Comparison of Live Skit and Video Delivery Styles Using Presentations With and Without Fluorescent Tracer Dyes at Pesticide Applicator Training for Promotion of Self-Protection from Dermal Exposure.

Carrie R. Foss, Pesticide Education Program, Cooperative Extension, Washington State University, Puyallup, WA, cfoss@wsu.edu

Emily H. Allen, Department of Environmental Health, University of Washington, Seattle, WA, eallen@u.washington.edu

Richard A. Fenske, Department of Environmental Health, University of Washington, Seattle, WA, rfenske@u.washington.edu

Carol A. Ramsay, Pesticide Education Program, Cooperative Extension, Washington State University, Pullman, WA, ramsay@wsu.edu

Abstract

Comparison of Live Skit and Video Delivery Styles Using Presentations With and Without Fluorescent Tracer Dyes at Pesticide Applicator Training for Promotion of Self-Protection from Dermal Exposure.

Carrie R. Foss, Pesticide Education Program, Cooperative Extension, Washington State University, Puyallup, WA
Emily H. Allen, Department of Environmental Health, University of Washington, Seattle, WA
Richard A. Fenske, Department of Environmental Health, University of Washington, Seattle, WA
Carol A. Ramsay, Pesticide Education Program, Cooperative Extension, Washington State University, Pullman, WA

Program delivery has a major impact on pesticide applicators' reception to learning. This study evaluated the impact of different training delivery styles, with and without the demonstration of fluorescent tracers, on dermal pesticide exposure. Three delivery styles were each tested at three large-group pesticide license recertification courses: live fluorescent tracer dye skit, video-taped dye presentation, instructional video. The target pesticide applicator group (764 people) comprised active, non-agricultural applicators that were similar in terms of group size, response rate, age, gender, employer type, and applications performed. Results of the ANOVA tests on eight questionnaire outcome variables showed that the live fluorescent tracer dye skit produced significantly greater positive responses ($p<0.05$) than the other two delivery styles and that the taped dye presentation produced greater responses than the instructional video.

Keywords: pesticide, safety, education, tracer, dye, exposure, health, delivery, style

Introduction

Training is recognized as an effective tool for behavior modification and promoting self-protection. State pesticide applicator training programs promote judicious and safe use of pesticides through outreach education (Ramsay and Foss 2000). Pesticide recertification courses cover a wide range of topics in addition to pesticide safety. Many classes have large audiences, which typically are less conducive to interactive learning methods than small audiences. This can result in a lowered level of learning. Another barrier to learning is that applicators may have change-resistant attitudes for a variety of reasons (M. Shenk, E-mail communication, 2000).

The fluorescent tracer technique has been used in pesticide safety education to demonstrate how contamination can inadvertently spread when a contaminated object is handled (Shenk, 1999; L. Schulze, E-mail communication, 1999; P. Hipkins, E-mail communication 1999). For participants, the visual experience of seeing how pesticide exposure can appear on their own skin has immediate impact and can increase awareness of how dermal pesticide exposure can occur. Fluorescent tracer has been successfully used to document dermal exposure in protective equipment studies (Fenske 1988; Fenske et al.1986a, 1986b; Archibald 1994; Methner 1994; Roff 1997; Saleh 1998; Houghton 1999).

This study evaluated the impact of different training delivery styles on simulated dermal exposure for pesticide applicators. The demonstration of fluorescent tracer dye was incorporated in two of the three delivery styles. The goal was to determine how to conduct more compelling, effective training to motivate applicators to protect their skin from pesticide exposure. A questionnaire was administered at each training site to evaluate training style and impact. Response information was collected from applicator attendees and compared in the context of an intervention effectiveness evaluation.

Methods

This study was designed to evaluate the educational impact of three different training delivery styles aimed at promoting self-protection from dermal exposure among pesticide applicators. Each of the three delivery styles (live skit using fluorescent tracer dye, videotaped presentation of dye skit, and instructional video with no dye component) was tested at three large-group pesticide license recertification courses in Washington state in 2000 and 2001 for a total of nine locations. Each presentation was a 50-minute segment of a two-day Washington State University Pesticide Education Program recertification training.

Live Fluorescent Tracer Dye Skit

University research and Cooperative Extension staff collaborated in developing the live skit, a fluorescent tracer dye presentation involving four licensed pesticide applicators. The skit was performed live in a classroom setting. Elements of the presentation included a ten-minute formal introduction on dermal pesticide exposure, a 15-minute pesticide-application skit using fluorescent tracer (Tinopal 5BM-GX), and a ten-minute interactive discussion and visualization showing the dermal fluorescent tracer exposure under black light. Pesticide applicators performed the improvisational skit and research staff conducted the other elements of the presentation.

