandings); the impacts of both participatory research processes and evaluator-practitioner linkages; the

importance of developing shared understandings regarding research findings; practitioner training in research methods; partnering with universities; and the impacts of locating evaluation internally. Complementing this framework, Patton (1997) refers to “evaluation’s premier lesson” as learning that attention to “personal factors,” that is, focusing the needs of those persons “who understand, value, and care about evaluation” (p. 50) fosters the use of evaluation findings.

Cousins and Earl (1992, 1995), Patton (1997), and Greene (1987, 1990) each conclude that a fundamental solution to the problems of non-use of evaluation results lies in participation in the evaluation processes by the intended primary users. Based in significant part on the social and organizational learning theories of Argyris and Schön (1978), Bandura (1977, 1986), and Senge (1990), Cousins and Earl (1992, 1995) see the concept of “organizational learning” as a foundation supporting the participation by intended users in all phases of the evaluation processes. Conversely, they see evaluation as a potential “organizational strategy” that promotes learning through the generation of knowledge within as well as through the acquisition of knowledge from the outside the organization.

Collectively, these assessments of evaluation practice suggest three critical needs related to worker health and safety training: (1) the need to build evaluation capacity and expand evaluation practice among those in the field, as well as among professional social scientists and educators; (2) the need to improve both the quality and utility of research and evaluation practice, and (3) the need to address potentially difficult social and political issues related to the exercise of influence and control over that practice.

It is possible to draw parallels between the organizational learning as a basis for participatory evaluation and arguments for workers' need, through their labor organizations, to develop and test their own theories about the causes and solutions of industrial accidents including the role played by their health and safety training programs. Dwyer (1991), in his sociological treatise on industrial accidents found substantial evidence that industrial error, and its related consequences of injury and death, are socially produced. In making this case, Dwyer concluded, that where primary tasks involve the "mastery of exceptional events" affecting health and safety, workers need increased autonomy to control their workplaces and an intimate understanding of the underlying causes and sources of both social and technical systems inadequacies or "errors" that lead to illness and injury. The later, in the nomenclature of intervention research and evaluation borrowed from organizational learning theory, is a call for workers' participation in the development and clarification of their own "theories of the situation" (or problem) (Schurman, 1996). Moreover, Dwyer has argued that education can either further or hinder workers' capacities necessary to anticipate potential risks, and act to eliminate or control them. Further, he suggests that a necessary component of the ongoing processes of eliminating and controlling workplace hazards is workers' construction of their own explanations regarding those hazards through learning processes that are consistent with their own culture, and the visions of truth and justice embedded within it. In intervention research and evaluation nomenclature, this education and its intended impacts in the workplace represent a "theory of action" (Argyris and Schön, 1978; Patton, 1996) or a "theory of change" (Connell & Kubisch, 1997). In the context of worker health and safety education, these theories represent the ways in which

those involved, for example, administrators and trainers, understand how their programs affect the actions taken by workers to make their work environment safer and healthier.

Dwyer's views are accentuated by those of Merrill (1995) who has proposed an empowerment model of worker education that seeks to extend the bounds of worker participation and control to include "anything and everything that must be done in order to put on a training course" (p. 43) in order that workers may make "what goes on in the classroom as indistinguishable as possible from what ought to go on in the work site when it is being managed safely" (p. 44). Merrill suggests that education programs that are empowering are "founded on the belief that if workers are to exercise greater control over the workplace, they must first—or at least simultaneously—exercise greater control over the classroom ... to ensure that they have the power actually to effect, through their involvement, the program's outcomes" (p. 44).

The progressive expansion of workers' roles in health and safety training programs signals a potential readiness for worker-trainers to participate in program related research and evaluation. Consistent with an empowerment approach to education, a number of organizations have sought to make their worker health and safety education programs more participatory and empowering on other levels. Most prominent have been reports of worker involvement as peer trainers in union-based programs (Deutsch, 1996; McQuiston et al., 1994; Merrill, 1994; 1995). More recently, two studies found that worker-trainers, when using participatory educational methods, can be as or more effective than professionals in improving their fellow workers' knowledge, self-efficacies, and behaviors (Cary, van Belle, Morris, Cameron & Bourcier, 1997; Kurtz, Robins and Schork, 1997).

Worker health and safety training programs have also involved workers in program development (e.g., on advisory boards, as curriculum and materials developers and reviewers) (McQuiston et al., 1994; Merrill, 1994, 1995; Roter, Rudd, Keough & Robinson, 1987). Outside the realm of participatory action research, examples of worker involvement in health and safety training research and evaluation have been limited in both number and scope (Merrill, 1994; Parkinson et al., 1989). In contrast, within the participatory action research realm workers have been heavily involved in research and evaluation activities in studies of ergonomics (Moore & Garg, 1996; Schurman, Silverstein & Richards, 1994), and in a long-term study of occupational stress (Baker, Israel, & Schurman, 1994; Heaney, Israel, Schurman, Baker, House, & Hugentobler, 1993; Hugentobler, Israel, & Schurman, 1992; Israel, Schurman, & House, 1989; Israel, Schurman, & Hugentobler, 1992; Israel, Schurman, Hugentobler, & House, 1992).

The premise of the present proposed study is an extension of both Dwyer's (1991) and Merrill's (1994; 1995) arguments. This extension holds: if worker education is to effectively contribute to, rather than detract from, worker health and safety, workers need to be active participants not only in designing and carrying out that education, but also in developing and testing explanations regarding how it affects workers and their efforts to change work place systems that impact on health and safety, and in conducting research and evaluation needed to assess and understand how, why and to what extent that education is effective. Only through their participation and control can workers develop what Dwyer terms "functionally adequate knowledge" and "causally adequate explanations" of the role of their education and training programs in improving health and safety. Further, their participation and control is necessary if that knowledge and

those causal explanations are to be “confirmed by reference to workers’ meaning systems” and “their sense of truth and justice.” Finally, development of their own capacities related to research and evaluation should enhance the ability of workers and their organizations to be self-determining or empowered in these efforts.

Using the framework of participatory action research, and echoing Dwyer’s (1991) and Merrill’s (1995) notions of workers’ roles in creating healthier and safer work place systems, Schurman and Israel (1995) have argued for the direct involvement of system members in processes of individual and collective learning and in creating systems change. They assert that “direct participation in the reconstruction of their own work activities” provides organizational members with opportunities to gain expertise as well as insights about their own work, and its interconnectedness with the work of others on various levels of activity (p. 240).

Within a systems framework (Katz & Kahn, 1978; Scott, 1992), worker health and safety training programs and this pilot project are seen as subsystems relative to their sponsoring organizations. Thus, an extension of Schurman and Israel’s assertion to the present study suggests expanded participation and collaboration in the realm of research and evaluation by project teams related to their training programs has the potential to develop critical awareness and promote systems (or organizational) learning regarding educational and evaluation practice.

This interpretation of the role of research and evaluation, as well as the role of participants within it, is the foundation of empowerment evaluation (Fetterman, Kaftarian, & Wandersman, 1996), participatory research (Brown, 1985, 1993; Brown & Tandon, 1983), participatory action research (Israel, Schurman, Hugentobler, & House,

1992; Schurman, & Israel, 1995), participatory evaluation (Cousins and Earl, 1992, 1995), and the related research and evaluation framework of the “theory of change approach to evaluation” (Connell and Kubisch, 1997). These frameworks form the basis of the Self-sufficiency Research and Evaluation Pilot Project (SREPP) which is the subject of the proposed study. SREPP involves five long-standing NIEHS Worker Education and Training Programs each of which will create a project team comprised of worker-trainers, program evaluators, and program staff. The purpose of the proposed study is to assess how and in what ways SREPP contributes to the development of theory and practice of more empowering ways of engaging in research and evaluation in worker health and safety training programs.

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Allan - “in my mind it is questionable whether empowerment evaluation approaches can do these -  
underlined - more rigorous methods; use theory in both program planning

# NIEHS 10-Year Anniversary Meeting

## October 20, 1997

### **Worker Education and Training Program**

#### 10 Years of Accomplishments Panel

Moderator: Denny Dobbin, NIEHS

First speaker: Marianne Brown, CA-AZ Consortium

Second speaker: Mitch Warren, Laborers-AGC

**DENNY DOBBIN:** The theme of this meeting is the Superfund Worker Training Program, and what it has accomplished during the ten years the program has been in place. It's extremely important that we do this. I learned from Steven Deutsch that every once in a while you have to take time, stop, look back, see what you've done... and take some credit for it. It's good to be able to do that today.

To start with, we've survived. When you think about the struggles we've had over the last ten years, the fact that we're even here today – and that we're here in greater numbers than we were ten years ago – runs parallel to what William Faulkner said in accepting the Nobel Prize for Literature: “Not only have we persisted over the last ten years, we've prevailed”. The program has grown and remained united despite many struggles. It's grown in both scope and content.

We started with \$10 million back in 1987. Dr. Sassaman and Dr. Dement put that program together very quickly, as she told us this morning. Grants for ten million dollars were awarded to eleven organizations. The program has grown to approximately four times that size: currently authorized at \$37 million in funds from the Department of Transportation (DOT), the Department of Energy (DOE), and the Environmental Protection Agency (EPA). I think of DOT as still being part of us, although we've only had a small amount of money from them over the years. But unless something's changed, we're still in the authorizing language. We just have never been able to get any money appropriated for it. So it's still an area for potential growth, and we should not give up.

I was reflecting this morning on some of the themes we've had in our growth period. They really fit the paradigm that was illustrated by our leadership this morning with the three-sided figure, the triangle: communication, convention, and science. One of the things we've accomplished with this program--and we'll want to discuss it today in our panel--is developing a culture of quality worker health and safety training that really hasn't existed in the past. We've pushed that forward over the last ten years, focusing on evaluation of the program at all levels: from the day-to-day training to the overall program, using a high level outside review panel.

Communication has been extremely important. The partnerships formed over the last ten years with our sister federal agencies -- DOE, EPA, and Transportation -- and the partnerships we've formed among ourselves are significant. There are, for example, differences between the union perspective and the university perspective, and one of the



strengths of the program has been learning to reconcile some of those differences, to work together, and to solve problems building on mutual strengths.

To touch on communication and science again, I think the technical workshops we've held over the last ten years have made a significant contribution, not only to these fields--worker health and safety, Superfund, transportation, and minority worker training--but also as a model for all worker health and safety training and worker protection. The Clearinghouse is part of our history. It gives us a focal point to have a central place where our information is archived and from where it can be disseminated. It's important to have a record to show what we've done technically and scientifically.

Finally, I think the institutional building we've done is the theme of the last ten years, the fact that we're here today with 20-some grants and over 75 institutions represented. The variety of areas we've ventured into shows one of the program's great strengths. What we hope to do today is spend a few minutes on the labor perspective and a few minutes on the university perspective. Then we'll have a dialogue about some of the features which have characterized the last ten years. So let's begin with Marianne Brown then move on to Mitch Warren before we take questions and comments.

MARIANNE BROWN: Thank you very much, good afternoon. I'm supposed to be covering the university perspective but I think it actually has been a joint effort between universities, unions, and the community-based organizations that have been pulled in through the minority worker training program. I can't talk exclusively about the universities because we're linked together as partners, both within our consortia and outside our consortia. I also want to recognize the National Institute of Environmental Health Sciences and all the staff who helped foster these connections among all of us working in the area of worker health and safety.

