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Pesticide Training for Adolescent Migrant Farmworkers
Final Technical Report

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LIST OF ABBREVIATIONS

CReATE: Creating Roads to Empowerment and Advancement through Education

CROET: Center for Research on Occupational and Environmental Toxicology

EPA: Environmental Protection Agency

ESL: English as a Second Language

FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act

MEP: Migrant Education Program

NAWS: National Agricultural Workers Survey

OHSU: Oregon Health & Science University

OSHA: Oregon Safety and Health Association

WPS: Worker Protection Standard

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ABSTRACT

This project was designed to evaluate the effectiveness of commonly used pesticide safety training materials with migrant adolescent farmworkers. Most migrant farmworkers are poorly educated and do not speak English as a primary language. While materials are available to train farmworkers on pesticide safety, few of the training methods have been evaluated with non-English speaking populations and no studies have addressed the effectiveness of agriculture health and safety training with adolescent migrant farmworkers. The purpose of the project was to determine if cultural, developmental, and age-related factors are associated with the adolescent's knowledge and beliefs of pesticide hazards and safety precautions and to what extent these factors influence the effectiveness of pesticide safety training. Specifically the project compared 1) the effectiveness of video methods of training and more interactive "flipchart" approaches to training, 2) the effectiveness of training delivered in the context of an educational program versus traditional methods of grower initiated training, 3) the effectiveness of traditional methods of delivering the training (audio-visual materials, training packets) when compared to an individualized computer-assisted approach. The educational interventions used in this project are built upon previous community-based projects with the migrant agricultural community and were dependent upon collaborative relationships with organizations that serve and advocate for the Latino agricultural community. Results from this project provide a model for future educational intervention research in agricultural occupational safety and health and contribute to the knowledge of workplace exposures and health effects in this vulnerable population.

SIGNIFICANT FINDINGS

- Adolescent farmworkers are varied in their backgrounds: some immigrate directly from Mexico to work in the fields; others live in the US and migrate with their families during the summer harvest season; others live in the US and work in the industry after school and during summers.

- Only 34% of adolescent farmworkers indicate having received pesticide training. This low proportion indicates that the adolescents either do not recognize employer-given information as formal training or that they have not received training. The EPA Worker Protection Standard is not being enforced.

- Overall, baseline scores on pesticide knowledge were much higher in this study population than we had predicted. Although only one third of the adolescents reported that they had received prior pesticide training, the assessment of knowledge that is routinely covered in Worker Protection Standard training indicated a high level of knowledge. The major predictor of baseline knowledge of pesticide hazards and safety precautions was found to be the primary language of the adolescents and the age of the adolescent. There were significant differences between the baseline knowledge scores of adults and younger adolescents.

- The EPA flipchart training method resulted in the greatest change in knowledge scores. The individualized cTRAIN program proved somewhat problematic with migrant farmworkers; nearly 40% were unable to complete the program in the allotted time. The effectiveness of the cTRAIN and the video were both judged to be the same. There was no difference between baseline pesticide knowledge scores between adults and teens.

- Approximately 17% of the adolescent agricultural workers reported mixing and/or applying pesticides either currently or in the past. Interviews with these adolescents indicated that they do not know the names of the chemicals that they have worked with and that in many instances they are taught this work by family members.

- In labor camps, over 50% of the adolescent and adult workers report speaking primarily indigenous languages; training should be offered in these indigenous languages.

- Focus groups revealed that adolescent farmworkers feel uncomfortable talking to their boss about safety issues. They believe they are destined to do agricultural work and that there is little opportunity for other employment. Adolescent farmworkers report that they will engage in risky occupational work if they are compensated with a higher wage

USEFULNESS OF FINDINGS

- Changing demographics of migrant labor force point to increasing number of indigenous Mexicans. Training materials are needed that can be comprehended easily by this population.

- Employers should understand the special needs of adolescent farmworkers (difference in learning development, fear of the boss, reluctance to ask questions) and be prepared to address the differences in supervising an adolescent worker. Employers should not rely on the adolescent worker's family/siblings to supervise the employee. Employers should realize that teenagers will not take initiative to ask for help or more information and will do as directed. This also means that they will listen to the boss if the boss can clearly communicate with the youth.

- The school venue is appropriate for worker safety training. The most preferred and perhaps most effective method of training with adolescents was the EPA interactive flipchart. Adolescents appear to learn best in an interactive environment. Adolescent farmworkers learn how to do farm work from their families. Adolescents who learn about occupational health and safety in a school setting may share this information with their parents and siblings.

- Adolescents with indigenous languages such as Mixteco and Trique are more likely to have less knowledge of levels of pesticide risks and health hazards. These subgroups need special training consideration.

1.0 BACKGROUND FOR THE PROJECT

This project addressed the need to evaluate the effectiveness of commonly used educational materials or training on adolescent migrant farmworkers' pesticide safety and health behaviors. In recent years the U.S. Environmental Protection Agency (EPA) and other agencies have begun initiatives to increase the scope and quality of agricultural health and safety training. However, few of the training methods have been evaluated with non-English speaking populations and no studies have addressed the effectiveness of agricultural health and safety training with adolescent migrant farmworkers. This study explored factors contributing to pesticide exposure risk including knowledge and beliefs about pesticides in adolescents working in different agricultural settings and examined cultural and/or developmental factors that contribute to risk. We evaluated commonly used pesticide training materials with adolescent migratory farmworkers and compared different methods of educational delivery on educational and behavioral outcomes. A major focus of this proposed work was to identify culturally-specific factors that enhance or inhibit the agricultural health and safety education of non-English speaking Latino adolescents and to compare the effectiveness of different educational approaches.

1.1 Adolescent Migrant Farmworkers: Issues in Studying an At-Risk Population

The Latino farmworker population is an understudied agricultural population. In particular, studies addressing the occupational health and safety of adolescent Latino farmworkers are needed. Any attempt to measure the magnitude of the problem of child agricultural labor in the Latino population is hampered by under reporting of the actual numbers of migratory farmworkers in the U.S.[1]. A large discrepancy exists between the number of Latino farmworkers reported by the Bureau of Labor Statistics and numbers reported by other sources. The migrant worker population has been estimated to be from 3 to 5 million, with the proportion of Latino heritage varying in different regions of the country. If one assumes that 80% of the migrant agricultural workforce is Latino, this translates into approximately 3.2 million Latino migrant farmworkers- a significantly larger number than the 218,000 reported by the Department of Labor in 1990. This difficulty in estimating the Latino population involved in agriculture stems from such factors as workers' mobility, undocumented laborers, and rural location. Language barriers and the seasonal nature of the work pose further problems. Additional barriers prevent an accurate count of migrant Latino *youth* employed in agriculture in the U.S.

There are no comprehensive statistics that encompass the total number of children employed as farmworkers. Epidemiological literature is incomplete because studies have largely focused on Midwestern family farms and have not included children living in other areas of the country, minority populations, and nonresident populations who migrate. With the decline in the numbers of family farms, fewer farm children will be working on family farms; but it is likely that there will be larger numbers of children of migrant farmworkers involved in agriculture [2]. The American Friends Service Committee estimated in 1975 that about 800,000 agricultural workers were children under age 16 [3], but these numbers don't include undocumented workers.

The National Agricultural Workers Survey (NAWS), commissioned by the Department of Labor, is a national survey that collects extensive data from farmworkers about their basic demographic attributes, legal status, education, family size, household compensation, wages and working conditions on farm jobs and participation in the U.S. labor force. The NAWS includes only hired

farmworkers 14 years of age or older [4]. The results of the National Agricultural Workers Survey indicate a trend towards an increased percentage of hired adolescent farmworkers between 14 and 17 years old. The survey estimated that 14-17 year olds make up 7 percent of all hired farmworkers working in crop production [4]. Almost ½ of these 14-17 year olds live on their own, away from their parents [5]. In a 1991 survey of seasonal agricultural workers (not permanent workers) by the US Department Labor, 4% were under age 18 [6]. Data from the National Agricultural Workers Survey indicate that 28 percent of hired farmworkers have children living with them and 13 percent of those children are reported to be working in the fields [4]. This survey also found that 47% of farmworkers below the age of 18 do not live with their parents.

The history of farm labor in the U.S. has been characterized by recurrent cycles of ethnic replacement. Although most people think of migrant farm workers as Spanish-speaking Mexicans, the population is actually a diverse community. Today, increasing numbers of new migrants are entering the U.S. representing indigenous groups from the southern states of Mexico. Mixtec workers from the state of Oaxaca are perhaps the largest indigenous group working in western U.S. agriculture [7], representing approximately 5 to 10 percent of the agricultural workforce. Results from a recent survey of migrant farmworkers in the state of Oregon indicate that in some communities the proportion of persons speaking indigenous languages may be as high as 36% [8]. Mixtec workers and those of other indigenous regions speak little or no Spanish or English, are in more desperate economic circumstances, and have cultural, language and physical characteristics distinct from Spanish-speaking Latino individuals. As the number of adolescent farmworkers increases in the U.S. and the characteristics of the migrant stream continue to change, it is likely that adolescents from indigenous areas of Mexico will constitute a greater proportion of the agricultural workforce.

Researchers have had difficulty in accessing data on special populations such as migrant laborers and even less has been documented on migrant children, including those who work in agriculture or who are exposed to occupational hazards due to the nature of their parents' work. We have demonstrated the ability to successfully partner with community organizations that serve migrant farmworker youth and have studied the knowledge, beliefs and pesticide protection practices of significant numbers of adolescents and adult migrant farmworkers. Our partnerships have allowed us access to data previously unavailable to those studying Latino adolescent migrant farmworkers.

1.2 Work Patterns/Practices

Children working in agriculture are exposed to many of the same occupational hazards as those experienced by adult workers. Only about five percent of farms in this country are covered by safety regulations of the Occupational Safety and Health Act. On the remaining 95 percent of farms, the owner/operator is responsible for assessing acceptable levels of risk for adults and children on the farm. Little information is available on the specific work practices of adolescent migrant farmworkers. However, current regulations do not protect 16 and 17 year olds working in agriculture from performing hazardous tasks and standards that regulate work hazards in other industries often do not apply in agriculture [2]. Many agricultural work tasks carry the risk of serious injury including applying pesticides. Children working in agriculture are exposed to pesticide spray, drift, and residues in the soil and on foliage [9]. A lack of wash water in the fields

means that farmworker children and adults are not able to wash off pesticide residues before eating and going to the bathroom. Pollack et al. [10] interviewed migrant farmworker children who work in New York State. They found that 48% of the children had worked in fields still wet with pesticides, and 36% had been sprayed directly or indirectly by drift while working in fields or orchards. Despite the prohibition of hazardous work by children under age 16, four boys reported they had mixed pesticides, and three said they had applied pesticides. Other injuries particularly of importance to migrant adolescent farmworkers are falling off ladders while picking fruit, eye injuries during thinning and harvesting, dehydration from lack of access to drinking water, sprains from ergonomic demands of the work and accidents from play around dangerous chemicals or equipment.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. §136), administered by the U.S. Environmental Protection Agency, regulates the registration and use of pesticides, including worker protection from pesticide exposure. The EPA's Worker Protection Standard regulations (40 C.F.R. 170), implemented in 1996, cover employees who handle agricultural pesticides and employees who cultivate and harvest plants. The regulation includes provisions regarding the use of personal protective equipment for those mixing or applying pesticides, the setting of re-entry times after fields are treated with pesticides, and the training of employees in basic pesticide-safety measures. The standards are to be implemented for both adults and children working in agriculture, and do not take into account special risks to young workers, except that children younger than 16 cannot work with Toxic Category I and II pesticides. However all children, even as young as 10 are allowed to hand harvest crops which potentially exposes them to pesticides. There is currently no published information on the effectiveness of these regulations in protecting the health of minority children and adolescents working in agriculture.