Two pesticide applicator characters working together were the basis for the skit: one inexperienced and recently trained, the other experienced but cavalier. Both personalities were caricatured for humorous effect. The two applicators discussed their pesticide application tasks, donned their personal protective equipment, loaded and mixed pesticides, pretended to travel to an application site, applied pesticides, encountered and resolved technical difficulties, interacted with a bystander, returned to their workplace, and completed record-keeping. The applicators wore denim-blue Tyvek coveralls or a blue work shirt and denim-blue Tyvek pants, ball caps, gloves, and boots or shoes. They used three-gallon Solo backpack sprayers (20 liters of water mixed with 25 grams of dye) to perform their applications. Other props included a potted silk tree, orange vinyl fencing, a sheet of paper, a stuffed animal, a doll, a drink cup, a soda can, a pack of cigarettes, and a table and chairs. Dialog was improvisational in nature. Two different teams of two performed the skit based on geographical convenience.

Figure 1. Scene from the live demonstration: loading backpack sprayers (shown here as a frame from the videotape).

Immediately upon the conclusion of the skit, the meeting room was darkened and ultraviolet lamps (a.k.a. UV or black light) were uncovered and brought forward. The applicators' hands, faces, protective equipment, and spray equipment were illuminated by the ultraviolet light showing where pesticide exposure had occurred. For their safety, the applicators and the presenter wore UV protective glasses during the black light session. Throughout the black light session, the audience was asked to participate by identifying specifically where the fluorescent tracer might be seen. Interactive discussion continued after the visible lights were switched back on. The audience was asked to identify work practices and use of protective equipment that could be improved to mitigate exposure, compared to the practices depicted during pesticide application skit.

Figure 2. Fluorescent tracer on hands under black light following the pesticide application skit. A band-aid on the palm has been removed, showing unexposed skin.

Taped Dye Presentation

The second delivery style used videotaped footage of the live skit and its corresponding discussion. This was a non-edited version recorded by a professional videographer using a broadcast-quality video camera. The sound, however, was not broadcast quality.

Instructional Video

The third delivery style used a 30-minute instructional safety video entitled *Safe Use of Pesticides in Outdoor Nurseries* (1995). This safety video was professionally filmed on-site at a California nursery. The script was largely narrated by an off-camera speaker and emphasized pesticide hazard identification, exposure routes and prevention, and emergency response. It was interspersed with short scenes of action and dialog among on-screen applicators. There was no fluorescent tracer footage used in this video.

Questionnaire

An anonymous, self-administered questionnaire was given in two parts to attendees at each of the nine locations. Prior to the presentation, applicators were given approximately 15 minutes to complete the first part, which asked for background regarding aspects of their work, pesticide use, self-protection, and health effects experienced. Following the presentation, the second part of the questionnaire was handed out, soliciting responses to the presentation itself. This training evaluation portion was completed within five minutes and turned in as attendees exited the room.

The second part of the questionnaire was designed to elicit a basic and straightforward response to the presentation delivery style. It asked attendees to rank on a five-point scale from "strongly agree" to "strongly disagree" their responses to four statements regarding awareness and impact. Table 1 breaks the four-item questionnaire into its component parts. The two awareness statements (“Main Idea” and “Enjoyed”) are considered training evaluation statements rather than measures of the training’s impact on health and safety or related knowledge, attitudes, or behaviors. The two other questionnaire statements provided an indication of impact; “More Aware” solicited self-reports of a gain in knowledge and “Do Differently” assessed a behavioral intention to improve self-protection from dermal exposure to pesticides.

Table 1. Awareness and Impacts Measures	
Awareness Statements	
Presentation’s main idea came across clearly	Main Idea
I enjoyed this presentation style more than a typical lecture presentation	Enjoyed
Impact Statements	
I will do something differently than I did before related to dermal exposure to pesticides	Do Differently
Presentation increased my awareness of dermal pesticide exposure	More Aware

Data Analysis

Questionnaire data was entered into a Microsoft Access 98 database for analysis. To assess the effect of the interventions (the experimental effect), one-way analysis of variance (ANOVA) was conducted, with intervention group (type of presentation) as the independent variable, and evaluation question response as described above as the dependent variable, for each of the eight outcomes (four questions and two measures of agreement). Planned contrasts were conducted to test two experimental hypotheses: 1) that the live fluorescent tracer skit group’s responses were more favorable on all outcome variables than the other groups’, and 2) that the videotape of the live skit generated more favorable response than the instructional video.