I did get a chance to talk to people from each of the universities to get their ideas about the important things that have happened over the ten years in their programs. I'd like to convey these ideas, and if we have time at the end, I'd like the people in those programs to add anything I've left out. The university programs -- for people who are new -- are the New England Consortium, based at the University of Massachusetts, Lowell; the University of Alabama, Birmingham; the Midwest Consortium in Cincinnati; the New Jersey-New York Consortium based at the University of Medicine and Dentistry of New Jersey, Rutgers, and the California-Arizona Consortium at the University of California, Los Angeles.

One of the most important accomplishments made through the minority worker training program, our newest NIEHS program, has been reaching new training groups. Some of the university consortia were and still are involved in that. We train low-income youth from communities of color and they go on to get jobs. Speakers this morning have already talked about the percentage of young workers from the inner city who have gone on to get jobs, or gone on for further training, education, and degrees. This is a legacy we're continuing to develop, and I think it's truly exciting.

The community-based organizations involved with those minority worker training programs have been able to leverage additional funds, from, for example, the Department of Housing and Urban Development. At the National Trainers Exchange in April in Manhattan Beach, we were all moved by Kizetta Vaughn's presentation on the program as well as by Gregory Jones, a graduate who came with his son and talked about what the program did for him. When I talked to Kizetta, she said, 'He's not unusual. He spoke for many hundreds of people in the program when he spoke about what he got out of it and what he went on to do.'

Through the Worker Education and Training Program, there has also been a connection with the environmental justice movement. Many attended the important conference held outside Washington, DC, in February 1994, when the President signed the executive order on environmental justice. Certainly the Director of NIEHS, Dr. Olden, was very instrumental in organizing the conference and seeing to it that that effort continued. We should also give credit to Congressman Louis Stokes for seeing that this minority worker training program existed. In the area of additional workers of color whom we've trained through our traditional training program, we've reached Spanish-speaking workers who work at TSD sites, at clean-up sites, at many different sites where hazardous materials are handled, in the West, the Southwest, the Southeast, the Midwest -- it's not just in the Southwest anymore that we have Spanish-speaking workers. In the South Pacific, workers in Guam, Saipan, American Samoa and Hawaii have benefitted, especially from emergency response training. The program has reached Native Americans in Nevada, Arizona, Alaska: it was really quite exciting hearing B.J. Griego, a railroad worker who is part Latino and part Navajo, talking about using the Navajo language in the training he did with Navajo railway workers. He went on to connect with the Southwest Network for Environmental and Economic Justice and do training there, so we have cross-training among programs, and that's a very positive thing.

Another important topic touched upon earlier is the continuity that has evolved between geographical areas. For example, some of us have been training emergency responders in adjacent communities who previously were only communicating when they were both brought in for an incident. Thanks to this program, emergency responders in one community began communicating with those in another because they were participating in the same training class. They learned each other's protocols and shared ideas. We also serve as a model for others doing worker training, although we're certainly not the first: OSHA's New Directions Program and others before distributed money to do similar training.

We had two technical workshops where we developed a minimum criteria document for training hazardous waste workers. NIEHS deserves a lot of credit for bringing together the various stakeholders to those workshops -- labor representatives, employers, government agencies, and private consultants. They all helped to develop the criteria which were adopted almost lock, stock, and barrel by OSHA and were put in Appendix E of 1910.120. Our only regret is that they're not mandatory guidelines. But the criteria are used by ourselves and others with these kinds of training programs to demonstrate that our programs are in compliance. The document came out of our own experience, from both a technical and an educational standpoint. We developed criteria and training requirements which can be generalized to the marketplace. Our curricula have also been gathered at the National Clearinghouse for Worker Safety and Health Training for Hazardous Materials, Waste Operations, and Emergency Response. Many companies and public agencies have ordered this material, which is now being used all over the U.S. All of us involved in developing this kind of curricula get telephone calls about it. So the commercial marketplace is trying to emulate our training programs, although, unfortunately, not as much as we would like.

Internally, within our network here, we've shared our curricula and evaluation ideas. We have incorporated learner-centered participatory based learning. We can give a great deal of credit to OCAW and Les Leopold at the Labor Institute for their guidance in this area. We did a small group activity at the first technical workshop. So gradually we've all developed more learner-centered education in our programs. Also, just to give a few examples, our program took the risk chart method from the International Chemical Workers Union and applied that in our evaluation approach. Others have used our "toxic jeopardy," which has been used widely, and I know the trainees really enjoy it. We have collaborated on developing videos with the Laborers and other groups.

Two things that really helped were the two National Trainer Exchanges we all participated in at Baltimore's Maritime Academy in the fall of 1994 and Manhattan Beach in 1997. Those were great opportunities where people brought a lot of ideas and we went back re-energized. We have another one I think scheduled in a couple of years, so we're looking for some leadership on that. We're also coming up with new

curricula. I know in our program one hazardous material area is emergency response at clandestine drug labs. Emergency responders have to go into booby trapped areas where there are a lot of heavy duty chemicals. It's not just an issue affecting Southern California: I understand that the Midwest is having a lot of these problems too, so we can share the curricula we are developing in this area.

In our programs we've worked with new partners both externally and internally. There's been a lot of cross-training among grantees. A few examples. I know that for both AFSCME and the Chemical Workers, the program at Berkeley has developed materials and training which is sensitive to workers with limited literacy. There's been collaboration between the Railroad Workers and the Chemical Workers; the New England Consortium and the Oil, Chemical Atomic Workers; among the UAW, the University of Alabama-Birmingham; and among the Ironworkers, the Teamsters and the railroad workers. The Midwest consortium spawned a "New Initiative Program." The Carpenters and AFSCME were initially part of other consortia. Now they are grantees on their own.

Within our consortia, we developed relationships with people and organizations in our communities we hadn't worked with before. The New Jersey-New York Consortium has worked with NYCOSH and Hunter and certain community-based organizations in New York; the UAB with Jackson State; our program with SEIU and others; the Midwest Consortium with SEMCOSH and the Greater Cincinnati Occupational Health Center; the New England Consortium with COSH groups in the Northeast. And the list continues: remember, more than 75 organizations are involved in this program!

Core support is another crucial area. Core support for this program allowed us to have a greater occupational health and safety presence in our region and the community we're serving. Here's an example from UCLA. Before this program, I worked three-quarters time on health and safety. I had a one-third time industrial hygienist and a ten-hour per week student. Now we have a 20-person program because we received additional grants from other sources besides NIEHS. Another example: the New England Consortium was just starting the Work Environment Program a few years ago, now they have a much larger program. So it's brought in other projects and funding to expand health and safety training for many of us and for this we are really grateful... and overworked!

One point Carol Rice made is that this program helped keep other programs afloat and build capacity. The COSH groups on the East Coast are part of the New England Consortium. With a downturn in New Directions money from OSHA in 1983 and 1984, it was certainly hard to keep afloat. I think this re-energized them and gave additional resources to those programs so they could keep going. All this is equally true for the unions. Program spinoffs resulted. There's much more emphasis on having the workers at the site actually do the training, along the lines of the model that Social Democratic countries like Sweden and Germany have adopted from the beginning. Other spinoffs include literacy training and service sector training; for the first time it was recognized that workers—for example, in health care—are hazardous materials handlers and hazardous waste handlers, and that they need some hazard awareness training.

I would put evaluation on an equal footing with core support. Program evaluation has consistently been stressed by NIEHS. New Directions gave support to it too, but I think the greatest emphasis on evaluation came from our funding agency. Worker education is certainly unique in comparison with, say, employer-based education. There, program evaluation is not usually a big component, and it's not routine that the information gathered from evaluations is used to revise the program. The minimum criteria document also addressed the importance of evaluation. We got some ideas about evaluation from the Midwest Consortium with the latent images technique. They pioneered among the university contributions in this area. I can also list UAB with their table talk exercises, the New Jersey-New York Consortium with their battery of multiple choice questions, and they also helped us get on the same page when it came to the data we were gathering on our registration forms.

Lastly, NIEHS provided forums for numerous issues: minimum criteria workshops, technological innovations in hazardous waste mitigation workshops, curriculum workshops, the National Trainers Exchange, evaluation workshops--all of those helped us

work together. Most importantly, I think the program continues to be of high quality. And because we share a lot of our information, and we learn from each other, fun! And I can say this even though I've been involved in it for almost eleven years. In closing, I think I speak for everyone when I express my appreciation to Dr. Olden, Dr. Sassaman, Denny, Chip and Sharon, David, Patricia, Joyce, Dorothy and everyone else who's helped make this program what it is.

MITCH WARREN: Good afternoon. I want to thank Chip for the invitation to participate in this panel.

The older I get, the more I tend to reminisce. As I prepared for this presentation I remembered being in Detroit in the summer of 1985 with Don Elisburg and the former director of Laborers-AGC, Warren Anderson, participating in an arbitration case. I remember one particular night talking about the possibility of Laborers-AGC training laborers to do hazardous waste removal. That conversation led to the formation of a committee of our training directors at our annual conference later that summer. Then in 1986, the education training and safety committee at the LIUNA convention adopted a resolution, one of many that has been adopted since, encouraging Laborers-AGC and our affiliates to participate in worker health and safety training, particularly in the environmental remediation market.

I guess it was probably at that same time that the AFL-CIO was convincing Congress to provide funding to support worker training under the Superfund Reauthorization Act. I also remember those early meetings with NIEHS officials when we were told how the grant program was going to work and how any not-for-profit organization with experience with worker health and safety training could submit a proposal that was going to be reviewed by our peers. I also recall John Dement and Denny Dobbin traversing the country, trying to build as much interest and support for this program as their meager travel budget would allow. I think based on what Denny told us earlier, there were 110 letters of interest after they went out and drummed up some interest. That boiled down to 50 applications and then the initial grant awards were to eleven grant recipients. Putting together a proposal was an adventure for all of us at Laborers-AGC. As Denny would tell you, we at Laborers-AGC decided early on that we would offer as much information as we possibly could and that equated to box loads of paper for our proposals. So I think NIH learned after that first round to put some constraints on what we had to say.

At any rate, I do remember the morning we finished our proposal. It happened to be about 6:00 a.m. the same day that the proposal was due. Don jumped in his car, drove to the airport, and flew to Washington where he handed our proposal to some really nice person from the Operating Engineers who carried the two proposals down to Research Triangle Park. Then of course, we all sat around and waited for a few weeks or months patiently to see if what we had proposed would make a favorable impact on the people who were doing the review. And then of course we went to work trying to develop the programs. This was after we had to convince Denny and John and the EPA that we really needed to develop our own curriculum, our own materials, to match our target audience needs.

Last week I surveyed union grantees and got a representative response I would like to share with you. The survey asked for feedback on accomplishments, organizational impact, worker health and safety impact, how the focus on worker training had changed since the inception of the NIEHS program, whether or not partnerships have been established to accomplish program goals, and any additional input the grantee felt appropriate for this presentation. While there were some common responses, I was a little surprised at how

each grantee had a unique perspective. As a result, I've decided to provide individual responses, time permitting.[\[1\]](#)

The first survey question asked the grantees to list their top five accomplishments under the NIEHS program. During the ten years the Firefighters had the cooperative agreement with NIEHS, they reported approximately 450,000 emergency responders trained either directly by the IAFF or with materials developed by the IAFF under the agreement. During the IAFF's cooperative agreement with NIEHS, they were very proud of the fact they had developed training materials that addressed all levels of hazardous waste materials emergency response. They also pride themselves on the fact that they have become one of the most prominent sources of instructor training for fire service trainers. Approximately 1,500 fire service trainers have completed IAFF instructor training to date and they believe that equates to approximately 75,000 emergency responders now being trained on an annual basis. The last comment the IAFF made was that this program has enabled them to assemble one of the most accomplished training staffs in the nation. This includes nine full-time staffers, a cadre of fire service health and safety and educational methodology consultants, and more than 120 master instructors throughout the United States.