There are both positive and negative factors associated with child labor. Employment can bring a sense of responsibility, discipline, and teamwork and provide opportunities of the development of new skills [11]. Migrant farmworkers often include children and adolescents in family work teams [2] and added hands in the field mean more productivity for migrant families and an overall higher earning power. However it has been reported that the single greatest problem facing children working in agriculture is children working under their parents' payroll numbers [4] and essentially not being counted as part of the agricultural workforce.

While employment opportunities in the United States may provide an opportunity for the migrant adolescent to contribute to family income, education may be jeopardized. If educational opportunities are not available, this population may not only be exposed to agricultural hazards, but also may be deprived of a standard education and opportunities to improve their overall standard of living. Migrant education programs, funded by state departments of education, provide an opportunity to increase educational opportunities for migrant farmworker children. In addition to providing overall educational opportunities for adolescent farmworkers, the migrant education environment offers an opportunity to address the special occupational health and safety needs of adolescent farmworkers.

1.3 Agriculture in Oregon

Agriculture is a major industry in Oregon. In 1995 more than 17,500,000 acres were devoted to agriculture [12]. This acreage was divided among roughly 38,500 farms, with an average size per farm of 455 acres. Oregon is a US leader in the production of grass seed, hazelnuts, peppermint, cranberry crops and potted florist azaleas. It is ranked second nationwide for the cultivation of hops, sweet cherries, snap beans and onions and ranked third in production of blueberries, strawberries and pears. The Oregon Department of Agriculture estimate that 54,000 people lived on farms in Oregon during 1992 [13]. This number reflects both unpaid and self-employed workers. The fluctuation in total farm labor in Oregon varies between 26,800 in January and 54,000 in June. Within Oregon, more than 90% of all farm laborers are from Latin America, almost exclusively from Mexico.

Many of the crops grown in Oregon are particularly advantageous for studying pesticide exposures in youth because production of these crops involve high to moderate field-worker pesticide exposure. These Oregon crops include apples, tomatoes, strawberries, vegetables, grapes and tree crops. The production of such crops involve high labor intensity [14]. These crops also involve heavy use of organophosphate pesticides. In 1987, more than 90% of the pesticides used in Oregon were used on land crops. Between 1990 and 1994 the fifteen crops with the highest reported pesticide use estimates, listed in descending order, were potatoes, grass seed, pears, peppermint, wheat, sugar beets, onions, berries, apples, hazelnuts, nurseries, bush beans, sweet corn, hops and peaches. The crops that are both chemically intensive and also employ a large number of seasonal workers include strawberries, blackberries, nursery and greenhouse crops and apple and pear orchards.

Data from the Oregon Agricultural Statistics Service (1994-1995) reveal that strawberries were the single largest berry crop in 1994 in the state. In 1994, more than 70,000 pounds of strawberries were harvested on 6,100 acres. Of the 28,186 total strawberry workers in 1990, 25,000 were migrant workers [15]. The most potentially hazardous pesticides used on the blackberry and strawberry crops included halogenated hydrocarbons (1,3-dichloropropene, methyl bromide, dicofol), organophosphates (diazinon, chlorpyrifos, azinophos methyl) carbamates (carbaryl, carbofuran), triazines (simazine), organochlorines (endosulfan), captan, heterocyclics (iprodione) carbamate fungicides (benomyl) and bypyridyliums (paraquat).

1.4 Agricultural Worker Training

Pesticide safety training programs for agricultural workers and agricultural pesticide handlers in Oregon are guided by federal and state regulations. These regulations include 1) the Worker Protection Standard (40 CFR 170.135) administered by the U.S. Environmental Protection Agency and 2) the Hazard Communication Rule (29 CFR 1910.1200) administered by the U.S. Occupational Safety and Health Administration (OSHA), and the state of Oregon additional amendments to the adopted U.S. OSHA Hazard Communication Rule (OAR 437-02-377).

1.4.1 Worker Protection Standard

The Environmental Protection Agency Worker Protection Standard (WPS) is aimed at reducing the risk of pesticide poisonings and injuries among agricultural workers and pesticide handlers. The WPS contains requirements pertaining to the use of safety equipment, reentry intervals, notification of workers about treated areas, decontamination supplies, emergency medical

information, access to labeling, pesticide applicator certification and training, and pesticide safety training for all workers and pesticide handlers, including migrant farmworkers.

The WPS requires that general pesticide safety information shall be presented to workers and handlers either orally from written materials or audio visually. The information must be presented in a manner that the workers can understand (such as through a translator) using nontechnical terms. The WPS states that farmworkers must receive worker-safety training that covers eleven specific topics related to pesticide exposure.

a) where and in what form pesticides may be encountered during work activities
b) hazards of pesticides resulting from toxicity and exposure, including acute and chronic effects, delayed effects, and sensitization
c) routes through which pesticides can enter the body
d) signs and symptoms of common types of pesticide poisoning
e) emergency first aid for pesticide injuries or poisonings
f) how to obtain emergency medical care
g) routine and emergency decontamination procedures, including emergency eye flushing techniques
h) hazards from chemigation and drift
i) hazards from pesticide residues on clothing
j) warnings about taking pesticides or pesticide containers home
k) the requirement of the WPS designed to reduce the risks of illness or injury resulting from workers' occupational exposure to pesticides, including application and entry restrictions, the design of the warning sign, posting or warning signs, oral warnings, the availability of specific information about applications, and the protection against retaliatory acts.

For new workers who are waiting to receive the complete WPS pesticide safety training that is required within the first 5 days of entering a treated area, the agricultural employer must assure that a worker receives basic pesticide safety information before they enter a treated area on the establishment. The basic pesticide safety information must include the following concepts:

a) Pesticides may be on or in plants, soil, irrigation water, or drifting from nearby applications
b) One can prevent pesticides from entering the body by:
    1) Following directions and/or signs about keeping out of treated or restricted areas
    2) Washing before eating, drinking, using chewing gum or tobacco, or using the toilet
    3) Wearing work clothing that protects the body from pesticide residues
    4) Washing/showering with soap and water, shampoo hair and put on clean clothes after work
    5) Washing work clothes separately from other clothes before wearing them again
    6) Washing immediately in the nearest clean water if pesticides are spilled or sprayed on the body and, as soon as possible, showering, shampooing, and changing into clean clothes

The complete WPS training must occur before the 6th day of entry into a treated area on the agricultural establishment. The WPS also requires that a pesticide safety poster and emergency medical care information should be posted when workers are on the agricultural establishment and, within the last 30 days, a pesticide specified in the WPS has been applied or a restricted-

entry interval has been in effect. The safety poster must be displayed in a central location and convey certain pesticide safety concepts similar to those presented in the training.

1.4.2 Hazard Communication Rule

The OSHA Hazard Communication Rule requires employers to establish hazard communication programs to transmit information on the hazards of chemicals to their employees by means of labels on containers, material safety data sheets, and training programs. Employee training must include:

a) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devises, visual appearance or odor of hazardous chemicals when being released, etc.).

b) The physical and health hazards of the chemicals in the work area .

c) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

d) The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

The state of Oregon has adopted the federal OSHA Hazard communication rule. Oregon has made additional state amendments to the rule. At the state level, the Hazard Communication Rule specifies that the brochure entitled *Safe Practices When Working Around Hazardous Agricultural Chemicals* developed by the Oregon Occupational Safety and Health Division (OR-OSHA), must be provided by agricultural employers to all employees. This brochure is available in English, Spanish, Russian, and numerous other languages. In addition, Oregon requires the Hazard Communication Rule to be applicable to all agricultural employers who employ one or more employees, whereas the Federal rule exempts agricultural employers with 10 or fewer workers. The Federal and Oregon Hazard Communication Rules specify that *effective* training programs about hazardous chemicals shall be provided to employees. In Oregon, because many workers may be functionally illiterate, reliance is generally placed on the videos and flipchart rather that the OR-OSHA brochure as a means for ensuring effectiveness and understandability of training. Further, the EPA Worker Protection Standard specifies that the presenter of the training shall respond to workers' questions. This provides opportunities for illiterate workers or workers whose primary language is not English or Spanish to ask questions that may help them to understand the pesticide safety information. Oregon OSHA personnel were not aware of any training materials adapted for workers whose primary language is an indigenous language [16]. In Oregon, effectiveness of training materials is evaluated by OR-OSHA compliance personnel when they are at an agricultural site and find evidence of inadequate training, or after having received a complaint, referral, or claim.

1.4.3 Materials Commonly Used In Oregon To Train Workers And Handlers About Pesticide Safety

Educational materials that have been developed in response to WPS and OSHA legislation are highly varied, developed for different segments of the farmworker population, and developed by

different groups [17]. There have been no published reports evaluating specific educational materials with farmworker populations. Quandt et al. [17] reviewed 35 farm safety reference materials for language of presentation, description of material, level of literacy required of users, and summary of content in relation to the WPS 11 requirements. The material was evaluated for completeness, quality of the production, orientation to the learner, and overall impression. The authors did not test the effectiveness of any of the materials, but noted the need for such evaluation.

Training materials are generally print items, training packages, and/or audiovisual materials. Quandt et al. reviewed 14 print items (brochures, posters, comics and a fotonovela) and determined that only 2 publications (both from the EPA) covered all WPS required points. These brochures are available in Spanish and are designed for Latino farmworkers. Eleven training packages were reviewed. In general, these items were judged to be more comprehensive than the print items. Six of these items are produced in Spanish, but of these six, only one met the WPS required points. Of ten audiovisual materials evaluated, one set of audiocassettes and 5 videos were in Spanish and met all the WPS required points. Quandt et al.[17] summarized the quality of the materials as often lacking an explanation of WHY a behavior is important. Also there is virtually no discussion of chemical residues that remain on plants, tools, and soil after applications. None of the materials are translated into Native American indigenous languages. The reviewers also noted that the health beliefs of the workers were not considered in any of these materials. In summary, care needs to be taken to choose materials that correspond to the needs of the learners, based on ethnicity, language, literacy level, and types of exposure.

Through our contacts with agricultural experts, we have obtained information on the most commonly used agricultural training methods in the state of Oregon. These six items are:

a) *Safe Practices When Working Around Hazardous Agricultural Chemicals* (required by OR-OSHA).