The nine pesticide applicator course sites at which this study was conducted had a combined course enrollment of 1431 applicators. Surveys were received from 1152, or 80.5% of enrolled applicators overall. Non-applicators (dealers, supervisors, consultants) who participated were excluded, yielding a group of 764 non-agriculture, active applicators, which formed the basis for the statistical analysis.

Results

The responses to the background portion of the questionnaire (Table 2) suggest that the three groups of applicators were similar in terms of type of work and demographic characteristics.

Table 2. Comparability (and characterization) of groups			
	Live Skit	**Skit Video**	**Instruct. Video**
N, applicators	268	260	236
Age, mean (SD)	43.4 (9.9)	43.9 (9.7)	45.4 (9.5)
Gender, % male	84.8%	88.9%	91.0%
Employer, %			
City/county	45.9%	36.5%	33.1%
Small company	20.9%	20.0%	20.3%
State	10.4%	23.5%	22.5%
Large company	7.8%	8.5%	4.2%
Schools	6.0%	5.4%	0.0%
Other	7.5%	6.2%	19.5%
Primary application site, %			
Landscape	50.0%	46.2%	37.3%
Turf	16.0%	15.4%	18.2%
Highway right-of-way	11.9%	7.7%	21.6%
Forestry	2.2%	6.9%	5.5%
Greenhouse/nursery	3.4%	4.6%	2.5%

Table 3 shows the significances of each of the ANOVA tests and planned contrasts conducted for the eight outcome measures using site as the unit of analysis. While the sample sizes were small (N=3 for each of the three groups), ANOVA is robust when assumptions of independence of observations are not violated. Levene's statistic was used to test the assumption of homogeneity of variances, and this assumption was not violated for any of the eight procedures ($p>0.05$ that variances were not different).

Results of the ANOVA tests on eight questionnaire outcome variables, in conjunction with group-specific means, showed that the live demonstration with fluorescent tracer (Group 1) produced significantly more favorable results ($p<0.05$) than the other two treatments for seven of eight outcome measures, including both process and impact evaluation measures. In addition, the videotape of the live skit (Group 2) produced significantly more favorable results ($p<0.05$) than the instructional video (Group 3) for four out of eight outcome measures.

Table 3. Significances (p-values) of one-way ANOVA tests by study hypothesis.

		Study hypothesis	
Outcome measure	**Means not equal**	**Group 1 > Group 2 and 3**	**Group 2 > Group 3**
Percent strongly agree			
Process			
Main Idea	0.022*	0.008**	0.049*
Enjoyed	0.002**	<0.001**	0.064
Impact			
Do Differently	0.010*	0.004**	0.023*
More Aware	0.002**	0.002**	0.002**
Percent any agree			
Process			
Main Idea	0.122	0.034*	0.160
Enjoyed	0.085	0.020*	0.215
Impact			
Do Differently	0.203	0.111	0.088
More Aware	0.002*	0.004**	0.001**

* p<0.05.
** p<0.01.

Table 3 shows that, for the four strongly-agree outcomes, the interventions produced significantly different responses: the live demonstration (Group 1) produced significantly more favorable responses than the other treatments and the videotape of the live skit (Group 2) produced significantly more favorable responses than the instructional video (Group 3) ($p<0.05$ for 11 of the 12 tests). For the all-agree outcomes, however, the results suggest a similar pattern but are not as significant as the strongly-agree outcomes, although for the hypothesis that the live demonstration (Group 1) would outperform the other two intervention arms, three of the four tests were significant ($p<0.05$).

Discussion

Pesticide applicators are responsible for protecting themselves against pesticide exposure. Basic and continuing education for pesticide applicators emphasizes the effects of pesticide exposure and the personal protective equipment required to protect against exposure. The Washington State University Pesticide Program recertification courses provided a large-group classroom setting to evaluate the educational impact of the fluorescent tracer dye improvisational skit in comparison to other delivery styles and content. This successful effort suggests that the combination of live, spontaneous presentation, active peer involvement, and fluorescent dye visualization, plus participatory discussion provided highly successful training that exceeded the video presentations with and without fluorescent dyes. It is recognized that the live skit performance requires a significant amount of preparation time in locating willing actors, props, and appropriate room set-up, especially adequate darkness. However, the time invested results in a higher level of training conducted and greater impact for the applicator-student.