OCAW's response to the survey was straightforward: it listed the institution of worker trainers as the most significant accomplishment. OCAW also said that the realization by the adult education and training community that worker trainers have the ability and the necessary skills to expertly deliver training on complex subjects, such as the HAZWOPER standard, was a significant accomplishment. Worker access to HAZWOPER training was critical to preserving safety and health in the workplace. Another accomplishment cited was advancement of workers' involvement in program curriculum writing and program evaluation. Finally, OCAW listed the application of funding with NIEHS worker training programs at DOE facilities as a key accomplishment.

The Operating Engineers' response to the survey question of the five most significant accomplishments included increased safety and health awareness of the membership, additional employment opportunities, greater uniformity in delivering training, and open communications and networking between local union instructors, as well as increased contractor recognition of membership skills.

The ICWU's response to the "accomplishments" question focused on cultural change at some facilities that permeated the entire workplace. Local unions have gained respect and then integrated to a greater extent in a number of activities. The program now has the capability to develop site-specific materials, often from actual site spills and exposures, having available basic generic materials.

A large number of worker trainers have developed their skills and are active in improving health and safety conditions at their facilities. The higher level of training, knowledge and credibility, both among trainers and all participants, have resulted in greater site development and activity. There has also been a ripple effect around some facilities that has had a positive impact on local communities. Some facilities have financially supported on-going training activities. This has included the development of site-specific worker trainers and, finally, numerous improvements in emergency response equipment and actual responses have prevented illnesses and environmental contamination. Companies have improved their programs with the knowledge input and questions of a better-informed work force.

Bill Bergfeld of Laborers-AGC offered the following list of accomplishments: first and foremost, the numbers trained and contact hours for both the Teamsters and Laborers amount to almost 70,000 workers and over 2.3 million contact hours over the past ten years. Our infrastructure has expanded to respond to the market, to include, for the two partners, over 20 fixed sites and eight mobile units. All are fully equipped and utilize mock sites for hands-on training. In addition, the development of a cadre of over 150 trainers is significant because they are the backbone of program delivery. Other accomplishments include expanded competency of the partners' individual staffs to allow them to perform grant administration,

curriculum development and revision, marketing the program to contractors, local unions and workers, instructor training and program evaluation; and finally, curriculum development that has resulted in several quality standardized courses complete with audiovisuals, instructor's manuals, and exams, both criteria- and performance-based.

The UBC responded that the NIEHS WTP had demonstrated the value of safety and health training for members in providing safer and more healthful work environments, as well as, promoting jobs for UBC members. It also has contributed to UBC's reputation for excellence in training, promoted positive working relationships among several trades, helped UBC establish its role within the UBC "family," and helped form partnerships with contractors, government agencies, and others.

I asked all of the union awardees what they thought the most significant impact was on their training. OCAW felt the program enabled the union to institutionalize the worker center training system they adopted in the first year of the program. This included the revelation that the organization had to clearly and precisely understand the training subject matter to develop curricula for worker trainers to deliver. This has allowed increased worker participation in the program, including instituting a new rank-and-file, worker-based evaluation system.

The Firefighters' response suggested that the NIEHS program had enabled them to reach more emergency responders with existing resources.

And we at Laborers-AGC believe the impact has been extensive. First, it's enabled the organization to expand to match market demand. In doing that, it's enabled us to expand employment opportunities for the membership. It's also enabled us to expand and standardize our curriculum development, including skills training. It improved the quality of instruction and instructors by enabling us to implement the instructor development program, now in its fifth year.

The Operators thought the impact was that the program brought back thousands of journeymen to the training centers for HAZMAT courses, and that in turn increased their participation in skills upgrading classes. In addition, a new generation of instructors emerged, along with an organizational commitment to safety and health for workers involved in HAZMAT.

The ICWU responded that there has been a growing understanding of the crucial role of worker trainers and labor education. Each of the consortium members has a resource they can utilize for a variety of educational purposes. In addition to improvements on a plant level in health and safety, the training methods have permeated most of the health and safety training which the consortium members conduct apart from HAZWOPER.

The UBC felt the impact on their program was establishing a presence in the Department of Energy.

We also asked about the impact that the program has had on safety and health. As I suspected, most of the grantees' responses were more from the gut and not from any particular statistical data, although I think there were indications that in time we will be able to generate these statistics.

The ICWU's response described annual surveys which documented that, throughout the ten years, the program had educated and motivated thousands of members and salaried personnel to improve shop conditions. In addition, a significant number of trainers have become local union health and safety representatives. Some have become international

union representatives: their training prepares them to deal with the health and safety issues that affect the members they represent.

Laborers-AGC responded that the program had helped expand worker awareness both on the job and at home. They also said it had helped establish minimum health and safety standards, promote awareness of those standards and inform and educate our signatory contractors.

OCAW reported their evaluation of the NIEHS program clearly showed that workers who have participated in the training were more aware of the perils of the work place and, more importantly, working with management in many situations. This has had a tremendous impact in changing the work place to provide for a healthier and safer environment. OCAW had increased the program focus on jobs and environment, environmental justice, and medical surveillance at DOE sites.

The UBC response suggested that the program had a very positive effect on those workers who had received training because of these grants.

Other issues that surveyed unions wished to share, include:

The IAFF indicated that NIEHS funding helps by providing training and material development that is critical to firefighters. Important is the multiplier of training: instructors who return to their communities to train others. The Firefighters reported that the NIEHS program had enabled them to move from developing quality training materials to providing instructor training for those regions, communities, and departments that did not have access to quality instructors or materials. More recently, the focus has expanded to encompass customization of programs that address the specific needs of different geographic regions.

At Laborers-AGC, we've added focus to include the minority worker training program, address language needs with Spanish and French translations of primary source materials, and look beyond our borders through projects sponsored by the International Affairs Department at LIUNA. Perhaps most significant is the establishment of the certified apprenticeship program. It will include the HAZMAT training for all new entrants into LIUNA's segment of the industry.

The International Union of Operating Engineers' response suggests that its program has evolved from an 80-hour trainer program to one that delivers training in all aspects of safety and health and environmental restoration directly to membership and contractor personnel.

ICWU reported that the program enabled them to reach thousands of workers they would not have been able to reach without the grant's support. They felt the key was training over 100 worker trainers.

The UBC reported that the initial effort of the Health and Safety Fund was on environmental training. With those programs as a point of departure, the UBC has broadened its repertoire to include training topics that appeal to a broader audience within the UBC.

Certainly we have formed all kinds of partnerships since the program began, and that effort continues. I know each of us can list many other positive results achieved during the last ten years. After reviewing responses to the survey, I think the following point can be made: grantees were given an opportunity to develop and implement programs that best matched the needs of their target audiences. This has resulted in hundreds of thousands of workers receiving quality training they would not have received otherwise.

Every grantee can point to expanded capacity to provide worker training: better equipped facilities, better training of trainers, expanded professional staff to provide technical support, and more sophistication and technical capability in developing curricula. Worker health and safety has become a way of life for the grantees in each organization and the members working in the field. It's an attitude that was created and solidified by this program. In closing, I think we've learned to work with others to make our programs more effective in reaching workers everywhere.

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[1] NOTE: The UBC survey response was received after the NIEHS 10-Year Anniversary meeting, and incorporated into this report.



# NIEHS 10-Year Anniversary Meeting

October 20, 1997

## Worker Education and Training Program

### 10 Year Perspective/Future Direction Panel

**Moderator: John Dement**

**First Speaker: Don Elisburg**

**Second Speaker: Steven Deutsch**

JOHN DEMENT: In 1987, I was detailed for 90 days by Dr. Ralls to assist with this program's birth, and I was able to see it through early childhood. Now, I'm fortunate enough to consult with Dr. Sassaman and some very good people, so I'm also seeing it through its adulthood. I guess it's fair to say at the outset that as our driving principle, we try to follow public health models for prevention. My last detailed interaction with the program was about two years ago, in 1995, when I was asked to come back and evaluate it as an interim panel member. I will use that as a kick-off point for a discussion of where I think the future lies.

The panel report was generated in December 1995. We were asked to look at broad aspects of the worker training program, its accomplishments, organization, and the future, along with some recommendations for NIEHS. Panel members represented a broad spectrum from labor, education, academic institutions, and industry. We also had some excellent consultants.

The panel's conclusions were that first of all, and probably most importantly for funding, the program had fulfilled its legislative mandate and produced high quality training. Equally important is that the program is developing innovative training approaches, methods, materials, and evaluation techniques. At the outset, we at NIEHS had no preconceived notion of how training should be delivered. We wanted to experiment. So the first 11 grantees had a lot of different program directions, a lot of different approaches to training. We tried to bring those people together to share their ideas. I think that process has helped to develop some fairly innovative tools.

Also, as we've heard, the program has raised the bar for worker training to another level. Prior to this program we had things like that hazard communication program from OSHA, which was nothing more than a statement that training had to be done, not how it had to be done. This program has raised the benchmark to another level. We've heard a lot of discussion today about reaching a difficult population to train. The minority worker training program is an excellent example of that. Also, transmitting this knowledge back to the workplace is a key benefit: some of the programs have evaluated not only the process of training but also changes in the workplace that have taken place because of training.

Here are a couple of recommendations from the panel's report. First, we recommended certain things with regard to evaluation: looking at short- and long-term impacts of training, we felt it was important to expand and continue evaluation. Second, we felt that tracking post-training employment was important. One of the criticisms of the program if you listened in the hallways was that some workers who were being trained were not going to work.

I am happy to see that in the last two years, the data on training under-served populations have really expanded very nicely.

Targeting training on new technologies. I think that is going to be particularly important for DOE to training.

Last, we felt that more active involvement of employers in the program was essential. I think the program has benefited from the increased employer involvement that has occurred in different grantees' programs to varying extents.

Now I will set the stage for some discussion of future challenges. Every program I have ever been involved with in the federal government has had a beginning and an end. I really would not like to see this program end because funding ends. So program continuation and at least partial grantee self-sufficiency are important issues that will have to be faced soon.

We've talked a lot in the program about diffusion of knowledge in the workplace, through workers training other workers, or perhaps training supervisors. I think it has to be more than just passive diffusion. I think it's time we realized that this program has set a higher benchmark for training. We need to look at how to expand it to other sectors, beyond hazardous waste emergency response training. In other words, the program needs to broadly address health and safety training. I challenge you to drive around any of our residential construction projects here in North Carolina and do a street-side inspection, and you will be appalled at the lack of health and safety, the lack of training.

Also, I think it's time to look at institutionalizing the program. Worker training is broader than hazardous waste and emergency response. It cuts across every sector, particularly construction.

We also have to face the issue of training non-union workers. Some of my union friends say the solution to that is to unionize them. There's a lot to be said for that, but despite all the efforts here in North Carolina, we haven't been very successful in that area... And we really do have a lot of training needs.

I want to echo the recommendation of the panel: employer buy-in. Whatever way we define buy-in, I think it will ultimately help ensure continuation of the program.

I'd now like to introduce two very visionary people. Don Elisburg, as you've heard, has been involved with this program since the early days. Steven Deutsch likewise has been involved with our program: he's assisted us in many, many different ways throughout its life.