   This brochure was developed by OR-OSHA and is considered by OR-OSHA to fulfill the requirements of the OSHA Hazard Communication Rule and the WPS basic pesticide safety information. However, it does not fulfill the WPS complete training requirement within the first 5 days of entry into a restricted area or the WPS posted safety and medical information requirement. The remaining materials on this list are commonly used in Oregon to fulfill these additional WPS requirements.

b) *Pesticide Safety: Worker Protection,* a bilingual training video for both handlers and workers produced by the University of Idaho Agricultural Communications Group. This tape contains two 16-minute sections; one for workers and the other for handlers.

c) *EPA Worker Protection Standards for Pesticide Handlers,* produced by Hood River Grower/Shipper Association, in English and Spanish, 58 minutes total (English and Spanish).

d) *Pesticide Handlers and the Worker Protection Standard,* produced by Michigan State University Extension, 50 minutes in length, available in English and Spanish.

e) *Protect Yourself From Pesticides Flipchart,* an EPA approved training tool that covers all WPS "worker" training requirements, produced and available from Gempler's Agricultural Supply (www.gemplers.com).

f) WPS Central Posting Kit, available from Gempler's Agricultural Supply (www.gemplers.com).

Few data exist on the effectiveness of these materials with migrant farmworkers and none that we are aware of have addressed the effectiveness of these training materials with adolescents. The implementation of the WPS with farmworkers has not been evaluated and little is known about the extent to which farmworkers receive pesticide training, characteristics of the training and variations in knowledge and safety behavior [18]. In a sample of 270 Latino farmworkers in NC, only a third reported having ever received information or training on pesticide safety. Training varies on location, duration, and language. The most common mode of delivery was videos, verbal presentations and most included printed materials. In this NC sample, only 23% reported that the training occurred on the farm where employed, with the remainder of training occurring in labor recruiter offices, offices of farmworker organizations and other sites [18].

Agricultural safety and health education for adolescents should inform young people about child labor laws and train them to prevent work-related illness and injury [2]. Currently a myriad of educational programs target adults and children in an effort to prevent childhood agricultural injuries; however little is documented on the special educational needs of non-English speaking Latino farmworkers. While the EPA WPS regulations should increase the pesticide hazard education that adolescent migrant farmworkers receive, there is no other regulation that insures that these youth receive any other education regarding the myriad of hazards associated with agricultural work, such as musculoskeletal injuries, trauma, dehydration and others.

1.4.4 The Need for Innovative Methods of Delivering Pesticide Training to Adolescents

Data suggest that farmworker pesticide training is varied in location, mode of training, and may not increase the use of protection from pesticides [18]. Farmworkers are dispersed throughout the agricultural community and occasions in which they do aggregate, such as in migrant education programs, should be viewed as potential sites to provide pesticide training, one goal of which would be to increase the overall proportion of trained farmworkers in the U.S. Migrant education programs also provide an opportunity to test innovative methods of delivering pesticide safety content. The survey conducted by Arcury et al. indicated that the most common methods of pesticide training have been videos (84%) and verbal presentation about the video (75%). However, videos have been found to have major shortcomings if used as the sole source of information [17]. The size of the training class and the role of the trainer could also inhibit individuals from asking questions for clarification of content. Worse yet, there is no evidence that trainees either understood or learned the material presented.

One method of delivering worker training is computer-based instruction, but its potential in agricultural safety training has not been explored. A major advantage of this format is the potential for adapting individual tutorials to specific needs of the learner [19]. Greater accessibility of computer technology has facilitated access to larger numbers of workers who can receive more tailored educational interventions. Computer technology can be especially useful for tailoring specific aspects of training aimed at behavioral change according to an individual's perceptions, beliefs, and attitudes that are most in need of alteration [20]. Computer-based training is becoming more and more feasible in work settings characterized by a transient workforce, small employers, and multiple operation sites. Several investigations are currently underway in the U.S. that will test computer-based training in construction site field offices [21] [22]. However, the feasibility of using computer-based training with farmworkers has not been explored.

The major advantages of using computer-based pesticide training with farmworkers are 1) the ability to individualize the training in the primary language of the workers, 2) the workers control the pace of the training allowing them to process information that accommodates their educational background, and 3) motivating feedback is given to the learner as he/she proceeds through the content. The primary disadvantage of this delivery technique is the migrant farmworkers' lack of familiarity with computers. The technology has to be presented in such a manner that the operation is simple and instructions are spoken in a language that is understood by the farmworker.

2.0 SPECIFIC AIMS/RESEARCH QUESTIONS

The major goal of the study was to evaluate commonly used pesticide education materials and new innovative delivery methods with a population of adolescent Latino migrant farmworkers. Specifically this project attempted to answer the following questions:

1. Does the knowledge level of pesticide hazards and safety precautions in an adolescent Latino population working in agriculture differ according to certain background characteristics such as primary language, age, agricultural work history, and living arrangements of the adolescent?
2. Are cultural, developmental, and age-related factors associated with the adolescent's knowledge and beliefs of pesticide hazards and safety precautions? If so, do these differences influence the effectiveness of common safety education approaches?
3. Where do adolescent farmworkers currently receive information on agricultural work hazards and how do they judge the appropriateness and effectiveness of these sources?
4. Are there differences in the effectiveness of traditional methods of pesticide training and methods specifically adapted for individualized learning? If so, are the differences observed across all ages and ethnic background?

3.0 METHODOLOGY

In this project we compared the effectiveness of three types of training materials across a sample of adolescents working in different types of agricultural settings. Objective measures of pesticide knowledge, work practices, and beliefs about pesticide hazards were obtained pre-and post-intervention. We also incorporated focus group methodology to explore current sources of information on agricultural work hazards and perceived appropriateness and effectiveness of these sources. The intervention was designed so that we could compare the following:

1. the effectiveness of video methods of training and more interactive "flipchart" approaches to training,
2. the effectiveness of traditional methods of delivering the training (audio-visual materials, training packets) to an individualized computer-assisted approach.
3. the influence of developmental, cultural, and work-specific factors on the effectiveness of pesticide safety education strategies.

3.1 Subjects and Settings

The target population for this project was migrant adolescent farmworkers in the state of Oregon. Three groups of farmworkers were recruited for the study:

1. Adolescent farmworkers were recruited through collaboration with the Oregon Migrant Education Program. To qualify for the Oregon Migrant Education Program, a migrant

child must have moved within the past three years across state or school district lines with a migrant parent, guardian, or spouse, or a member of the child's immediate family to obtain temporary or seasonal employment in an agricultural or fishing activity. The child may be any grade between preschool and grade 12, and between 3-21 years of age, and has not received a high school diploma or GED. A "migrant child" remains eligible for three years after his or her family's last qualifying arrival date. The Migrant Education Program (MEP) implements a regular school year program including middle and senior high school. In our previous studies we have found that a portion of these youth choose to engage in agricultural work during the summers (depending on the community). We targeted 11-18 year olds enrolled in the MEP.

2. A specific MEP available in one county in Oregon is the Summer Evening Migrant English as a Second Language (ESL) Program that serves predominately agricultural workers. This program enrolls between 200-300 students per summer. Many of these enrollees are minors living in labor camps. This summer program is operated in one site with up to eight classrooms of migrant farmworkers.
3. We recruited a sample of agricultural youth who are not enrolled in the MEP by visiting the migrant housing camps where these adolescent workers frequently live. This group served as a comparison group to the students enrolled in the MEP.

The agricultural communities from which we recruited study participants included:

- The Hillsboro School District in Washington County, and located in the Willamette Valley, is an important home base for the migrant population and serves a large proportion of the total migrant youth receiving educational services. This school district has year-long migrant education programs plus in the summer has an large evening ESL program enrolling approximately up to 300 students each summer. Types of agricultural work includes primarily berry and vegetable crops and nursery work.
- The Marion, Yamhill and Forest Grove School Districts are also located in the Willamette Valley and serve a migrant agricultural community similar to that seen in the Hillsboro District. They have a large year-long MEP. Primary crops are berry, vegetable and nurseries.
- The Jefferson/Crook/Deschutes Counties are located in the central area of Oregon, approximately 120 miles from Portland. This community grows primarily potatoes, grass seed, sugar beets, mint and cilantro. They have a large year-long MEP.

3.2 Research Design

In the first year of the study we compared the effectiveness of video methods of training to more interactive "flipchart" approaches to training. Three agricultural communities (Hillsboro, Marion, and Jefferson/Crooks/Deschutes) served as the study sites for Year I. The research design included the following steps:

1. Baseline information was obtained on knowledge of pesticides, beliefs about pesticide exposures and health hazards, and current work practices from the study participants in each setting.
2. The adolescent sample from the Jefferson/Crooks/Deschutes site was assigned the video Pesticide Safety: Worker Protection produced by the University of Idaho Agricultural Communications Group. The Marion group was assigned the Protect

Yourself From Pesticides Flipchart, an EPA approved training tool. Knowledge tests were administered at the completion of the training. In the Hillsboro ESL, students were randomly assigned to the video training, "flipchart" training, or control status. Knowledge tests were administered at the completion of the training.

3. Two weeks later study participants who had been given the pesticide safety training were administered a second knowledge test, belief questionnaire and a short questionnaire seeking information on changes that they have made in their work practices as a result of the training.
4. At the completion of the second testing, a small group of adolescents was recruited from each site to participate in a focus group that explored environmental interactions and interrelationships.

In Year 2 of the study we used a similar study design, but examined differences in the effectiveness of traditional methods of pesticide training and methods specifically adapted for individualized learning. This intervention took place in the agricultural communities of Hillsboro, Forest Grove, Yamhill and Marion Counties.

1. Baseline information was obtained on knowledge of pesticides, beliefs about pesticide exposures and health hazards, and current work practices.
2. At each of the study sites students were randomly assigned either 1) training with the video *Pesticide Safety: Worker Protection* produced by the University of Idaho Agricultural Communications Group or 2) computerized training (cTRAIN) training of the content in the *Pesticide Safety Worker Protection* video. In the Hillsboro ESL, students were randomly assigned to the video training, cTRAIN training, or control status. Knowledge tests were administered at the completion of the training.
3. Two weeks later study participants who had been given the pesticide safety training completed a second knowledge test, belief questionnaire and a short questionnaire seeking information on changes that they had made in their work practices as a result of the training.

At the completion of the second testing, adolescents who had reported that they mix/applied pesticides were invited to participate in focus groups that explored the circumstances in which this work activity occurs.

Adolescents participating in the referent group received an EPA booklet called "How to Protect Yourself From Pesticides". This booklet contains the same information as presented on the EPA Flipchart. At the conclusion of the interview participants in the referent group were given the answers to the knowledge test.

The MEP program serves farmworkers up to age 21. These older farmworkers (19-21) were not excluded from participation but rather invited to participate along with the younger adolescents. Data from these older farmworkers were not included in the evaluation of the training programs. Adult farmworkers were also interviewed in the migrant labor camps in year two. These adults did not receive formal training but were given a booklet indicating how to protect themselves from pesticides. Inclusion of adults in the control group sampling simplified the recruitment of adolescents; youth were more comfortable interviewing when they saw experienced workers interacting with the research team.

Table 1. Sampling and Training Design

	Testing Site	Intervention	Time Lapse	Outcome Measure
2001	Madras	Video	→ 2 weeks	Test knowledge, beliefs, and practices
	Gervais	Flipchart		
	ESL	Randomly assigned video or Flipchart		
	Camps	No training		
2002	Silverton	Randomly assigned video or cTRAIN	→ 2 weeks	Test knowledge, beliefs, and practices
	Cascade			
	Dayton			
	Forest Grove			
	ESL			
	Camps	No training		

3.3 Study Instruments and Outcome Measures

The interview questionnaire to measure agriculture work practices contains items on type of work, use of protective clothing, sanitation, and wearing of clothing outside of fields. The questionnaire was used previously in our NIOSH-funded project "Health Outcomes in Adolescent Minority Farmworkers" and in our NIEHS-funded project "Reducing Pesticide Exposures in Minority Families". This instrument contains items that call for dichotomous responses, 4-point Likert scale responses, and items calling for open-ended responses. A briefer version of this questionnaire was administered at the two-week follow-up period. This version included items pertaining to use of protective clothing, bathing, laundry, and wearing of work clothing outside of fields.