This study supports the existing evidence that the fluorescent tracer dye technique can effectively demonstrate pesticide exposure to applicators either live or on videotape; however, the live presentation is superior. When either the live skit or its videotape were compared with a safety video, both resulted with increased positive training responses. Applicators believe and respect what they can see with their own eyes. They also appreciate humor.

These data further support the use of fluorescent tracer dye when dealing with large audiences as well as small audiences. The largest class size for the live skit was 255 attendees. Thus, class size should not limit the use of this educational approach. But, it is noted that room set-up is important for the ability of the audience in the back and sides to see the skit and resulting exposure under the black light (this may require more extensive or powerful black lighting).

To improve on the elements of this study, an evaluation tool could be designed to assess behavior changes in self-protection related to the educational presentation. In this study, impact evaluation was limited to the results of the self-administered questionnaire and not an objective measure of self-protection.

The effectiveness of a training program depends on many elements, including group size, relevance of the topic, manner of instruction, and motivational incentive (Cohen and Colligan 1998). The fluorescent tracer dye demonstration skit evaluated in this study provides an effective and lasting intervention approach for pesticide applicators whether presented by live skit or videotape demonstration.

Conclusions

Fluorescent tracer technique can be effective in pesticide applicator education. Entertaining and/or interactive elements can add to the impact of safety training. Having applicators play key roles in the training can enhance the credibility of the presentation by making the content more realistic and meaningful to the audience.

Acknowledgments

The authors acknowledge and thank the applicator-actors (E. Gerber, D. Heath, F. Marshall, J. Sabalausky); Joe Hudak; Michael Alavanja and Cheryl McDonnell of the Agricultural Health Study; the focus group participants; and the questionnaire respondents for their contributions to this study. This project was funded by the National Institute for Occupational Safety and Health (Cooperative

Agreement No. U07/CCU012926, Pacific Northwest Agricultural Safety and Health Center).

References

Archibald, B. A., Solomon, K. R., et al. (1994). Fluorescent tracer and pesticide penetration through selected protective clothing. *Bull Environ Contam Toxicol 53(4),* 479-485.

Cohen, A. and Colligan, M. J. (1998). *Assessing occupational safety and health training: a literature review.* DHHS (NIOSH) Pub. No. 98-145. Cincinnati, OH: National Institute for Occupational Safety and Health (NIOSH).

Fenske, R. A. (1988). Comparative assessment of protective clothing performance by measurement of dermal exposure during pesticide applications. *Applied Industrial Hygiene, 3,* 207-213.

Fenske, R. A., Leffingwell, J. T., et al. (1986). A video imaging technique for assessing dermal exposure. I: Instrument design and testing. *Am Ind Hyg Assoc J 47(12)*, 764-770.

Fenske, R. A., Wong, S. M., et al. (1986). A video imaging technique for assessing dermal exposure. II: Fluorescent tracer testing. *Am Ind Hyg Assoc J 47(12)*, 771-775.

Houghton, D., Archibald, B., et al. (1999). Review of video imaging techniques for estimating dermal exposure to pesticides. Occupational hazards of pesticide exposure: Sampling, monitoring, measuring. D. Ecobichon. Philadelphia, PA: Taylor & Francis.

Methner, M. M. and Fenske, R. A. (1994). Pesticide exposure during greenhouse applications, part II. Chemical permeation through protective clothing in contact with treated foliage. *Applied Occupational and Environmental Hygiene 9*, 567-574.

Ramsay, C. A. and Foss, C. R. (2000). *Washington Pesticide Laws and Safety*. Washington State University. Pullman, WA.

Roff, M. W. (1997). Accuracy and reproducibility of calibrations on the skin using the fives fluorescence monitor. *Ann Occup Hyg 41(3)*, 313-24.

Safe use of pesticides in outdoor nurseries. (1995). University of California Visual Media,Oakland, CA. University of California, Division of Agriculture and Natural Resources, Communication Services-Publications.

Shenk, M. (2000). Issues in non-English pesticide applicator training programs. *Journal of Pesticide Safety Education, 2*, 15-26.

US Environmental Protection Agency Office of Pesticide Programs. (2000). *Certification and Training Programs*. http://www.epa.gov/pesticides/safety/applicators/ctprogs.htm.