DON ELISBURG: First, Mitch's description of how this whole program got started is very apt. I'm sorry Elaine Davies isn't here, but I wanted to mention that when we first went up to the Hill to explain what we were trying to do, no one understood anything about hazardous waste. The way we described worker protection was really very simple. We just said we wanted workers employed by contractors to have the same kind of training that the people at EPA did. When they went out on these sites, there were people in moon suits, and there were construction workers in regular boots: there was a serious dichotomy there. That was the whole pitch to Congress.

Second, Mitch talked about partnerships. I don't know if Joe Fitzgerald or Ray Wong are still here but somebody can pass it back to them. One of the most interesting partnerships that got the Department of Energy activity going was an offer that we couldn't refuse from then Deputy Assistant Secretary for Environmental Management Pat Whitfield, who wanted some training done out at the Fernald site. A consortium of the Laborers, Operating Engineers, Teamsters, and Firefighters put together a training package in an extremely short period of time and sent it down to DOE and got this contract. It was amazing: here were three construction unions and the Firefighters Union putting together a training

package to teach the industrial workers at Fernald about hazardous waste. It had a number of classes that worked very well, and it was the precursor of what is now the DOE training program.

When I listen to some contractors saying 'We want you to validate what you are doing', there's a kind of role reversal here because the only way these contractors even understood what anybody was doing was because these grantees went out and showed them. There's a need to get back to basics about who knows what about workers and worker training.

About the future, I want to echo what John Dement said, but perhaps a little more bluntly. A ten-year run on a program is very unusual. To begin with \$10 million and now have thirty something million floating around is also unusual. To be able to sustain it is even more unusual. We need to bear in mind that we are constantly doing a high-wire act on continued funding. You have to begin to look at the future, or lack thereof, of this grant program and how training workers will be sustained.

Second, is the demonstration of demand. Fortunately, the Bureau of Labor Statistics had some numbers about the potential for environmental work that we could use the first time we went to Congress. I don't know whether we've gotten much better in identifying the long-term target populations, although I know they are out there. What are the long-term industry populations? How is this really going to work? How should economic support be built up to continue a program paid for by Uncle Sam? The questions remain.

Third, there's a great track record here. I could sit down by simply saying it ain't broke, don't fix it, and that's fine. Particularly from the panel report, we've heard today about an enormous number of great achievements. We've got to be able to repackage this training program to sell it to the new folks on the block.

Complacency is an enemy. Anybody who believes they have an entitlement to this money can one day wake up very unhappy. I don't care who they are, the fact of the matter is that if you rest on your laurels, waiting for the next check, you could be very disappointed very quickly. We have to be able to defend what we are doing. We need to consider how we are applying the enormous lessons learned from the training. I hate to talk about revising curricula. I was so involved in putting together curricula in the initial training programs I never wanted to look at it again. But it's important to understand that the industry is growing in geometric proportions, as well as evolving technologically. Are we training for future technology? Are we looking at what needs to be done down the road for the people going into this industry? Some of the people trained by the grantees are halfway towards retirement. It's a maturing industry. Are we training for that maturity? Are we justifying the subsidized training by being at the cutting edge of the technology?

We need to look at how this grant program was funded and be prepared for a change -- not necessarily in this round but perhaps in the next round of the Superfund. Except for the DOE, this program is funded out of the Superfund Tax. It was funded with the notion that the Superfund Tax would pay for general training of workers in the industry. That's very specific in the statute. But it doesn't give us the entitlement to it always being so in terms of the Superfund Tax. EPA may be concerned, for example, about justifying training workers going into the private work force and not necessarily working at Superfund sites. We have private sector clean ups. DOE says 'Why are you training people who aren't at these sites?' For all of those questions, I think there are answers. A broad-based work force and worker protection are important to the country. This grant program is the vehicle by which it is being accomplished, and everybody should pay for it. This is still the case to be made. We need to understand that most of the people who signed off on the original legislation are no longer around. In biblical terms 'There came a pharaoh that knew not Joseph'. There are lots of new pharaohs there, and they don't know any of these Joseph's. It's time for us to remember that there's a whole new crowd in Congress and in the Administration which needs to be educated about environmental cleanup and worker safety and health.

The key point we should look at, even given the lack of statistics, is that we've changed the safety and health culture on these environmental clean-up sites. We don't have people dying in the numbers one might have expected. We don't have poisoned workers seeking hospital treatments. We are fairly certain that the long-latency health problems aren't developing. If this program had not gone into effect in 1987, the situation on these sites would have been very different. We need to make this case in the future when we go to sell this program to members of Congress who have no experience in these matters.

Then there is the question of 'How do we connect what's happening with the research?' About five years ago, we took a run at poor Bill Suk and his research program. We asked how much of that 35 million dollars a year is going to directly relate to worker protection and training issues. It's still a legitimate question even though I haven't heard it answered yet.

I ask not because of any conflict with the research program, but because of the importance of demonstrating the connection between the two. The linkage between the two is one of the reasons that NIEHS has this grant program and the research funding.

We need to look at what kind of training we are offering. I have no fault with awareness training, but is that the right training to be focusing on now? I have some concern with refresher training, as well. When you've been at this for ten years, what kind of refresher course will allow you to stay awake? Significant time and effort goes into refresher training because we've got this base of thousands of trained workers out there who need some kind of refresher training attention.

This discussion leads to the question of certification. We created the certification business. We invented self-certification. We went to OSHA with the proposed 29 CFR 1910.121 and said 'Look, you folks need to do this', and they haven't done it for a decade. Maybe it's time to go back and say, 'Wait a minute, you've got these regulations out here -- You've got 40-hour training; you've got this kind of training; somebody else has 80-hour training. Maybe it's time to start asking 'We're ten years into this program, what should the regulations say? About training and certification?' The current training regulations were not written in stone. Politically it might be hard to change, but almost every line of those substantive regulations was written by a couple of people, some of whom are still sitting in this room! Do we keep living with this into the fourth generation?

There are also the extremely important questions raised to by the DOE program that are also the questions for the minority worker training program. What are the demographics? Who needs to be trained? What should the target population be? We train certain people under one program and other people under another program, but are we putting all of them in the right 'pigeon holes'? What's the social demand? Should groups be told 'It's time for you to be self-sustaining?' so that funds can be allocated to connecting with local populations if you're going to get into the Brownfields, which are tremendously important vehicles for urban clean-up.

How are you targeting your resources? Are you targeting a hundred thousand dollars because that's all they give you, or are you beginning to look at what the community needs? These questions are not easily answered, and I suspect nobody here will have dinner with me tonight. But they are questions that we need to ask and answer. Because if *we* don't ask these questions, others will, and I guarantee nobody is going to like those answers.

Finally, should we be talking about some kind of uniformity of training? Should everybody be creating a separate curriculum? It was John Dement who said 'initial grant programs should experiment with differing approaches to cleanup training and curricula. The result has been our own 'hundred flowers blooming.' But we have to look at cost effectiveness. The quality of this program is excellent. But now selling it means it requires a different package to avoid the confusion of 40 different programs, but a few that are particularly focused to the specific training needs.

Some of my comments may be mind boggling to you. But while I appreciate Mitch's historical perspective I also appreciate Chip's look down the road. If you want 50 or 60 or a hundred million dollars for these worker training programs, it's important to think about how it all should be packaged so it can be justified it even in these troubled times. Thank you.

STEVEN DEUTSCH: Part of the stock taking in celebration is to reflect on who the heroes are. We've just heard from two of them. It's pretty obvious what role John Dement has played. Those who know Don's work for decades in government and out, know the contributions he has made to occupational health and safety. I honor and respect both of them, and I know the rest of you feel the same way.

I'd like to reflect on what was said earlier. I don't think you can begin to talk about a solution without naming the problem, and no one so far has said the word 'racism.' America is celebrating its economic success and an unemployment rate under five percent. But look at the unemployment rate for African-American inner city youth. Look at the unemployment rate for Native Americans. Join Marianne Brown and go down the Alameda corridor in Los Angeles. It's no surprise that the communities of color are where the majority of toxic sites are. You can appreciate a toxic site on this side of your bus and on that side of your bus. Third World people of color work in those plants. In between those plants there are residences of people of color, and there is the elementary school for black and brown children. Understand the role of racism in this society. If we don't do that friends; we don't name that problem. And if we don't name it, I don't know how we can address the challenges of the years ahead. I'm not going to say more on that one because it's already been referred to, but it's a challenge. I think a lot about this society, about my children's future and their children's future in a multi-ethnic, multi-racial, multi-lingual society that is just.

Eleven years ago when I was working in Washington, I appreciated having conversations with Denny Dobbins about the soon-to-be created NIEHS hazardous waste worker training program. It's been a privilege to be involved in the program over this decade.

Immediately after those discussions, I returned to Scandinavia, where I had been involved for ten years. One of the critical lessons from the Scandinavian experience that I have been trying to make in this country since the late '70s is that if you want to reduce workplace injuries and illness, one of the most powerful ways to do so is to train and activate rank-and-file workers. It works and the data demonstrate it. It's built into the law and the work environment legislation in Norway and Sweden, not just out of ideology, not just because they have more powerful unions or a higher union density rate than we do, not irrelevant mind you, but that's not the reason. The reason is because it is scientifically grounded and based. So it's crucial as we think about the future to continue to make that argument persuasively. It is in the best interest of all parties: management, government, workers. It is in the interest of all parties for gains across the board.

I got a call last week from friends in Norway. The government had just funded a major, state-of-the-art study on workplace safety and health. I was asked if I would be willing to participate over the next half dozen months. 'Why are they doing this in 1997?' I scratched my head and wondered. Hadn't it already been done? The point is yes, it's been done, but they understand that you don't do it once and let it sit there. You revisit, update, and extend the argument so that you can make convincing cases to everybody in the society that it is in their best interest to do those things necessary to continue to address problems of unnecessary injury and illness. I say unnecessary particularly in our society now where over a half of all lost-time injuries and illnesses are muscular-skeletal. We know those injuries are overwhelmingly preventable. And it's criminal that we haven't done more to address this problem.

Denny, in his opening remarks for the last panel, talked about inter-agency cooperation. That's one of the real contributions of this program, compared to other programs in the federal government. I laud NIEHS and all the other agencies involved. It is something that absolutely should be continued.

Nineteen years ago, I guess I got one of the first OSHA New Directions training grants and ran a worker training program based at the University of Oregon Labor Education Research Center, where I still work. In 1981 I put together a special health and safety volume of the Labor Studies Journal on the impact in that

short period, 1978 to 1981, of the OSHA New Directions training grant program. It was a very small pebble dropped into a large pond. Here's what that report said: 'before 1978, there were fewer than 15 health and safety staff persons in the unions, only one half of whom had had professional training. By 1981 the number was 100. Before 1978, only four universities in the country had worker occupational health and safety training programs. By 1981, there were 19 and another 19 engaged in both employer and employee training, with over 125 professionals involved.'

Point number one. We have a history of a program that is now very small potatoes, and it was even at the time, in 1978. But it did have a tremendous -- and here's my point -- lingering effect, that went well beyond the end of the funding. The program I'm in, like many around the country, was sparked by the OSHA money, long gone. But we continue to have staff and do health and safety training for workers all over the state of Oregon and regionally. So as you look at the OSHA program over time, it had a huge impact with a small start-up. NIEHS, on the other hand, and those \$10 million to \$37 million direct funds, has had a much larger impact in terms of the numbers of people trained.