A "Pesticide Knowledge" questionnaire was used to measure knowledge about pesticides. This 20-item questionnaire was designed to measure knowledge in three general areas: 1) General Knowledge, 2) Health Problems, and 3) Protective Clothing and Safety. Responses are either "True" or "False" and a total score is assessed for each respondent based on the number of correct answers given.

A third questionnaire was used to measure adolescent beliefs regarding the hazards of pesticide exposure. The questionnaire contains items on sources of and previous information received on pesticides, and beliefs about the risks associated with pesticides. The concepts measured on the beliefs questionnaire include the economic necessity of farmwork, perceptions of pesticide exposure, beliefs about the use of protection, perceived health risks of pesticides, and perception of harm. This instrument contains dichotomous items, 4-point Likert, and open-ended questions.

We also used a short demographic questionnaire to obtain information on age, years of education, numbers of years of agricultural work, native country, migratory patterns, and primary language. English and Spanish versions of these 4 study instruments are included in Appendix A.

3.4 Interviewer and Research Training

This project was highly dependent on the involvement of members of the Latino community in the research process. Involvement of migratory farmworker populations in the research project presented distinct challenges; however our collaborations with agencies advocating for this population assisted greatly in the implementation of this work. Our major community partner was CReATE (Creating Roads to Empowerment and Advancement through Education) an alternative high school for at risk youth, most of whom are Latino. We trained bilingual adolescent students to administer the study instruments to the adolescent subjects in our study.

3.5 Types of Educational Interventions

The video, "Pesticide Safety: Worker Protection" is commonly used as a training tool by Oregon farmers. The 18-minute video was produced by the University of Idaho Agricultural Communications Group and has been approved by EPA as meeting the criteria for content and quality of materials used in basic safety training for agricultural workers as required by the Worker Protection Standard. The Spanish version of the video was shown to small groups of adolescent farmworkers in a classroom setting.

The EPA flipchart also covers the WPS worker training requirements and is EPA approved. The flipchart presentation was given to small groups of students (approximately 15-20) in a classroom setting. The audience sees illustrations on the flipchart while a native Spanish-speaker gives the flipchart presentation. To provide for consistency in the pesticide training across sites, we adhered strictly to the guidelines that are published with the training material and used only two trainers from CROET experienced in farmworker education and chemical toxicity.

3.6 Pre-Intervention Development of Computer-based Training:

The cTRAIN program [23] was selected for computer-based training. Key cTRAIN features for this implementation, were: (1) simple but consistent information and quiz "screens," (2) a continuously on-screen "navigation bar" so that participants do not need to remember instructions or "commands," (3) optional text-to-speech (computer-generated speech) selectable on each screen, and (4) an optional nine-button input unit instead of a keyboard for the participant interface with the computer. In addition, the program allowed training material to be presented in small units of information followed by multiple choice quiz questions, feedback on whether the answer to the quiz questions were correct (thus it was interactive) and repetition of information if a quiz question was answered incorrectly.

Dr. Anger had already completed developmental work that was crucial to the use of cTRAIN in this project. In his other grants (from CROET and RO1 OHO4193-01) he had focused on eliminating the need for a knowledgeable (and costly) training instructor. A primary goal was to develop instructions integral to the computer-based training program that would "teach" participants how to navigate and use the program. The initial "system use" instructions were text-based descriptions of how the program worked and what action each "button" was designed to carry out (e.g., step forward or backward, play movie, speak text). Brief movies were created to teach the most fundamental actions (don headphone, speak text, play movie) and the remaining actions were taught through simple text descriptions (which could be "spoken"). Practice was provided on each action. This development period was carried out over several months through serial testing of the system user instructions with adult Latino workers at a

wholesale nursery, careful observation of where they struggled and feedback from them ("how can we improve the program"), followed by re-programming to fix the problems. While this produced a lengthy pre-training "instruction" period, it overcame the variability of examiner explanations of how to operate the training and enabled the participant to interact with the computer with minimal support. Identical user instructions in Spanish and English were created, with brief descriptive Spanish and English words under the icons (e.g., "show" and "ver" in the navigation bar), respectively depending on the language chosen for training.

The new "user instructions" along with a 32-screen (18 information screens, 14 quiz questions) cTRAIN program on orientation to the wholesale nursery's policies and guidelines were administered to 49 (8M, 41F) adult employees (mean age 39±9.8) who had not been involved in the development process. All but one participant was a craftsperson, the entry-level job involving operations with plants, and the other was a "coach" (work group leader). The participant education ranged from 0 to 16 years, all in Mexico. Each identified Spanish as their primary language and all elected to take the training program in Spanish. Examiners consented the participants, told them to "press the 9 button to begin training," and then sat in a chair approximately 3 meters behind and to the side of the participant where they could observe progress and answer questions if asked. Examiner estimates of the percent of screens on which text speaking was used ranged from 2-95%, but it was under 10% for all but 5 participants. Examiners rated the ease with which participants learned to use and then progress through the program, based on the number and type of questions they asked and the tentativeness with which they stepped through the training. Those with 0-2 years of education (N=11) had a mean rating of "struggled" or "difficult," while usage was rated as "somewhat easy" to "easy" for those with 3 or more years of education (N=38, including 7 with 3 years, 5 with 4 years, 3 with 5 years and 9 with 6 years of education). The mean number of participant questions or support requests (per session) was 3.1, with means of 3.7 to 4.4 questions for those with 0-2 years of education and less than 3 questions per session for those with 4 or more years of education. All participants completed the system use instructions with minimal support (e.g., "yes, you are right") and most went on to complete some or all of a training topic during the time they had available.

The mean time to complete each screen (equivalent to a moderately long paragraph plus a picture) was a relatively slow 1.4 minutes. Those with 0-2 years of education required a mean of 1.9 minutes, while those with 3 and above years of education required 1.2 minutes per screen. The fastest speed was 0.6 minutes per screen by the one participant who was familiar with computers and had completed 16 years of education. Of these 49 participants, 22 completed the test at the end of the orientation (work schedules required return of the remaining participants prior to completion) with scores between 85 and 100% correct (of 14 2-answer questions). Most (14) participants who completed the test had 6-9 years of education.

This background developmental work set the stage for developing pesticide safety training for adolescent farmers. In Year one the health and safety content in the EPA flipchart and information from the video was structured into short paragraphs that would fit on cTRAIN screens. The content was divided into 4 topics: Recognizing pesticides, pesticide protection, risks and emergencies, and Federal law. A picture was taken to illustrate the text on every screen, and an animation extracted from the video that depicted spray drift was included on one screen. Permission to use parts of the video in the computer-based training was obtained from its

developers (University of Idaho). Three CREATE students and 9 migrant adolescents from the target audience took the computer-based training in Spanish and provided feedback leading to changes in the training. The training program was thus finalized without reference to the pesticide information test that was the primary evaluation tool of the project, so that the test would not influence the quiz questions developed for cTRAIN.

3.7 Focus Group Methodology

The project included focus group methodology to explore agricultural and employment issues that are not currently measured in the four questionnaires used in the project. An ecological framework was utilized, exploring not only beliefs, knowledge, and attitudes, but also examining the complex array of interactions and interrelationships that occur between humans with their environments. Adolescents provided insight on such topics as perceived vulnerability of illness due to pesticide exposure, attitudes toward farmwork, influence of their boss, knowledge of occupational hazards, safety training, and barriers to occupational choice.

Study participants between the ages of 11-18 were recruited from a state Migrant Education Program (MEP), an evening English as a Second Language (ESL) program targeting adolescent migrant farmworkers, or from migrant farmworker housing camps. Recruitment was conducted face-to-face by project staff until the desired number of participants was attained. Groups were limited to 6-10 adolescents in order to reduce the tendency for group fragmentation [24] [25]. At one site, where a large range in ages was apparent, two groups were conducted in order to maintain the homogeneity of the participants and reduce peer pressure that could result from mixing participants of different ages and experience levels [24]. A $5 incentive was offered to compensate the adolescents for their time and effort.

A total of five focus sessions were conducted in three separate agricultural regions of the state over a three-month period. The primary moderator for the groups was a 23-year old bilingual/bicultural Hispanic male with extensive experience working with youth as well as experience working in the agriculture industry. The moderators were trained in fundamentals of focus group facilitation and one pilot session was conducted. An additional research member served as an observer at each group. The semi-structured interview guide consisted of six major questions and probes that were sequenced to capture views through a natural and logical flow of discussion [24]. After the first two sessions, a list of follow-up questions was created to allow the moderator to obtain more detail about items that emerged from the earlier focus sessions. Core focus session questions and the focus group guide are located in Appendix B.

At the request of participants, three of the five sessions were conducted primarily in English with some Spanish; two sessions were conducted entirely in Spanish. Upon completion of the focus session, all Spanish audio-recordings were translated into English and all sessions were transcribed. Group facilitators and project staff reviewed the transcriptions for accuracy. After the first three focus group sessions, project staff reviewed the transcripts for general themes and generated a list of follow-up questions to facilitate more information in the final two sessions. After all the transcripts had been read, responses were grouped into a taxonomy of themes and categorized under the four levels of influence according to the ecological model.

In year two, we conducted individual interviews with teenagers who indicated they mixed and applied pesticides on the survey interviews. We modified our protocol to focus on this subgroup of research participants because we had questions regarding the proportion of youth reporting that their work involved mixing or applying agricultural chemicals (25% over two years of sampling) The interview took place at the two week following up of the pesticide training intervention. Bilingual research assistants conducted the interviews. The 15-minute interview asked about the type of chemicals and methods of application, training and supervision, place of application, protective measure taken to prevent exposure, and reasons for participating in this type of work. Participants received $5 for their time and participation in this component. Interview questions are available in Appendix C.

4.0 RESULTS

4.1 Recruitment

A total of 332 adolescent farmworkers ages 11 to 18 participated in this project during the harvesting periods of 2001 (n=161) and 2002 (n=171). Participants came from migrant education programs, ESL programs, and migrant labor camps (temporary housing for workers). The following table shows the source for the adolescents who were recruited to the project and their assigned training groups.

Table 2. Recruitment Sites by Training Group

Training Group	Migrant Education Program n = 144	ESL Program n = 62	Labor Camp n = 126
None	3	4	126
c-train	32	9	0
Video	87	37	0
Flipchart	22	12	0

We also recruited 243 farmworkers over the age of 18 as an adult referent group. These farmworkers were recruited from labor camps (n = 203), the Migrant Education Program (n=7) and the ESL program (n = 33). Of note, there was one participant for whom we did not have data on age.

4.2 Sample Characteristics

Table 3 shows the characteristics of the adolescents and adults farmworkers recruited for the study. There was a slightly higher proportion of females among the adolescent group and the adolescent groups was also more likely to contain individuals born in the United States. The likelihood of speaking an indigenous language was higher among the adult group.

Table 3. Demographic Characteristics of Adolescents (n = 332) and Adult Referent group (n = 243)

Characteristic		Adolescents n = 332	Adults n = 243
Mean age Standard deviation		15.9 1.84	28.9 11.28
Gender*	Female Male	110 (33.1%) 222 (66.9%)	61 (25.1%) 182 (74.9%)
Country of Origin**	Mexico U.S. Other Missing	271(81.9%) 56 (16.9%) 4 (1.2)%0 1 (0.4%)	240 (98.8%) 1 (0.4%) 2 (0.8%)
Primary language***	Spanish English Indigenous language Other/missing	214 (64.5%) 26 (7.8%) 89 (26.8%) 3 (0.9%)	125 (51.4%) 1 (0.4%) 115 (47.3%) 2 (0.8%)

* Significantly different (chi square =4.33; df=1; p=.038)
**Significantly different (chi square =43.14; df=2; p=.000)
*** Significantly different (chi square =39.28; df=4; p=.000)

4.3 Composition of Training Groups

The mean age of adolescent participants in the study was 15.9, with a standard deviation of 1.8 and a range of 11-18. Table 4 shows the age distributions within each training group.

Table 4. Age Distribution by Training Assignment Group

Training Group	Number of Participants	Mean Age	Standard Deviation
None	133	16.1	1.86
c-Train	41	15.6	1.69
Video	124	16.04	1.84
Flipchart	34	15.23	1.74

As table 5 demonstrates, analysis of variance did show there were statistically significant differences in mean ages across these groups, but minimally so.

Table 5. Analysis of Variance of Mean Age between Training Assignment Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between training Groups	27.221	3	9.074	2.729	.044
Within training Groups	1090.743	328	3.325		
Total	1117.964	331			

We were particularly interested in those adolescents under 16 years of age versus those 16 and older. That distribution is reflected in Table 6 below.

Table 6. Distribution of Age Group by Training

Training Group	Number of Participants	% Under 16	% 16 and Older
None	133	33.1	66.9
c-Train	41	46.3	53.7
Video	124	27.4	72.6
Flipchart	34	58.8	41.2

These differences were also statistically significant (chi-square = 14.1, df=3, p = .003).

Research staff noted qualitative differences between participants recruited through the MEP, the ESL program, and those recruited directly from the labor camps. We identified these different sources of participants as a potentially important determinant of participants' baseline knowledge and ability to be successful in the training programs. As Table 7 illustrates, composition of each training group differed according the recruitment source. Nearly all the control group came from labor camps. Adolescents who received cTRAIN were more likely to be attending Migrant Education Programs, while those receiving the video or flipchart training were slightly more likely to be from the ESL programs.

Table 7. Recruitment Source of Participants in Training Groups (n = 332)

	TRAINING ASSIGNMENT			
Recruitment Source	**None n =133**	**c-Train n =41**	**Video n =124**	**Flipchart n =34**
Migrant Education Programs	2.3%	78.0%	70.2%	64.7%
ESL Program: Washington County	3.0%	22.0%	29.8%	35.3%
Labor Camps	94.7%	0	0	0

The training groups were also compared on gender, primary language spoken, and on whether or not they reported having received prior pesticide training. Of the 332 participants, approximately two-thirds were male, about two-thirds stated they had received no prior pesticide training, and about two-thirds indicated their primary spoken language was either English or Spanish (the remainder speaking indigenous languages). Participants in the control group were more likely to report that they had received prior pesticide training and also to speak an indigenous language than participants in any of the training groups. This information is summarized in Table 8, below.

Table 8. Distribution of Adolescent Participants by Training Group for Gender, Previous Pesticide Training, and Primary Language Spoken

	No Training n = 133	c-Train n = 41	Video n = 124	Flipchart n = 34
Gender				
Male	68.4%	65.9%	64.5%	70.6%
Female	31.6%	34.1%	35.5%	29.4%
Previous training*				
Yes	53.4%	17.1%	22.6%	17.6%
No	46.6%	82.9%	77.4%	82.4%
Primary language spoken**				
English or Spanish	45.1%	87.8%	80.6%	79.4%
Indigenous	54.9%	12.2%	19.4%	20.6%

*Statistically significant difference: Chi-square=38.899; df=3, p=.000
**Statistically significant difference: Chi-square = 49.780, df=3, p=.000

4.4 Specific Aim #1 Results: Does the knowledge level of pesticide hazards and safety precautions in an adolescent Latino population working in agriculture differ according to certain background characteristics such as primary language, age, agricultural work history, and living arrangements of the adolescent?

Baseline pesticide knowledge scores were obtained on 332 adolescents and 243 adults using the Pesticide Knowledge Questionnaire. The mean number of correct answers for adolescents was 15.61 with a standard deviation of 2.53. Adults scored somewhat better on average, with a mean score of 16.02, with a standard deviation of 2.34. Independent sample t-test showed no significant differences between these two groups (t=-1.97; df=543; p= 0.05). However, the youngest participants (age <16) had significantly lower mean baseline pesticide scores than did the adults (t= -3.185, df=201; p=.002).

A model was developed to evaluate the extent to which baseline pesticide knowledge scores among the adolescent participants varied according to participants' ages, gender, whether they had received pesticide training in the past, and whether they spoke and indigenous language. Table 9 shows the results of this model. As can be seen, those adolescents who were 16 and older had significantly higher initial pesticide knowledge scores than their younger peers. After adjusting for past pesticide training, gender, and language, the average score for adolescents under the age of 16 was 0.84 points lower than for older adolescents (95% CI: 0.30 to 1.38 points lower). Those who spoke an indigenous language also had significantly lower initial scores. After adjusting for past pesticide training, gender, and age, the average score for participants who spoke indigenous languages was 1.14 points less than the average score among those speaking Spanish as their primary language (95% CI: 0.60 to 1.68 points lower). Being female and having had previous pesticide training did not significantly affect baseline knowledge scores.

Table 9. Results of Model of Effects of Demographic Variables on Initial Pesticide Knowledge Score for Adolescent Participants (n= 332)

	Estimate	*P* value	95% CI
Intercept	15.2925		
Female	0.3177	0.247	-0.22, 0.86
Age >= 16	0.8388	0.002	0.30, 1.38
Past pesticide training	0.2725	0.323	-0.27,0.81
Indigenous language speaker	-1.1392	<0.001	-1.68, -0.60

Adolescents differed from adults in the type of agricultural work they did and in their participation in mixing and applying pesticides. Among those who have ever or are now working in agriculture, the type of work, past pesticide training, and whether they mix and apply chemicals differed between adults and adolescents as shown in Table 10, below.

Table 10. Work Experiences of Adolescent and Adult Farmworkers

Work Experiences		**Adolescents N = 332**	**Adults N=243**
Type of Work[1]	Field Work	275 (82.8%)	226 (93.0%)
	Nursery Work	18 (5.4)	4 (1.6%)
	Other	36 (10.8%)	8 (3.3%)
	Missing	3 (0.9%)	5 (2.1%)
Previous Pesticide[2] Training	Yes	112 (33.7%)	152 (62.6%)
	No	208 (62.7%)	87 (35.8%)
	Missing data	12 (3.6%)	4 (1.6%)
Has ever (or currently) mixed or applied chemicals[3]	Yes	51 (15.4%)	64 (26.3%)
	No	272 (81.9%)	170 (70.0%)
	Missing	9 (2.7%)	9 (3.7%)

[1]Chi square =18.69, df=3, p=.000
[2] Chi square = 47.02, df=2, p = .000
[3] Chi square = 11.51, df=2, p=.003

These adolescents and adults also differed on a variety of work practices associated with reducing contact with pesticides, as illustrated in Table 11, below. Over 75% of both adults and teens indicated they wash their hands before eating (there was no significant difference between the two groups). For other work practices, the teens were more likely to change clothes and shower within 30 minutes of arriving home, while the adults were more likely to take off their shoes or boots before entering the home and to wash their work clothes separately from other dirty laundry.

Table 11. Pesticide Exposure Related Work Practices of Adolescent and Adult Farmworkers

Work Practice	Options	Adolescents N=332	Adults N=243
While in the field, do you wash hands before eating?[1]	Always Never Sometimes Missing	257 (77.4%) 12 (3.6%) 60 (18.1%) 3 (0.9%)	192 (79.0%) 2 (0.8%) 44 (18.1%) 5 (2.1%)
How long after arriving home do you change out of work clothes[2]	Immediately < 30 minutes > 30 minutes Missing	187 (56.3%) 102 (30.7%) 36 (10.8%) 7 (2.1%)	102 (42.0%) 90 (37.0%) 45 (18.5%) 6 (2.5%)
Do you take off work boots or shoes before entering house?[3]	Yes No Sometimes Missing	267 (80.4%) 18 (5.4%) 39 (11.7%) 8 (2.4%)	213 (87.7%) 16 (6.6%) 9 (3.7%) 5 (2.1%)
How long after arriving home do you shower or bathe?[4]	Immediately < 30 minutes >30 minutes Missing	140 (42.2%) 134 (40.4%) 51 (15.6%) 7 (2.1%)	71 (29.2%) 98 (40.3%) 69 (28.4%) 5 (2.1%)
Do you wash work clothes separately from other dirty laundry?[5]	Yes No Missing	286 (86.1%) 40 (12.0%) 6 (1.8%)	230 (94.7%) 8 (3.3%) 5 (2.1%)

[1] Chi square =5.88, df=3, p=.118
[2] Chi square = 13.37, df=3, p=.004
[3] Chi square = 12.15, df=3, p=.007
[4] Chi square = 17.84, df= 3, p=.000
[5] Chi square = 14.06, df=2, p=.001

4.5 Specific Aim #2: Are cultural, developmental, and age-related factors associated with the adolescent's knowledge and beliefs of pesticide hazards and safety precautions? If so, do these differences influence the effectiveness of common safety education approaches?

Of the 332 adolescents initially recruited for the study 199 were assigned to one of three intervention groups: cTRAIN, Video or Flipchart. Of these, 126 completed both the pretest and follow-up pesticide knowledge surveys administered two weeks after the training. Table 12 shows the numbers of participants in all training groups for both the pretest pesticide knowledge scores and follow-up pesticide knowledge scores. We obtained follow up scores for 126 of the participants who had received a training intervention. Attrition was greatest for the group that had received the video training (41.9%) compared to 29.2% in the cTRAIN group and 26.4% in the Flipchart group.

Table 12. Numbers of Participants in Training Groups: Pretest Scores Only and those with Pretest and Follow up Scores

Training Group	Pretest Scores Only	Pretest and Follow up Scores
c-Train	41	29
Video	124	72
Flipchart	34	25
Totals	199	126

Minimal change was observed from baseline to follow-up scores. The average change in knowledge scores between pre- and follow-up tests was significantly influenced by age, sex, language, and prior pesticide training [F = 2.40, df= 4, 121 p=0.54]. These four factors were controlled for in all subsequent analyses. Average change in knowledge scores were not significantly different for subjects without prior pesticide training compared to those who had a history of pesticide training (p = 0.13).

Even after accounting for age, language, sex, and past pesticide training, changes in knowledge scores were significantly higher among individuals trained with the flipchart relative to either cTRAIN or the video ($p < 0.01$ for both). The average change in knowledge scores for those given the flipchart was approximately 2.26 points higher than those trained with either cTRAIN or the video.