Let me move on to the question of the assessment of government programs and how one looks towards the future. I personally have been involved in a handful of those evaluation and assessment studies, carried out by organizations such as the Government Accounting Office. What I would like to suggest is that there are a couple of very important things that have happened in this program that haven't explicitly been mentioned this afternoon.

First, a unique sense of community has evolved. That's unusual because in fact government funding programs are competitive. That's even what they are called: competitive grants. And there is a culture of competition for resources. Now nobody here in this room sees it as competitive, right? In any case, you have transcended that and I congratulate you and I congratulate NIEHS for doing that.

I personally have had a lot of experience in grant training programs in various federal agencies over several decades. I know of none that has created a sense of community comparable to what this program has created. It's really quite extraordinary, and you should congratulate yourselves for that. It's a very important characteristic that I hope you will nurture and sustain into the future. You've done it through sharing curriculum. You've done it through the Clearinghouse. You've done it through regular conferences of grantees such as this and through trainers exchanges. You've done it through the technical workshops for skills building and cross-learning experiences Marianne alluded to. Finally, something very important has come from NIEHS itself: encouragement for collaborative work. On the right-hand side of our portfolio, the last page refers to the newest such endeavor across grantee organizations. That's extremely important in that it's created a climate of mutual gains, sharing, and community building.

Now, I want to very quickly make four projections for the future.

Number one, I want to suggest that whether we like it or not, the politics of the United States in the short-term is going to be to push partnerships between public and private. That is the reality. It is absolutely essential that we work more in this program to gain more of what John and his committee called 'employer buy in': getting employers to be more active, to commit more to cost sharing and to partnering. In follow-up to Joe Fitzgerald's remarks, DOE should promote such public private partnership between NIEHS grantees and its contractors.

Point number two, I think this partnership is congenial, generally speaking, with where labor-management relations are going in this country: the whole issue of joint labor management and cooperative programs, mutual gain programs and all those things. But I would like to point out that in health and safety, it's not just ideological, it's empirical. And again the ergonomics intervention strategy is probably the best single illustration I can come up with quickly to make the point. It is demonstrable. The GAO just came out with a new study on private sector employers that showed the drop in injury and illness rates in those joint ergonomic intervention programs. It is cost effective for employers to get

on board with everybody in this room who is doing the training of the workforce to try and mutually solve those kinds of problems.

Point number three deals with the whole question of outreach. I think it's a proverbial pebble dropped into a pond. Marianne mentioned, for example, that the number of institutions now involved is much higher than the number of grantee institutions. This program's impact extends to universities, to unions, not because of direct funding, but because of its influence on other institutions. I can say that, by the way, without sounding self-serving because my institution does not have an NIEHS grant. I'm not waving a flag trying to get an NIEHS grant, but I would like to see our program partner with grantees here, learn from your experiences delivering hazardous waste training.

And finally I'm going to add to what Don said about sustainability and funding, because these factors are crucially important. I don't like the idea of pushing grantees to grovel in their grant proposals, although to a certain extent, you have to pay homage to the agency and to those of us who might be involved in reviewing your proposals. I've already talked about trying to get cost sharing with employers and so forth. But the reality is that ultimately the federal government has a stake in the success of this program, and it's crucial to make that case.

As an illustration, if in fact the United States has decided that tobacco use is a public health issue, it's clear we can't put the responsibility on the unions that represent tobacco workers or on the individual tobacco farmers, walk away from it and let them solve the problem. It's like the legislation years ago in the Redwood National Park in California. They knew it was going to cost jobs, and so a variety of measures to cushion the effect on workers were built into the law. I transfer the analogy, if you will, to health and safety. We've got a national problem. We need national solutions. We need a national commitment, and that means public funds. The reality is we need to keep the funding at the federal level. I think Don was absolutely right about this.

There are two models I want to leave that with. One is the cents per hour negotiated agreement in the building trades. It's great as a model. It ought to be considered at every contract, at every labor organization at least to the point of trying to get it. AFSCME and SEIU locals in a public sector agency, should do it just as well. That concept of cents per hour negotiated funding jointly with the employers putting that fund in jointly administered with the unions for health and safety training as one.

The other may not happen here from one day to the next, but it may be a realistic possibility for the future. The Swedish Worker Environment Fund is funded by a tiny, itty bitty little tax on payroll. We have 115 million people in the United States. How about a little payroll tax, one penny per hour for every worker in America. That's 115 million pennies an hour, eight hours a day. That's real money.

# **Does a Collateral Duty Require Less Protection: Workers, Hazardous Materials Emergency Response, and OSHA's Failure to Protect-**

**BY CRAIG SLATIN AND EDUARDO SIQUEIRA**

*Trash Collector Dies after Inhaling Discarded Acid*

*By Lawrence Van Gelder, New York Times, November 13, 1996*

*New York -- A city worker died Tuesday after he inhaled the fumes of a corrosive acid from a discarded container that burst under the compacting blades of a garbage truck making routine collections in Brooklyn. Fire Department hazardous materials experts identified the substance as hydrofluoric acid, often used to etch glass. A second sanitation worker was injured in the incident, which brought the Mayor and Sanitation Commissioner rushing to the burn unit of New York Hospital-Cornell Medical Center, touched off an investigation by police and sanitation departments and raised the possibility of homicide charges against those responsible for leaving the acid to be picked up. The source of acid was not known Tuesday night.*

*... The dead man was identified as Michael Hanly, 49, of Brooklyn, a Sanitation Department worker for 22 years. His injured partner, who suffered burns on the face and hands when he came to Hanly's aid, was identified as Thomas Giammarino, a member of the Department for 15 years ...*

This incident presents an example of the health and safety risks resulting from exposures to hazardous waste by workers engaged in waste management activities. Comprehensive health and safety programs which address these risks can be implemented as part of efforts to prevent fatalities and injuries resulting from exposure to hazardous wastes [1]. To be effective, such programs should address the potential for exposure to hazardous waste materials even though a particular set of tasks does not primarily place workers in contact with hazardous wastes. For many workers, like these sanitation workers, addressing and responding to a hazardous materials emergency incident is a likely "collateral duty." That is, although they have not been hired as hazardous waste operations workers, a potential for exposure to hazardous waste materials exists in the nature of their work. This potential should be considered a part of the job for most workers engaged in waste management activities.

Waste management activities are widespread throughout most industrial sectors, and hazardous materials are a component of the waste of almost every aspect of industry -- from manufacturing and processing to health care and education. Workers with a collateral duty to manage hazardous waste, regardless of the industrial sector, require health and safety protection provisions that include measures for an emergency response to a hazardous materials incident (spill, release, explosion, combustion, and so forth). Unfortunately, OSHA has failed to appropriately acknowledge this threat to workers and has been confusing and inconsistent in the interpretation and enforcement of its regulatory requirement for training workers with such a collateral duty. This article will discuss efforts on a national level to secure these protections and provide an example of a union's training program for workers with such a collateral duty.

## **OSHA'S HAZWOPER STANDARD, 29 CFR, 1910.120**

The Superfund Amendments and Reauthorization Act (SARA) of 1986, Section 126, mandated that the Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA) regulate health and safety protection of hazardous waste operations and hazardous materials emergency response workers. The regulation was to include mandatory health and safety training [2]. The resulting regulatory standard, 29 CFR, 1910.120 (and 40 CFR, Part 311 -- so that all public workers left unprotected by OSHA would be protected by a corresponding EPA standard) established, among other



training requirements, training for workers who would be engaged in any of certain levels of hazardous materials emergency response [3]. The levels were based upon those established and made standard by the National Fire Protection Association (NFPA). The NFPA levels of response actions were; First Responder Awareness, First Responder Operations, Technician, Specialist, and Incident Commander [4].

OSHA has established training requirements for each level of hazardous materials emergency response work. A mandatory number of training hours was established for all but the Awareness Level training. The number of hours of training is not wholly clear as stated in the standard, and usually does not allow time to address all of the mandated topics. However, the standard's training requirements (for emergency responders and hazardous waste operations workers) represent the most comprehensive training mandate from OSHA for any industrial processes [5].

Between 1989 and 1993, OSHA personnel from all regions of the country provided numerous responses to employer inquiries regarding which workers should receive some level of emergency response training. By 1993, OSHA published these responses as *Quips to 29 CFR, 1910.120* [6]. Following is a discussion of the agency's responses regarding training for Awareness Level Emergency Response workers.

In the *Quips*, OSHA defined First Responders at the Awareness Level as:

“... those individuals who are likely to witness or discover releases of a hazardous substance and who have been trained, and whose duty it is, to initiate an emergency response sequence by notifying the proper authorities of the release.” [7]

In the New York City case described above, this scenario is applicable to Thomas Giammarino, the worker who got burned when he tried to help Michael Hanly. After the spill happened, he was the “first-on-the-scene” of the incident and might have been better able to avoid injury had he been properly trained. The Awareness Level training curriculum mandated by OSHA covers what to do in case of incidental releases of unknown hazardous chemicals.

The *Quips* also state that:

“In applying OSHA's standard it is important to look at the statutory purpose, which is to protect workers. The training requirements of both the Hazard Communication standard, 29 CFR 1910.1200 (HAZCOM) and the Hazardous Waste Operations and Emergency Response standard must be applied in a way which will provide meaningful and adequate training to the workers to ensure their safety. More employees are likely to be covered by the training requirements of HAZCOM than the training requirements for First Responders under 29 CFR 1910.120. However, it is important that the population of adequately trained First Responders be large enough to provide the necessary protection in the event of an emergency.” [8] (Emphasis added.)

We believe that this interpretation suffices to justify the training of public-sector waste management workers at the Awareness Level in order to prevent many injuries and even deaths, such as the one in New York. The Awareness Level training curriculum mandated by OSHA includes identifying and recognizing the potential hazards of dealing with unlabeled hazardous materials containers. Nonetheless, OSHA has refused to establish this as agency policy and instead leaves interpretation to the employer rather than clearly mandating worker protection [9].

The American Federation of State, County and Municipal Employees International Union (AFSCME), which represents thousands of sanitation workers, stated the need for this protection in 1995 when it applied for the National Institute of Environmental Health Sciences (NIEHS) Hazardous Waste and Emergency Response Workers training grant. In the section titled “Sanitation and Landfill Employees,” AFSCME argued that “... sanitation workers are routinely exposed to hazardous materials when they are

illegally dumped, end up in trash compactors, are crushed by the apparatus and then spill onto streets and alleys ... ” [10] The union also claimed that untrained sanitation workers are asked to clean up spills without protective equipment and decontamination procedures in place. In a number of cases, cities have neither standard operating procedures nor emergency response plans to deal with incidental releases. AFSCME asserted that the First Responder Awareness Level health and safety training combined with correct, specific workplace practices and operating procedures can prevent deaths of public workers. (A discussion of AFSCME’s training program is provided later in this article.)

## **NIEHS’ INTERPRETATION OF REQUIREMENTS**

The NIEHS Superfund Worker Training (SWT) Program developed Minimum Criteria for Worker Health and Safety Training for Hazardous Waste Operations and Emergency Response. The minimum criteria were developed through a consensus process which was called for by the NIEHS program awardees. They believed that criteria were needed as guidance for training providers as well as other federal and state government agencies. A planning committee developed a draft discussion document in advance of the workshop. The draft was circulated to the NIEHS program grantees, external experts, and several federal agency representatives.

The draft was used as the basis for discussion and development of a final document at a Technical Workshop in March 1990. The workshop was attended by representatives from the NIEHS-funded health and safety training organizations, private industry, government agencies, and national consensus organizations. After the workshop, a draft report was sent to all workshop participants for review and comment. The final Minimum Criteria document was issued in April 1990.

The purpose of the process was to identify, evaluate, discuss, and make recommendations on training quality issues in the area of hazardous waste operations/hazardous chemical emergency response operations. Some hoped that the document would be useful to OSHA in its efforts to establish guidelines for its proposed standard, 29 CFR, 1910.121, Accreditation of Hazardous Waste Worker Health and Safety Training Programs. By 1993, it became apparent that the standard would not be finalized. Therefore, the NIEHS SWT program decided to initiate a process to develop interpretive guidance to its Minimum Criteria document to increase its usefulness to training organizations.

NIEHS established a planning committee of representatives from awardees of the SWT program. Subcommittees were formed to develop draft interpretive guidance documents for each category of the OSHA HAZWOPER standard, 29 CFR, 1910.120. They included hazardous waste sites, Resource Conservation and Recovery Act (RCRA)-regulated Treatment, Storage and Disposal (TSD) facilities, and hazardous materials emergency response. In addition, interpretive guidance was drafted for the general training criteria of the document.

The draft interpretive guidance documents were distributed to all of the NIEHS SWT awardees, as well as interested parties at government agencies such as the National Institute of Occupational Safety and Health (NIOSH), OSHA, the Department of Energy, and the EPA. They also were distributed to interested representatives from private industry, state and local emergency response organizations, and related consensus and non-profit organizations.

In March 1994, more than 70 persons representing many of these organizations and institutions participated in an NIEHS-sponsored technical workshop to critique the draft guidance documents and develop

consensus regarding final documents. This was accomplished and a final set of interpretive guidance to the NIEHS Minimum Criteria document was issued. OSHA used significant portions of the Minimum Criteria document and the interpretive guidance in its development of the non-mandatory Appendix E to the HAZWOPER standard. However, OSHA chose not to include important language supporting workers with a collateral duty to respond to hazardous materials incidents.

## **HAZMAT ER JOB CATEGORIES**

During the discussions of health and safety training criteria for workers who will engage in emergency response activities to hazardous materials incidents, two basic groups of workers who are responsible for this type of emergency response were identified: 1. †collateral duty emergency response workers, and, 2. public and facility (off-site, full-time) emergency response workers. As defined in the interpretive guidance document, they are:

- Collateral duty emergency responders typically serve as the on-site emergency response team at a fixed location and have a relatively high level of knowledge about the hazardous materials and situations with which they are expected to perform the emergency response activity.
- Off-site emergency responders are required to be prepared to respond to hazardous materials emergencies in a nearly unlimited response environment about which they may have very limited prior information [11].

Collateral duty emergency response workers addressed by this document include “part-time industrial and transportation emergency responders, as well as uncontrolled RCRA emergency response (workers).” The Minimum Criteria document specifically did not address the training needs of these workers and was directed mostly toward firefighters and police personnel. The interpretive guidance workshop extended recommendations for training to the following categories of workers.

1. Industrial workers with part time duties in chemical emergency response
2. Hospital workers: Service and maintenance; Housekeeping; Trades and building maintenance
3. Technical: Nurses; Lab, X-ray and specialty technicians; Other health care workers
4. Educational workers
5. Security guards
6. Transportation: Highway, Railway, Warehouse
7. Water and Sewer workers
8. Wastewater treatment plant workers
9. Water treatment plant workers
10. Department of Public Works
11. Sanitation Department workers

## 12. Maintenance

### 13. Street and Highway Department maintenance workers

This list represented a major step forward in a debate that had been taking place within the NIEHS SWT program for more than six years. Unions such as the International Chemical Workers Union (ICWU) and the United Steel Workers of America (USWA), as well as the Oil, Chemical, and Atomic Workers Union (OCAW), had been calling for support from other unions and organizations in the program for extension of the HAZWOPER training to apply to workers, who, in the course of their normal work activities, might have to respond to a less-than-minor spill or leak of a hazardous substance. However, the International Association of Fire Fighters (IAFF) believed that response actions at private facilities would and should lead to calls for fire service response, and therefore, training should be provided primarily to these workers. In addition, OSHA was receiving, or was concerned about receiving, challenges from employers and employer associations, who did not want to be required to provide the more extensive HAZWOPER training in addition to Hazard Communication Standard training. For both of these reasons, the NIEHS SWT awardees had not been able to agree on a unified position regarding the requirement to provide at least Awareness Level training to industrial and service/public sector workers who may be required to respond to a hazardous substance emergency [12].

Between 1990 and 1994, the ICWU, the United Auto Workers (UAW), USWA, and representatives of other unions and workers, and university programs countered the IAFF assertions regarding such response actions by stating that employers generally would not call in the local fire service because they would not want them to know what was going on in the facility. Other unions, including those representing rail workers, service industry employees, and public sector employees, believed training was needed for workers who may be first to witness or discover a release. The IAFF wanted support for asserting hazardous materials incident emergency response activities as the role of firefighters and the other groups wanted IAFF support for the training needs of other workers who would be called upon to respond to a hazardous materials emergency incident [13].

The NIEHS SWT program started in 1987, with an initial eleven awards to various consortia and programs across the country. Five of the awards were either to labor unions or labor/management trust funds -- representing construction workers, manufacturing and processing workers, and firefighters. In 1990, 1992, and 1995, NIEHS issued requests for proposals and made awards which extended the number of awardees. By 1995, program participation by more manufacturing unions and service-sector unions had increased. The needs of workers represented by the manufacturing, processing, and service-sector unions, as well as primarily non-union workers who received their training from university consortia participating in the SWT program, led to an agreement to include the above listed worker categories [14, 15].

This division of emergency response workers into two broad groups was an important compromise. It acknowledged that firefighters maintain substantial responsibilities for hazardous chemical emergency response incidents, requiring extensive training. It also acknowledged that a large segment of workers in manufacturing, chemical and oil processing, transportation, distribution, and throughout the service and government sectors need at a minimum, Awareness-Level Emergency Response Health and Safety training that complies with the requirements of 29 CFR 1910.120.

### **AFSCME IN THE SWT PROGRAM: WORKERS WITH A COLLATERAL FOR HAZMAT ER**

The American Federation of State, County, and Municipal Employees International Union (AFSCME) represents government workers, many of whom are responsible for waste management. They include workers in these types of operations: sanitation, water and wastewater treatment, public works, and facility maintenance (education, health care, long-term care, recreational, institutional, and so forth.). Increasingly, as hazardous materials are used by government agencies as a component of service production processes

and as government agencies continue to manage hazardous waste (water-borne and solid -- which becomes airborne through incineration), government workers -- many of them AFSCME members -- face higher risks from hazardous waste exposures. Unfortunately, in not a few instances, these hazardous materials are being employed as a way of facilitating a reduction in government employment levels. For example, toxic and hazardous cleaning chemicals and herbicides permit a few workers to conduct operations that formerly required much larger crews.

An understanding that union members with actual and potential hazardous waste exposure risks require strong health and safety support led to the development of an NIEHS-supported hazardous materials emergency responder health and safety training program. The program provides members with the following types of health and safety training courses: First-on-the-Scene Awareness Level; 24-hour Confined Spaces and Hazardous Materials; 24-hour Operations Level; 40-hour Technicians Level. The union also provides a 40-hour Train-the-Trainer course which is used to develop peer trainers. The AFSCME training program has been implemented successfully in many cities, including in Toledo, Ohio; Kalamazoo and Ypsilanti, Michigan; Washington, D.C.; Salt Lake City, Utah; Indianapolis, Indiana; and other Midwestern cities. A discussion of the program and its political context has been presented previously [16].

### **THE AFSCME EXPERIENCE IN TOLEDO**

Many City of Toledo employees are represented by AFSCME, including those at the Department of Public Works (DPW) and the Department of Public Utilities (DPU). AFSCME represents both blue- and white-collar (lower ranking supervisors) job classifications in the city, organized in two separate locals.

After negotiations between AFSCME Health and Safety International staff, AFSCME Council 8 staff, and city managers, AFSCME was able to offer a 40-hour Train-the-Trainer (TTT) course to develop a team of local members who could help AFSCME staff deliver emergency responder First-on-the-Scene training.

Review of the OSHA HAZWOPER standard training requirements led to a decision that Awareness Level training was applicable to hundreds of city employees. The training was provided by peer trainers who attended the 40-hour TTT course. Most of the employees trained by the peer trainers belonged to Toledo's DPU and worked in blue-collar job classifications, operating the water and wastewater treatment plants, maintaining sewer lines, and cleaning streets and parks.

In July 1996, an evaluation team conducted a group interview at Toledo's Water Reclamation Plant. Five city employees who were trained to become health and safety trainers in 1994, and have since conducted training, were interviewed. The group interview with the peer trainers was held about two years after their TTT training. In November 1996, four of the employees trained by the peer trainers also were interviewed, about two years after their Awareness Level training.

The interviews provided data confirming several aspects of the workers' jobs. First, a large percentage of the city's DPW and DPU work force maintains a collateral duty to respond to a hazardous materials emergency. Secondly, the Awareness Level health and safety training, which was only a single eight-hour period of training, supported the workers' needs for information and strategy planning. It helped them and the city's departments to change working conditions so that emergencies were either more likely to be

prevented or responded to in a manner that was more likely to prevent injuries and fatalities. The following section provides some of this data.

## **IMPACTS OF TRAINING**

The interviewed AFSCME members explicitly credited the eight-hour awareness level training for giving them the initial information necessary to understand the interplay between technical and scientific information on workplace hazards and their rights and responsibilities in the workplace, as manifested in the Occupational Safety and Health Act (OSH Act). Therefore, as important as the understanding of emergency response technical knowledge was their realization that employees can only exercise their workplace rights, such as refusing unsafe work or filing an OSHA complaint, after gaining some knowledge about workplace hazards:

“OSHA is fine, but if you don't know that a hazard exists, they're not responsible. ... The administration and the workers have all gone through this. Now everybody has been made aware of all the hazards that are basically around.” And: “People found out they had the right to question whether it was safe or not.”

A fellow employee synthesized the group's perceptions by characterizing the Awareness Level training as the “spark plug for safety awareness.”

There were marked changes in the procedures used by the Sewer Division to deal with spills that required the participation of city employees. After the eight-hour awareness level training, some DPU employees were selected for Operations Level training. Furthermore, the interviewees believed the TTT program served as the gateway for employees to get training in those lengthier courses required by the OSHA HAZWOPER standard for workers who respond defensively (usually the case in Toledo) or aggressively (for example, in case of a chlorine leak in the ton containers used in the wastewater facility) to leaks or spills.

One trainer talked of having “steward vision.” That is, he believed “ ... it was important for our folks to become knowledgeable and receive additional training ... ” His concerns were founded on the past practice by the fire department of calling DPU workers to respond to hazardous materials spills that could flow into a sewer. Since the training courses, procedures have been put into place to assure that only “ ... trained people go over to meet with the Fire Division in regard to a spill.” He stated that as a result of the training, employees were better able to communicate to management the need to establish appropriate health and safety procedures. One thing that helped was attendance by supervisors and administrators at training courses: “They were learning the same things that the workers were learning, and that opened a lot of their eyes. ... Administration and labor were both on the same street at that point, as opposed to, hey, you know this guy is out on the expressway and this guy is here on local roads.” This led to changes in management practices.