Table 13. Change in Pesticide Knowledge Score by Training Group

	average point change	p-value	95% CI
flip vs. cTRAIN	2.26	0.002	(0.82, 3.71)
flip vs. video	2.27	<0.001	(1.00, 3.54)
video vs. cTRAIN	-0.01	0.987	(-1.18, 1.16)

4.6 Specific Aim # 4: Are there differences in the effectiveness of traditional methods of pesticide training and methods specifically adapted for individualized learning? If so, are the differences observed across all ages and ethnic background?

Flipcharts and videos have traditionally been used to train agricultural workers regarding pesticide safety. The use of a computer training program is new and relatively untested to date. As was demonstrated above, the flipchart training, a traditional and interactive training method, produced significantly better results that either the video training program or the newer cTRAIN program. However, because the cTRAIN program is new, we examined the performance of those participants carefully to see if this method of training might be feasible for future testing.

We administered the cTRAIN basic pesticides training program to 49 participants (includes 8 pretest subjects). All but one of the 49 participants completed the system training instructions and at least unit 1 (12 screens) of the basic pesticides program. The cTRAIN program had a performance post test built into its program. The 48 participants had a score of 93.5% correct on

these post tests (consisting of the same quiz screen questions on which feedback was received during the training) covering those units completed. Participants took a mean of 46.5 seconds to look at each screen they completed. Of the 49 participants, 30 completed the cTRAIN basic pesticides program (46 information screens and 28 quiz screens) and the cTRAIN post-training test with a mean score of 26.1 (SD=2.0) out of 28 questions (93.2%). Of the 19 participants who did not complete the training program, 6 were stopped due to time constraints, 9 took the training in a group of 12 people for whom the examiner did not have time to provide support (clearly needed in some cases) or effectively monitor progress (to prevent cross-talk and other distractions).

4.7 Specific Aim # 3: Where do adolescent farmworkers currently receive information on agricultural work hazards and how do they judge the appropriateness and effectiveness of these sources?

This aim was achieved with focus groups in year one of the project. All individuals participating in the focus groups were either currently working in agriculture, had worked in the fields in the past summer, or were planning to work in the fields in the upcoming agricultural season. A total of five focus sessions were conducted in three separate agricultural regions of the state over a three-month period. The semi-structured interview guide consisted of six major questions and probes that were sequenced to capture views through a natural and logical flow of discussion (Appendix B).

Description of Focus Group Participants

The mean age of the 33 adolescents participating in focus groups was 15.3 (SD±2.1) with the majority between the ages of 13 to 16 years. Eighteen of the adolescents were male; 15 were female. All of the participants were of Hispanic origin; 59.4% were born in Latin America (18 in Mexico, 1 in Guatemala) and 40.6% were born in the United States. Twenty-three of the participants (71.9%) had some formal education in the U.S., ranging from 5th to 10th grade. The remaining 28.1% received their education in Mexico, ranging from 1st to 9th grade. The two predominant languages were English and Spanish; 100% of the participants spoke Spanish, 65.6% spoke English, and 37.5% spoke an indigenous language.

Findings Regarding the Microenvironment

Some of the adolescents identified specific diseases that could be related to occupational exposure to pesticides, while others described disease outcomes in more generic terms. Specific diseases that were mentioned included cancer, skin disorders such as "*bumps*" and "*rashes*," high fever, asthma and other allergic reactions. This statement reflects the adolescents' perceptions of the relationship between certain kinds of exposures and the occurrence of cancer: "*Some chemicals are found to be leading to cancer. You can get skin cancer if you have a lot of sunlight exposure, and if you get pesticides on your skin and it is not washed right away, I suppose you can get cancer...*" Consistent in all of the focus sessions was the suggestion that getting sick was an inevitable part of the job: "*Everybody knows you are going to get sick someway. You are going to get a headache from the sun or you are going to get sunburn or whatever.*"

Although participants indicated that they recognized the importance of protective behaviors, complying with recommendations was another matter, as illustrated by one youth who stated that

he recognized that pesticides were around when he ate his lunch, however, "*you are like so hungry; you sit down wherever you can ... sometimes you don't even wash your hands.*" Participants suggested that failure to wash was a result of time constraints, lack of education about hazards, and in some instances, complacency. "*When you go to lunch and you don't have time to wash your hands*" stated one youth; and another suggested that "*...most people don't have the education or experience (to know about the hazards). They don't know what's going to hurt them.*"

Participants also indicated that it was not always easy to wear protective clothing (identified as long sleeved shirts, pants, hat, bandanas, and thick socks). As an example, a subject stated that he would wear protective clothing when he went into the field, but when he got hot, he would find it intolerable: "*In the morning you go and are dressed like you are going to ski; by the end of the day, it looks like you are going swimming.*" It is also difficult to wear respiratory protection, even a simple cloth over one's mouth. As stated by one participant, "*We don't cover our mouths because it's hard to breathe.*"

Findings Regarding the Work Organizational Environment

The participants identified an array of people who they perceived as their "*bosses.*" These included the farm owner, the crew boss, and the field boss. Typically, participants in these sessions had some level of contact with the "*boss.*" Although some youths described their bosses as "*pretty good,*" others described them as uncaring: "*Some bosses don't care about the workers, they just care about the work to be done. They just care about the money.*" And another: "*They worry about the fruit a lot. They don't worry about the people.*" Another youth, when asked how he would react if the boss asked him to do something that may be dangerous at work responded: "*The bosses say they are the ones in charge and that we either take the job or leave it.*"

In some cases, fear impeded the worker's ability to get desired information. Subjects indicated that they would not ask questions regarding pesticides, and they would not ask for clarification if work-related instructions were not understood.

Participants provided several examples of deficiencies in the work environment. The lack of availability of soap and water was perceived as a major problem: We "*need more water faucet things where people can wash hands...so many workers and not enough water for everyone to wash hands and to drink...so people can protect themselves.*" Oftentimes, workers will bring bottled water because of concerns about water contamination. "*At some point irrigation water gets in contact with sewage and chemicals and that's not good.*" Other supplies are also not available. For example, one worker, when describing a lack of toilet paper, stated: "*They may stock one day and then it runs out and they don't put anymore.*" Although the provision of protective clothing, such as long rubber boots, rubber jackets and pants, was viewed as the responsibility of the boss, with one exception workers indicated that they provided their own protective garments.

Health and safety training may or may not be provided by the employer. When it was provided, it was not always well understood, as stated by one youth, " *sometimes the boss is talking so fast and using these big words and I don't understand and I am just staring at him...*" In some cases,

information is provided in English to workers who do not speak English, said others. While some bosses were described as "*good in that they teach you how to use the tools*," one youth suggested that others "*don't want to waste their time*" telling workers about health and safety issues. Some participants believed that their immigrant status (lack of documentation) placed them in a powerless position. Because they were perceived as powerless, the boss may feel less compelled to provide pesticide education.

Findings Regarding the Social/Community Environment.
Much of what the adolescent farmworker knows about work he/she has learned through observing and listening to his parents and other family members. "*My father taught me...in the fields. We used to sow onions, potatoes, lettuces, all types of vegetables... he taught me to plant all types of plants...to harvest.*" While these youths may not feel that they can ask their bosses questions about work, they can ask family and friends.

Adolescents learned about pesticide exposures both from observation of others as well as by being told about them. The adolescents described family members or co-workers who had become sick. One subject stated his mother "*got a big rash on her hand*" when she sprayed some plants. Another reported that a co-worker '*passed out*' and had to be taken away by an ambulance after exposure in a recently sprayed field. Other health effects reported or observed included sunburn, high fever, "*itchy eyes*," and nausea and vomiting.

Findings Regarding the Macroenvironment
It was clear from some of the comments that these adolescents feel stereotyped, because of their ethnicity. This was particularly notable among the non-English speaking group. "*You feel like only Mexicans do this (work in the fields) cause that is all you usually see, Mexican people around.*" The ability to choose the type of work one performs is partially related to societal attitudes. "*You really don't have much of an option*," stated one respondent. Members of their family "*are immigrants ... and (they) don't have papers or whatever; and the only place they can go that would accept them is in the fields.*" And another stated that because "*papers are fake; ... some are afraid.*" Furthermore, some participants stated they had to work because they were poor: "*The poverty that we have, that is the thing that makes us work.*"

Other barriers to choice are language and level of literacy. "*I don't know English either... I think that is the reason some farmers don't really take precautions, because they know (we) are immigrants, and they can get immigrants in a lot of trouble.*" And another: "*When you are working in the field, you feel like you have no rights.*" This lack of choice results in workers taking risks. A sense of powerlessness prevents them from being able to speak out when they perceive that conditions are unsafe because the boss "would probably get mad and fire you right there."

Interviews with Adolescents who Handle Chemicals
In the second year of the project 16 interviews were conducted with teenagers 18 years and younger who indicated their work included working directly with agricultural chemicals. All of the participants were males. Half of these young men indicated that they had mixed and/or applied chemicals in the United States and the other half indicated their experience was in Mexico. None of the youths interviewed indicated they had formal training or had received a

certificate entitling them to do this work. In most cases, they received informal training from the boss or family member (father, brother or uncle). Only about ½ of the youth indicated that they were supervised during this work.

Knowledge of Chemicals. Only one of the teenagers was able to recite a name of the product he applied. The young men described the chemicals as granules, powders and liquids of different textures and colors. The large majority indicated they applied the chemical using a backpack pump. They didn't know exactly what plagues the chemicals were targeting, but explained that the chemicals were used to *"kill weeds", "worms" and "animals that entered the plants"* and that they were good for treating *"plant infections"*. Occasionally the youths would mix the chemicals as well as apply them, but only one youth indicated he followed directions on the label. One young man referred to the chemicals as "*medicine*".

Personal Protection. Most of the teenagers protected themselves with long sleeves and pants and appropriate footwear, with a large number indicating they work plastic suits or rubber boots and gloves. Sometimes the youths had to purchase their own protective clothing. Several indicated wearing cloth gloves, which are not recommended for chemical applications. For face protection, goggles were occasionally utilized, but more common were handkerchiefs and in two cases, a respirator.

Reasons for Mixing and/or Applying Chemicals. The youths indicated that they did the work out of family obligation if they worked on a small family farm. One participant, who was trained and supervised by his brothers, described his experience: *"I learned (how to use agricultural chemicals) from my brothers and they supervised me. They told me to be careful so it doesn't get on my hands and to cover my nose. I wore long pants, a mask on my nose, and gloves that I bought myself. I learned how to tell the difference between different chemicals. It was fun for me to learn how to use the liquid chemicals."*

Still, one youth, who has lived in the United States for a number of years, indicated, *"It is very hard work. I didn't want to work in the field but my father took me there. I did it to work with my parents and earn some money."*

Though money is definitely the impetus for working in the fields, only a couple of youth indicated that they earned additional money for mixing and/or applying the chemicals. The general sentiment is that the activity of mixing and/or applying pesticides was just part of the job and the youth did not view it as beyond the call of duty. In fact, in some cases the youth showed pride in their work, as is the case of one participant who said, *"This was my own job and no big deal (to handle chemicals)"*. In the words of another, *"It's my job. I like to work with the insecticides. It's the first job that I had."*

The actual reports given by the adolescents participating in these interviews are included in Appendix D.

4.8 Evaluation of Process

Recruitment of Study Sites and Study Participants
Schools were identified through the Oregon Migrant Education Program (MEP). Project staff attended a MEP coordinator meeting to explain the need for pesticide safety training for adolescents and generate interest in the study. Staff also attended community education classes to promote pesticide safety in the family. Participants of these classes requested the training be given to their teenage children. Arrangements were made in those areas to provide training to the teenagers in their school settings. When schools were contacted without prior contact with the MEP coordinator, the program was sometimes met with resistance; in two cases teachers and principals declined to participate in the program because they felt it negatively targeted Hispanic youth in a school where there were already racial tensions.

Participants were recruited from traditional school settings and from labor camps. In the school setting, teachers often had to request permission from the principal in order to participate in the program. A teacher explained the study to the students known to work in agriculture and recommended that they participate in the interview and training. In most cases the training took place during class time. Occasionally trainings were held after school or in the evening in conjunction with parent conferences.

In the first year of recruitment in the summer ESL program, the program began in the second week of the ESL summer program. By the time the 2-week follow-up visit was made, many of the migrant teenagers had moved to other locations for work. In year two, staff met with the summer school teachers before classes began to explain the study and arrange times for the training. The teachers were enthusiastic about the program and helped considerably in participant recruitment. Many teachers, as well as the ESL director, expressed extreme disappointment that adolescents who could not produce a parental consent form were excluded from receiving safety training.

In the camps, recruitment was made face-to-face. Project staff approached a group of youth, explain the study and invite them to participate. Sometimes the youth were hesitant to participate but staff began interviewing other teenagers, they self-recruit or participants help recruit their friends. In some cases participants were wary of drawing attention from their boss or other camp manager. In all cases if the boss or camp manager approached project staff, they agreed to let the staff continue with the interviews.

In year two of the study the IRB required parental consent for non-emancipated youth to participate in the study. This severely hampered recruitment and participation; approximately 25 youth were not able to participate in the study because they did not have parental consent to participate in the research study.

Community Involvement
Student interns from CReATe alternative school were involved in participant recruitment and interviewing. In year one, approximately twelve students showed interest in participating in the program as interns. Project staff presented the interview and safety training program to the potential interns so they could understand the research process. At the next training session

interns were instructed on how to conduct interviews and practiced interviewing each other. Students successfully completing the final training session, where they went through the entire recruitment, consent, and interview process with a research assistant, were invited to conduct interviews in the field. These interns traveled with project staff around the state to interview adolescent farmworkers and provide training. Two CReATe interns were invited to work at CROET in the summer to learn more about the research process, prepare field kits and enter data.

CReATe staff were also hired to help with the supervision of interns. Another CReATe staff member was employed to co-moderate focus groups in year one.

Study Retention:

Table 14. Study Retention of Study Participants According to Recruitment Site

Recruitment Site	Baseline Adults	Baseline Teens	Follow-up (Teens only)
MEP	7	144	114
ESL	33	62	13
Camp	203	126	0
TOTAL	243	332	126

As the table shows, the retention of the adolescents recruited from the English as a Second Language Summer Program (conducted in the evening hours) was significantly lower than that observed for the adolescents enrolled in the traditional school year migrant education program. This difference reflects the very migratory nature of the students in the summer ESL program. Many of the students are in Oregon for only a 3-4 week period harvesting specific crops before moving on to other areas of the United States. While we believe the summer ESL program is an excellent location for pesticide safety training, it was not optimal for a post intervention assessment.

Consumer Satisfaction with Educational Intervention

MEP and ESL personnel were positive in their evaluation of the training program, repeatedly indicating that the youth desperately needed this education. They indicated that the flipchart intervention was by far the most entertaining and appropriate for the young workers. The flipchart presentation encouraged participation and was in a format that allowed questions to be asked at any time. Participants seemed lively and interested in the flipchart presentation.

The video presentation was easy to administer; some teachers indicated that they would continue to show the video each year. Other teachers indicated that although the information contained in the video was important, there was sometimes too much detail and information on types of farmwork not relevant to the work of their adolescent audience. Others noticed that voice on the video was too boring and that students sometimes lost interest in the subject content.

The cTRAIN presentation was also used in a school setting. Many of the classrooms were not adequately equipped to set up multiple laptop computers; furniture had to be rearranged and electrical outlets reinforced. Students were initially very interested in the computers, which look

very flashy. The students sometimes seemed distracted by the close proximity of their peers and would monitor their progress with the progress of their neighbor. Students in the Migrant Education traditional school setting seemed content with the individualized computer format whereas students enrolled in the summer ESL program from the migrant labor camps who had little or no experience with computers sometimes refused to do the computer training.

Dissemination of Research and Information

Research results were shared with project partners, the scientific community and the public as they became available. These include published manuscripts, power point presentations, and preliminary reports. Information on this research with Oregon's adolescent farmworkers is also published on the web at www.ohsu.edu/aghealth. The following posters and presentations were given:

Presentations:

- Children's Pesticide Exposure in Oregon: The Adolescent Farmworker Experience, Agricultural Health and Safety for Children and Teens, Yakima, WA, 2002
- Work Practices, Pesticide Knowledge and Risk Perception among Adolescent and Adult Migrant Farmworkers, Northwest Occupational Health and Safety, Seaside, OR, October 2001
- Developing Environmental Health Leadership Skills in At-Risk Latino Youth, Society for Public Health Education, Atlanta, GA, October 2001
- Work Practices, Pesticide Knowledge & Risk Perception among Adolescent Migrant Farmworkers, Health Risk Communication: A seminar on Policy and Practice, Portland, OR, February 2002
- Risk Communication with Adolescent Migrant Farmworkers, Portland State University, Portland, OR, March 2002
- CROET Agricultural Research with Migrant Farmworkers, Portland, OR, 2002
- Integration of Research, Education and Community Involvement of Adolescents Working in Agriculture, EPA Community Involvement Conference, Portland, OR, 2002
- Worker training for adolescent migrant farmworkers, ICOH, Baltimore, MD, October 2002
- Youth at Risk: Pesticide Knowledge and Work Behaviors of Adolescent Migrant Farmworkers, APHA, Philadelphia PA, November 2002
- Adolescent farmworkers: an emerging workforce, Western Migrant Stream Forum, Mesa, AZ, January 2003
- Addressing Pesticide Exposure in Migrant and Seasonal Farmworker Communities, Society for Applied Anthropology, March 2003

Posters:

- Work Practices, Pesticide Knowledge and Risk Perception among Adolescent and Adult Migrant Farmworkers, National Occupational Research Agenda, Annual Meeting, Washington DC, June 2001.
- Understanding the Pesticide Knowledge and Beliefs of Adolescent Farmworkers, International Society of Environmental Epidemiologists, Vancouver BC, August 2002

Planned Manuscripts:

- Salazar MK, Napolitano M, Scherer JA, McCauley LA (in review). Factors Affecting Pesticide Exposure among Hispanic Adolescent Farmworkers: A Descriptive Study.
- Validation of Pesticide Knowledge Inventory
- Youth in Agriculture: Mixing and Handling Agro-chemicals
- Research with Adolescent Migrant Farmworkers: Challenges and Opportunities
- Pesticide Knowledge and Health Beliefs: Comparison of Adult and Adolescent Farmworkers.
- Worker Protection Standard: Adequate for Youth Workers in Agriculture?

5.0 DISCUSSION

5.1 Training Effectiveness

There are a number of strengths of this study. We evaluated two educational materials that are frequently used with agricultural workers and that met the WPS for content. No data exists on the effectiveness of these training materials. The preferred type of training among the adolescents and also the type with the greatest increase in follow-up scores was the EPA flipchart training. This is the only training type that included human interactive training. The ability to interact and ask questions during the presentation appeared to result in increased gain in knowledge scores.

The video training was not judged to be as effective as training method, although it is the format that is used most frequently in the agricultural communities in Oregon. Research staff observations during the training sessions noted several areas of the video that appeared to lose the adolescent's interest. Given that group interactive training is unlikely to be given to large numbers of farmworkers, there is a need to develop video training that is more interactive and engaging for adolescents.

We experienced some difficulty using computer-based training with this population. We have found that cTRAIN or a program with comparable features can be used effectively with Latino adolescents and adults agricultural workers who have limited education and do not speak Spanish. However, computer-based training cannot be used without support, as 9 of the 19 who did not complete training required support but did not receive it (the remaining participants who did not complete were primarily stopped by external time constraints). The examiner who oversaw the training with cTRAIN recommended that a lone examiner could support 5-6 trainees. The findings from this study differ significantly with our experience with non-minority participants who have a high school education. These participants need virtually no support and thus the number of trainees who can learn from cTRAIN at any one time is constrained only by the time required to set up and document the training[23][26].

5.2 Assessment of Knowledge

Our major conclusion regarding the scores on the pesticide knowledge tests is that the current knowledge test lacks sensitivity to detect subtle differences in knowledge. We developed a short knowledge test that could be read to farmworkers and which would only require a true-false response. In the second year of the study we included several supplemental questions in a multiple response format to assess the ability of the adolescents to correctly answer these items. Analyses of those response are underway.

Pretest scores of all of our recruitment sites were significantly higher than those that we observed in a similar study of adolescent farmworkers conducted in 1999 [27]. Baseline knowledge tests did not differ according to whether the participant reported they had received prior pesticide training. Although there was no difference between baseline pesticide knowledge scores between adults and all teens, the youngest teens (<16 years of age) had lower scores than the adults. There does appear to have been some differences in the percent correct on questions related to health effects when compared to questions related to the action of pesticides and safety behavior. Further analyses of these differences will be conducted in the future.

5.3 Training Challenges with Workers Speaking Indigenous Languages

As we demonstrated in our 1999 investigation, speaking indigenous languages continues to result in lower knowledge scores. The adolescents who spoke primarily indigenous languages, spoke broken Spanish. We can not determine to what extent the lower knowledge scores among this subsample is attributable to lack of understanding the question or a lower level of knowledge. Clearly pesticide training materials and other work safety materials are needed in indigenous languages. Over half of the adolescents in our control groups spoke indigenous languages (Table 8). There are however several challenges to meeting this need. First, there is no written form for indigenous languages. Training materials will have to be in audio and visual format. Secondly, there are many indigenous languages. In Oregon we encounter primarily Mixteco, Zapoteco and Triqui but have also interacted with farmworkers speaking Nahuatl, Tlapaneco, Quicheana and Chinoteco. Multiple audio formats will need to be developed to be of use to this population. Finally, there are few resources (human and material) to assist in meeting the needs of this subpopulation. We have had some of our survey and training materials verbally translated into Mixteco by trilingual residents of some labor camps we visited. Clearly, concentrated efforts are needed in this area to ensure that these workers (youth and adult) receive the training they need to work safely in agriculture.

5.4 Ecological Model

The instruments that we used in this study were adapted from those that we have used with adult farmworkers and previous studies with adolescents [27][28][29]. Significant prior research has been conducted using these instruments and though this study focused on adolescents, findings can be compared to those of adult farmworkers. However, we recognized that the instruments might be inadequate to solicit a wide range of factors that influence the work of these youth. Therefore an ecological model guided our focus group discussions. The results of these discussions have pointed out the need for further instrument development in the area of family influences, perceptions of supervisors, and the impressions of youth workers about employers and agricultural work in the United States.