One employee expressed his perception that “Prior to the training ‘stupid things’ were being done and were considered ‘just normally accepted practices ... from the Commissioner on down.’” An example was provided. “When you had something in the hole and you had to clean out a channel, you'd go down in there, and the way you'd get down in there was to ride the cleaning hose down. It had a small nozzle about this big. You put your feet around and hang on and ride down it ... We wouldn't think of doing stuff like that now. I don't think there is anybody in the work force that would think about going into a hole like that now.”

All participants in the interviewed groups expressed the opinion that AFSCME's TTT program contributed to changing emergency response procedures in Toledo. According to them, new policies and standard operating procedures were written after the training course. Here is one trainer's explanation of how inappropriate past practices were discontinued and proper written procedures were put into place:

“ ... Instead of a lack of policy and procedure, there was a policy and procedure and it was followed ... maybe not completely ... Maybe the policy wasn't the best to start with, but it was a step in the right direction.”

Other examples of workplace practice changes that occurred include a request for respirators by bridge maintenance workers before they would manipulate bridge expansion joints, as recommended by the manufacturer. In the past, the job was done without them wearing any personal protective equipment. A similar situation happened with water treatment workers who started asking safety-and-health-related questions before manipulating chemicals used to disinfect the water.

## CONCLUSION

The extensive use of hazardous materials in most aspects of U.S. production results in potential worker exposure to hazardous waste materials in most industries, including the service and government sectors [17]. The process directed by the NIEHS SWT program, defined here, which led to a national consensus to identify and establish training criteria for workers who maintain a collateral duty to respond to hazardous materials emergency incidents suggests the breadth of this occupational and environmental health problem. The NIEHS SWT program incorporates more than 100 organizations throughout the U.S. It appropriately supports programs which provide emergency response health and safety training for workers with only a collateral duty for hazardous materials emergency response.

The evidence from the AFSCME training effort in Toledo suggests that the provision of eight hours of Awareness Level, or First-on-the-Scene, training to a majority of workers and supervisors involved in municipal waste management can greatly improve both worker and community health and safety. It introduced awareness to hazardous materials emergency response health and safety issues and broadened employee health and safety education related to potential and real exposures to hazardous materials. This effort led to significant improvements in workplace health and safety conditions and policies. It also improved the city's ability to both prevent and respond to hazardous materials emergency incidents. It was accomplished by providing a basis for improved standard operating procedures so that they would not cause emergencies and also, in the event of an emergency, they would facilitate a more unified and prepared response effort.

The Interpretive Guidance to the NIEHS Minimum Criteria for Worker Health and Safety Training For Hazardous Waste Operations and Emergency Response was provided to OSHA while it was preparing Appendix (e) to the HAZWOPER standard (29 CFR, 1910.120). The appendix was added as a non-mandatory element of the standard which could provide training organizations and employers with direction regarding elements of required worker training. OSHA did not include the language addressing workers with a collateral duty to respond to hazardous materials emergency incidents, even though the agency was strongly encouraged to do so.

We believe that OSHA has failed to extend its protection to workers who face a potential set of exposures that, as in the case of the New York City sanitation workers, can result not only in serious injury but also in death. This is a callous and irresponsible act on the part of OSHA. The agency itself has told employers that they need to provide adequate training, even though they won't commit themselves to a clear definition of the workers to be trained. Undoubtedly, the agency finds itself too politically vulnerable to state that employers in most sectors of industry, including the service sector, have a responsibility to provide emergency response health and safety training to a vastly expanded set of workers from that which is currently defined. Nonetheless, political vulnerability is no excuse for blatant underprotection that can lead to a worker's death. Above all else, OSHA is a public health agency and has an obligation to prevent injury, illness, and death [18].

OSHA should revise Appendix (e) and make its interpretation and enforcement of the standard consistent so that collateral duty emergency response workers are protected by the standard. The agency is reluctant to make any changes to existing standards because of the complicated rule-making process that would be set in motion by such an action. That is why Appendix (e) was made non-mandatory. It permitted an amendment to the standard without initiating the rule-making process. Therefore, at the least, OSHA should not cave in to employers' reluctance to provide expanded worker training and it should amend non-



mandatory Appendix (e) to include the language in the NIEHS document that establishes and defines collateral duty emergency response workers. OSHA should not support employer attitudes and beliefs that they have only a limited responsibility to protect the health and safety of their employees [19].

Eight hours of Awareness Level Emergency Responder health and safety training can make, and, as in Toledo, has made a difference in the ability of workers engaged in waste management activities to assess the conditions that can lead to a hazardous materials emergency incident, as well as the existence of such an incident. The training helps workers to prevent such incidents and be better prepared to address them in a manner that will reduce any adverse impacts of the incident and their response to it. As we stated earlier, the training will be most effective when it is part of a comprehensive health and safety program and those programs will be most effective when toxics use reduction and pollution prevention measures are established as primary workplace hazardous materials exposure control methods. However, in the meantime, worker-oriented training programs, like the AFSCME program discussed here, can go a long way toward preventing incidents like the one in New York City that seriously injured Thomas Giammarino and killed Michael Hanly.

## **ACKNOWLEDGEMENTS**

We thank the City of Toledo employees who helped us to understand the usefulness of the AFSCME training program, and its impact in improving health and safety for workers and Toledo residents. Our thanks also to Marilyn Powers at the George Meany Center for Labor Studies for her careful review of an earlier draft. The research involved in developing this paper was partially supported by NIH/NIEHS grant #1 U45 ES07823-02.

## **REFERENCES**

1. Additional elements necessary for prevention of occupational illnesses, injuries, and fatalities that may result from worker exposure to hazardous waste materials include: Government regulation (and enforcement) requiring waste minimization, control, and management; committed government support for toxic use reduction and pollution prevention through investment into research and development, and employer and union/worker education and consultation support, as well as legislation and regulation (with enforcement) that establishes criteria and requirements for employer action; and private-sector programs for responsible waste management.

2. U.S. Public Law 99-499, Oct. 17, 1986. 99th Congress

3. In its Notice of Proposed Rulemaking and Public Hearings for Hazardous Waste Operations and Emergency Response (FR/Vol. 52, No. 153/ Aug. 10, 1987; p. 29623), OSHA stated that “Congressional intent then is to provide protection to employees whenever they deal with hazardous wastes.” It continues, “Section 126 (g)(11) also indicates emergency response is an independent concept separate from hazardous waste removal operations. For those and other reasons OSHA believes section 126 is intended to cover emergency response to hazardous substances whether on a CERCLA or RCRA site or elsewhere.” The agency qualifies the statement with “... only employers whose employees have the reasonable possibility of engaging in emergency response are covered.” OSHA later qualifies it further by stating that the standard would not apply for responses to “incidental spills” and that would not “expose employees to exposures of hazardous substances above the established permissible exposure limits of this rule.” (The rule incorporates NIOSH and ACGIH limits due to the language in SARA section 126(b)(3).)

4. National Fire Protection Association (NFPA) "Recommended Practice for Responding to Hazardous Materials Incidents 471" and "Standard for Professional Competence of Responders to Hazardous Materials Incidents 472." NFPA, Quincy, MA, 1986 & 1992. These standards were revised after the promulgation of 29 CFR, 1910.120. The original ER levels from the standards in place in 1986 remain in the OSHA standard. Changing them would require public participation in the standard-setting and revision process. It would be costly, time consuming, and unduly burdensome to OSHA, and could potentially threaten the viability and effectiveness of the standard. To maintain the existing worker health and safety protections, OSHA chose to continue to define emergency response levels and training requirements for all workers based upon criteria deemed as outmoded for firefighters.

5. U.S. Department of Labor, Occupational Safety and Health Administration. "Training Requirements in OSHA Standards and Training Guidelines" OSHA 2254, 1995 (Revised).

6. Occupational Safety and Health Administration, Directorate of Compliance Programs. *HAZWOPER Interpretive Quips* (IQs), October 1992.

7. OSHA HAZWOPER Interpretive Quips; file: q(6-1)01.irs. letters: WChristie 04-05-90.

8. OSHA HAZWOPER Interpretive Quips; file: q(6-1)01.irs. letters: WChristie 04-05-90.

9. By 1990, OSHA seemed to be leaning away from requiring HAZWOPER First Responder Awareness Level health and safety training. However, since much of HAZWOPER compliance was to be performance-based, the agency was indicating that it might be required depending upon the site-specific conditions.

10. AFSCME Proposal in response to an NIEHS request for proposals, #ES-95-001, 1995.

11. National Clearinghouse for Worker Health and Safety Training. Interpretive Guidance to the Minimum Criteria for Worker Health and Safety Training for Hazardous Waste Operations and Emergency Response; Resulting from a Technical Workshop Sponsored by the National Institute of Environmental Health Sciences, March 29 - 31, 1994. Silver Springs, MD, George Meany Center for Labor Studies. Pg. 104.

12. Author's notes from NIEHS semi-annual Superfund Worker Training program awardees business meetings - October 1990 - October 1996. The NIEHS SWT program facilitates discussions between the various interests represented by the awardee organizations. The meetings have helped to establish a stronger sense in awardees that they are part of a national program. In this way, competing interests are raised and, to some degree, cooperative strategies for supporting these interests are developed.

13. Author's notes from NIEHS semi-annual Superfund Worker Training program awardees business meetings - October 1990 - October 1996.

14. International unions represented at the workshop included the International Association of Firefighters (IAFF); the Oil, Chemical, and Atomic Workers Union (OCAW); the International Chemical Workers Union (ICWU); the United Steel Workers of America (USWA); the United Auto Workers (UAW); the American Federation of State, County, and Municipal Employees (AFSCME); the George Meany Center -- representing the Brotherhood of Maintenance of Way Employees; the United Transportation Union; Brotherhood of Locomotive Engineers; Transport Workers Union; Transportation Communications International Union; International Brotherhood of Boilermakers; National Conference of Firemen and Oilers; Brotherhood of Railroad Signalmen (an SEIU affiliate); the International Brotherhood of Teamsters; and the Service Employees International Union (SEIU).

15. The increased program participation of unions representing workers involved in hazardous waste operations other than waste site remediation reflects the increasing need for responsible hazardous waste management in all industrial sectors.

16. Siqueira, CE, Marquardt, WG. "Twelve Years To A Safer Workplace," *New Solutions* 5(2) (1995):15-21.

17. Advocates of worker health and safety should consider the need to redefine hazardous wastes to address workers' needs in the workplace as well as for the protection of the environment. Hazardous waste has been defined for environmental legislation and regulation by individuals, organizations, and agencies that address environmental rather than occupational health. Waste is created whenever an industrial process results in the production of some substance that is not part of the intended product or service. When that substance is a hazardous material, it is a hazardous waste. Therefore, welding fumes, for example, are a hazardous waste. Current occupational health regulations designate many such waste-products as health hazards but fail to address the generation of and worker exposure to a hazardous waste material.

18. OSHA's location within the Department of Labor does not diminish its function as a public health agency. The OSH Act begins, "An Act: To assure safe and healthful working conditions for working men and women."

19. The EPA and officials of state, county, and municipal governments also hold a responsibility to protect these workers. For the most part, the EPA has refused to enforce 40 CFR Part 311 and the other levels of government, as employers, have faulted on compliance, knowing that enforcement was not likely.

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**MEASUREMENTS OF OXYGEN CONCENTRATION OF AIR WITHIN TOTALLY-  
ENCAPSULATING CHEMICAL PROTECTIVE SUITS**

**by**

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**ABSTRACT**

This study measured oxygen concentrations of air within totally-encapsulating chemical-protective (TECP) suits during simulated hazardous materials emergency response operations. This was done to allow assessment of the suitability of use of air within TECP suits as an emergency air supply during escapes from contaminated areas following loss of primary air supply. Samples of air were extracted through a probe installed in TECP suits as the suits were worn during simulated hazardous materials control operations. Data on oxygen concentration were obtained using direct reading equipment and through Orsat analysis of samples. Results indicate that the air within a TECP suit becomes significantly oxygen deficient soon after the suit is closed, but generally maintains oxygen concentrations somewhat above those known to produce significant physiological effects. However, due to the further reduction of oxygen content inherent in breathing the air within TECP suits, it is anticipated that symptoms of oxygen deficiency sufficient to impair escape could be experienced in some instances. Recommendations are made

for modifying current training practices in order to better prepare personnel working in Level A chemical protective ensembles to cope with loss of air supply.

## **INTRODUCTION**

Level A chemical-protective ensembles are commonly used by personnel responding to hazardous materials emergencies. The main protective barrier of Level A ensembles is the totally-encapsulating chemical-protective (TECP) suit. TECP suits completely enclose the wearer, are intended to be gas tight, and are designed to maintain a slight internal pressure. These suits are fitted with one or more exhaust valves or check valves which release air to prevent excessive pressure from developing within the suit. Personnel working inside these suits are dependent on self-contained breathing apparatus (SCBA) for air supply.

One emergency that personnel may encounter while working in a Level A ensemble is loss of air supply. This can occur due to equipment failure or due to total depletion of air supply while working in a chemically contaminated area. Loss of air supply constitutes a major, life threatening emergency since suffocation inside the TECP suit is possible. However, opening the suit to obtain breathing air in such a situation can result in chemical exposure which may also constitute a major threat to life or health.

Over the past decade, students in hazardous materials emergency response training programs have commonly been instructed to resist any urge they may have to open the TECP suit in a contaminated area following loss of air supply. As an alternative, trainees have been instructed to disconnect the SCBA facepiece and utilize air within the TECP suit as an escape air supply. This traditional instruction is based on the

idea, as stated in one commonly used emergency response training manual, that "several minutes of air should remain within the suit, allowing the user to reach a safe haven".<sup>(1)</sup>

Within the past year, the efficacy of using the air within a TECP suit as an emergency air supply has been called into question by personnel overseeing safety and health training provided to workers at U.S. Department of Energy (DOE) facilities. DOE officials assert that workers in air-supplied suits can begin to experience symptoms of oxygen deficiency in as little as 40 seconds following loss of air supply.<sup>(2)</sup>

Air-supplied suits completely enclose the wearer much like TECP suits. However, breathable air is constantly fed into an air-supplied suit through an airline and the encapsulated worker does not wear a respirator inside the suit as with a Level A ensemble.

Given the serious nature of chemical hazards requiring Level A protection, any feasible alternative is preferable to opening the TECP suit in a contaminated area in response to loss of air supply. However, the idea that the air within the suit can afford "several minutes" of escape breathing time, as commonly asserted by hazardous materials emergency response trainers, may cause some trainees to underestimate the seriousness of this type of emergency. Moreover, trainers may be unknowingly misinforming trainees, or giving them a false impression, about the amount of escape time which the air within a TECP suit should provide them in such an emergency.

In order to determine how trainers can best instruct trainees to deal with loss of air supply in a TECP suit, a reasonable estimate of the amount of escape time afforded the wearer by breathing the air within the suit must be established. Variables involved in making such an estimate would include: the volume of air inside the suit, the oxygen content of that air, the difficulty of the escape route, and the level of physical fitness of

the responder. The objective of this research project is to provide an estimate of one of these variables: the oxygen content of air inside a TECP suit during use.

## **MATERIALS AND METHODS**

Research for this project was conducted using a typical level A ensemble of personal protective equipment. Equipment used included Lifeguard Responder TECP suits and MSA Ultralite SCBAs. In order to insure gas tight integrity, only new suits which had passed the manufacturer's pressure test were used.

A probe or pass-through fitting was installed in place of one of the two exhaust valves built into the Responder suits. The probe was fitted with two tygon tubes, allowing air within the suit to be sampled without compromising suit integrity. The tubes were tightly capped when not in use. Air samples were pumped into Tedlar bags for Orsat analysis to determine oxygen and carbon dioxide content. As each sample was collected, a direct measurement of oxygen concentration was simultaneously made using an MSA model 260 combustible gas and oxygen meter.

Participants in the project included both trainees and instructors using Level A PPE during field exercises at the UAB Center for Labor Education and Research (CLEAR). Participants made simulated hot zone entries and performed various hazardous materials spill control and leak repair operations. Care was taken to avoid leakage of air under positive pressure from SCBA facepieces into the suit. Toward that end, all participants were clean shaven and passed a negative pressure fit check as part of the equipment donning procedure.

Sampling of suit air was carried out on two occasions at CLEAR. The first round of sampling involved four hot zone entries. Samples were collected at intervals of approximately two minutes and ten minutes after the TECP suits were closed. The

second round of sampling involved three hot zone entries, with samples collected at intervals of approximately two minutes, ten minutes, and twenty minutes after the suits were closed. During the second session, additional information was gathered using an Industrial Scientific TMX multi-gas monitor. The TMX was worn inside the TECP suits so as to record the oxygen content throughout the entries.

Systemic workload of participants in both sessions was estimated by coding the work activities performed and converting the codes into caloric values. This was done using the method described by Tayyari, Burford, and Ramsey.<sup>(3)</sup>

## **RESULTS**

Data collected in the first sampling session are shown in Table 1. Orsat analysis of samples indicated mean oxygen concentrations of 19.4% for samples collected at the two minute interval and 18.1% for samples collected at the ten minute interval. Direct readings of oxygen concentration taken with the MSA 260 at the time of sample collection were generally consistent with the results of Orsat analysis.

Table 1. Data from Sampling Session 1



Following analysis of the initial round of samples, it was determined that extended entry times might result in oxygen concentrations significantly lower than the 18.1% mean determined at the 10 minute interval in sampling session one. Thus, it was determined that the second sampling session should include additional samples collected at the 20 minute interval. It was also determined that a more comprehensive set of data should be obtained from each entry. Thus, the Industrial Scientific TMX was used to record oxygen concentration at one minute intervals throughout all entries during session 2.

Data collected in the second sampling session are shown in Table 2. Orsat analysis of samples indicated mean oxygen concentrations of 19.5% for samples collected at the two minute interval, 17.7% for samples collected at the ten minute interval, and 17.4% for samples collected at the 20 minute interval. Simultaneous readings of oxygen concentration with the MSA 260 and the Industrial Scientific TMX were generally consistent with the results of Orsat analysis.

Figure 1 shows oxygen concentrations within TECP suits as a function of time following suit closure. The data plotted are mean oxygen concentrations for each one-minute entry interval during three session 2 entries, as recorded by the Industrial Scientific TMX. This plot indicates rapid reduction in oxygen concentration within TECP suits during the first few minutes following TECP suit closure. After the rapid initial drop, oxygen concentrations continued to fall throughout the remainder of the entries, but at significantly reduced rates.

Table 2. Data from Sampling Session 2

Figure 1. Oxygen concentration of air within TECP suits as a function of time following suit closure.

Estimates of systemic work load averaged 2.63 kcal/min for tasks performed during session 1 and 2.60 kcal/min for tasks performed during session 2. All estimated workloads were classifiable as light workloads<sup>(4)</sup>. However, it is possible that the method used underestimated the actual workloads, as no consideration was given to the 14 kg (31 lb) ensemble of equipment worn during the sessions. Research by others has classified similar tasks performed in Level A protective ensembles as heavy to very heavy workloads<sup>(5)</sup>.

## **DISCUSSION**

Several factors must be considered in assessing whether or not the air inside a TECP suit should offer "several minutes" of escape breathing air, thus "allowing the user

to reach a safe haven" following loss of air supply. This project focused on only one of those factors: oxygen content of air within TECP suits during use.

Symptoms of oxygen deficiency are well-documented to begin at an atmospheric oxygen concentration of approximately 16%.<sup>(6,7)</sup> The effects become progressively more severe with further reduction in oxygen content<sup>(8)</sup>, as shown in table 3.

Table 3. Expected Physiological Effects of Oxygen Deficiency

As the results of this project indicate, oxygen concentration of air within a TECP suit drops below 18% during the first several minutes after the suit is closed. Results also indicate that up to and beyond twenty minutes following closure of a TECP suit the air within the suit contains sufficient oxygen to support respiration without significant effects of oxygen deficiency. However, once air within the suit begins to be utilized as an emergency air supply, the oxygen content should be rapidly reduced due to the 20 to 25% oxygen depletion associated with the respiratory process.<sup>(9,10,11)</sup> This significantly

calls into question the amount of escape time available prior to the onset of symptoms of oxygen deficiency for a person using that air as an emergency supply.

Specific factors affecting whether or not a person breathing the air inside a TECP suit would be able to reach a safe area include the following:

1. The volume of air inside the suit,
2. The amount of time elapsing between the closing of the suit and the occurrence of loss of air supply,
3. The length and difficulty of the escape route,
4. The level of physical fitness and emotional stability of the person, and
5. Individual variation in susceptibility to the effects of oxygen deficiency.

In a hypothetical example, an emergency responder losing air supply early in a Level A entry may be able to breath air from inside the suit without significant symptoms of oxygen deficiency while affecting a quick escape over level terrain to reach a decontamination area. In contrast, the same responder may experience symptoms sufficient to make self rescue impossible if loss of air supply occurs later in the entry and the escape pathway is long or difficult. Given the potentially complex and unpredictable interactions between the factors involved, this seems a dangerous topic for generalization.

## **CONCLUSION**

Loss of air supply in a TECP suit constitutes a major, life threatening emergency. For this reason, hazardous materials emergency response training should include procedures for coping with it.

Standard operating procedures of response organizations should also address this issue. Careful monitoring of entrant's closed suit times and rigorous SCBA maintenance programs are important precautions which can prevent loss of air supply from occurring.

If loss of air supply should occur, immediately opening the TECP suit is not a reasonable response in many hazardous materials situations, such as those involving highly toxic or corrosive substances. However, in some instances, the hazard posed by oxygen deficiency in TECP suits may be greater than that posed by chemicals. Trainees in hazardous materials programs must be informed of this hazard, with a major focus on recognizing the symptoms of oxygen deficiency.

Those who use Level A equipment need to be trained in standard procedures which address the hazard of oxygen deficiency as well as chemical hazards in coping with loss of air supply. This could be accomplished by instructing trainees to react to this type of emergency by immediately moving toward a designated safe area while breathing air from inside the suit, but to remain on guard for symptoms of oxygen deficiency. Trainees could be instructed to open the suit enough to admit outside air should the effects of oxygen deficiency begin to impair their ability to complete the escape. By that time they may have at least reached a less contaminated area, if not a clean area. This would require that only TECP suits which can be opened by the wearer be selected for use in Level A ensembles.

Given the results of this project, the common assertion that "several minutes of air should remain within the suit, allowing the user to reach a safe haven" seems overly generalized and simplistic. In some cases, it may be blatantly incorrect. Given that, it seems appropriate for trainers to reevaluate traditional instruction on dealing with loss of air supply in a TECP suit.

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