5.5 Handling Agro-chemicals

In our 1999 study we reported that approximately ¼ of the adolescents that we surveyed said they handled agro-chemicals currently or in the past. This proportion continued to be observed in this current study. Given this observation, we felt it was prudent to talk with these adolescents in more depth about the work that they do. Several conclusions can be made based on our findings: 1) there are classes of chemicals that are prohibited for

adolescents under 16 to work with, however there are also chemicals (including pesticides) with no restrictions in relation to youth work activities, 2) in no circumstance did we find any adolescent that could name the specific name or type of pesticide that they had worked with, 3) in multiple instances the work activity is done along side a family member 4) sometimes the work activity began in the adolescent's home country. Clearly, there are circumstances in which adolescents load, mix and assist in applying pesticides. Additional research is needed in this important area.

5.6 Adult/Adolescent Comparisons

As was already mentioned, adults had significantly higher baseline mean pesticide scores than the youngest participants in the study, although when considered as a single group, those under 19 did not differ significantly from those 19 years of age and older. Clearly the older the agricultural worker, the more likely he or she is to have acquired some knowledge of safety issues when working with pesticides.

Adults and adolescents differed on their past work histories, their present work practices, and most of the safety behaviors we investigated. The adults were much more likely to have received previous pesticide training. As for safety practices while at work, both adults and teens washed their hands before eating about 78% of the time. Interestingly, although adults were more likely than teens to change their clothes within 30 minutes of arriving home from work, and to take their shoes/boots off before entering their homes, the teens were much more likely to shower or bathe within 30 minutes of arriving home. The reasons for these differences bears further investigation.

5.7 Study Limitations

The study had several potential limitations that were recognized and considered in the plan for the design and implementation. Attrition of study participants from pretest and follow-up was a problem in subgroups of the study sample. The workers in agriculture are a diverse group. We found that many of the adolescents in the ESL program had moved on to another agricultural region or had dropped out of the ESL program by the time of the follow-up testing. This attrition reflects the very migratory nature of agricultural work. We attempted to work around this problem by implementing the program early in the harvesting period and using the advice of our community partners in timing data collection.

The migrant workers who enroll in MEP's and ESL may not be characteristics of the general farmworker population in the region. We attempted to work around this problem by the inclusion of a comparison group of adolescents, not enrolled in MEP or ESL program. Our results did indicate distinct difference, the most striking being the frequency of speaking indigenous languages among workers in the labor camps. We could not implement a training program in the labor camps, but did give the participants the correct answers to the pesticide knowledge test and a pesticide safety pamphlet. We believe that MEPs and ESL programs provide an excellent training opportunity for these workers. Innovation is needed to develop effective training for adolescents who are not enrolled in these programs.

Change in knowledge or self-report of changes in work practices and the use of protection was a limitation of the project.. However, the nature of agricultural work with the migrant population

presents distinct barriers to direct observation of work behavior. Some behaviors such as hand-washing or the use of gloves and types of clothing could be directly observed if access were given to the grower's property. We have been engaged in migrant farmworker research for 8 years and find that only rarely will growers allow direct observations of their workforce. When access is obtained from a grower, the proportion of adolescent workers in the field is not always known, nor are these young workers readily recognized. We will continue to try to partner with growers for the implementation of our research studies, but for the purposes of agricultural training, the aggregation of adolescents in the school setting continues to be the optimal method of accessing this population.

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REFERENCES

1. American Public Health Association: APHA policy statement 9405: Protection of child and adolescent workers. American Journal of Public Health: 440-1, 1995

2. Committee on the Health and Safety Implications of Child Labor: National Research Council, Institute of Medicine. Protecting youth at work: Health, safety, and development of working children and adolescents in the United States. National Academy Press, 1998

3. American Friends Service Committee: School Days, Saturdays, Sundays and Fiestas (Children who work in commercial agriculture), Philadelphia, PA, 1975

4. U.S. General Accounting Office: Child labor in agriculture: Characteristics and legality of work , Washington, DC, GAO/HEHS-98-112R. 1998

5. Mines R, Gabbard S, Stierman A: A profile of U.S. farm workers. Demographics, household composition, income and use of services. Based on data from the National Agricultural Workers Survey (NAWS). Prepared for: The Commission on Immigration Reform, Washington, DC, 1997

6. U.S. Department of Labor, Office of Program Economics: Findings from the National Agricultural Workers Survey (NAWS) 1990: A Demographic and Employment Profile of Perishable Crop Farm Worker. Research Report 1, Washington D.C., 1991

7. Zabin C, Kearney M, Garcia A, Runsten D, Nagengast C: Mixtec migrants in California agriculture: A new cycle of poverty, California Institute for Rural Studies, Davis, CA, 1993

8. McCauley L, Anger W, Bryan C, Center for Research on Occupational and Environmental

Toxicology OHSU: Health outcomes in adolescent minority farmworkers. Technical Report. National Institute for Occupational Safety and Health : (1 RO1 CCR014362-01), 1998

9. Wilk V: Health hazards to children in agriculture. American Journal of Industrial Medicine 283-90, 1993

10. Pollack S, McConnell R, Gallelli M, Schmidt J, Obregon R, Landrigan P: Pesticide exposure and working conditions among migrant farmworker children in western NY state. Presented at: The Annual Meeting of the American Public Health Association. New York., 1990

11. Pollack S, Landrigan P, Mallino DL: Child labor in 1990: Prevalence and health hazards. Annual Review of Public Health: 359-75, 1990

12. Oregon Department of Agriculture: Oregon Nursery and Greenhouse Survey, 1994-1995. USDA National Agricultural Statistics Service and the Oregon Department of Agriculture, 1996

13. Oregon Department of Agriculture: 1994-1995 Oregon Agriculture and Fisheries Statistics. Oregon Agriculture Facts and Figures. USDA National Agricultural Statistics Service and the Oregon Department of Agriculture, 1995

14. Nigg H, Beier R, Carter O, Chaisson C, Franklin C, Lavy T, Lewis R, Lombardo P, McCarthy J, Maddy K: Exposure to pesticides. In: The Effects of Pesticides on Human Health, Princeton Scientific Publishing Co. Inc., 35-129, 1992

15. Oregon State University: Labor Demand, Productivity and Overhead Cost for Harvesting 1990 Strawberry Crop. Oregon State University Agricultural Experiment Station, 1992

16. Cooke G: Senior Agricultural Health Compliance Office Pesticide Coordinator, Oregon OSHA. (Personal Communication). April 6, 2000

17. Quandt S, Austin C, Arcury T, Summers M, Saavedra R: Agricultural chemical safety training materials for farmworkers: review and annotated bibliography . Journal of Agromedicine: 3-24, 1999

18. Arcury T, Austin C, Quandt S, Saavedra R: Enhancing community participation in intervention research: Farmworkers and agricultural chemicals in North Carolina. Health Education and Behavior: 563-78, 1999

19. De Vries H, Burg J: Computer-tailored interventions motivating people to adopt health promoting behaviors: Introduction to a new approach. Patient Education and Counseling. 99-195, 1999

20. Rhodes F, Fishbein M, Reis J: Using behavioral theory in computer-based health promotion and appraisal. Health Education and Behavior: 20-34, 1997

21. Jones P: Computer-based hazard communication program delivery for the construction industry. In: Proceedings of the first international conference of CIB working commission: Implementation of safety and health on construction sites. (eds. Alves Dias & Coble), 1996

22. Kerr MJ: Progress report on pre-intervention noise study. Submitted to NIOSH (Grant number RO1 CCR 513049-0A1), 1998

23. Anger WK, Rohlman DS, Kirkpatrick J, Reed RR, Lundeen CA, Eckerman DA: cTRAIN: A computer-aided training system developed in SuperCard© teaching skills using behavioral education principles. Behavior Research Methods Instruments and Computers: 277-81, 2001

24. Krueger R: Focus groups: A practical guide for applied research. Sage Publications, 1994

25. Morgan D: Planning Focus Groups. Sage Publications, 1998

26. Eckerman DA, Lundeen CL, Steele A, Fercho HL, Amerman TA, Anger WK: Interactive training vs. Reading to Teach Respiratory Protection. Journal of Occupational Health Psychology: 313-23, 2002

27. McCauley LA, Sticker D, Bryan C, Lasarev MR, Scherer JA: Pesticide knowledge and risk perception among adolescent Latino farmworkers. Journal of Agricultural Safety and Health: 397-409, 2002

28. McCauley L, Lasarev M, Higgins G, Rothlein J, Muniz J, Ebbert C, Phillips J: Work characteristics and pesticide exposures among migrant agricultural families: a community-based research approach. Environmental Health Perspectives: 533-8, 2001

29. McCauley L, Michaels S, Rothlein J, Muniz J, Lasarev M, Ebbert C: Pesticide exposure and self-reported home hygiene practices in agricultural families. Environmental Health Perspectives: 397-409, 2002

Appendix A

Study instruments

ID # _____ - ____
Interviewer _____

Demographics
Pesticide Training for Adolescent Migrant Farmworkers

Name: _____ Date _____

1	Gender	1 Male 2 Female
2	How old are you today?	_____ years
3	Where were you born?	1 México What state? _____ 2 Central America What country? _____ 3 South America What country? _____ 4 United States
4	What is your race?	1 Hispanic 2 White 3 Other _____
5	Where do you live when you aren't in the United States?	_____
6	Address in Oregon (city)	_____
7	When was the first time you came to the United States?	_____ _____ month year
8	How many years of school did you complete in your home country?	0 1 2 3 4 5 6 7 8 9 10 11 12 12+
9	Have you gone to school in the United States?	1 Yes 2 No
10	**If yes,** how many years of school have you completed in the US?	0 1 2 3 4 5 6 7 8 9 10 11 12 12+
11	What is your main language?	_____
12	Can you read in this language?	1 Very well 2 A little 3 No
13	Do you speak another language(s)?	What language(s)? _____
14	In the past year, how many times have you moved because of work?	_____
15	In what county or city will you work most of this year? *(only farm work)*	_____
16	Which of the following do you do?	1 Watch television 2 Watch movies 3 Use a computer 4 Play video games 5 Exercise (not including work) 6 Smoke cigarettes 7 Listen to the radio

ID# _____ – ____
Interviewer _____

Health Beliefs
Pesticide Training for Adolescent Migrant Farmworkers

Name: _____ _____ Date: _____

In this study, there are no "correct" or "incorrect" responses. We want to know what you believe. Also, "exposed to pesticides" or "contact with pesticides" means to be in a place where they have sprayed or used pesticides

1. Please tell us which of the following describe(s) your work.
   1 You work in the field now
   2 You have worked in the field in the past
   3 You think you will work in the field in the coming summer
   4 You have never worked in the field

2. Have you worked in the US in jobs other than farming, orchard work, or nursery work?
   1 Yes
   2 No

3. How difficult would it be to find other work outside of agriculture?
   1 It would not be difficult
   2 It would be a little difficult
   3 Very difficult
   4 Impossible

4. Do you know if there are the types of work that would pay you the same or more than you earn now?
   1 You think there are many possibilities
   2 You think there might be a few possibilities.
   3 You don't know of other types of work that pay the same.

5. Have you been in contact with pesticides during your work in the field?
   1 Daily
   2 One time a week
   3 One time a season
   4 Never
   5 Don't know

6. There are many ways in which people can become exposed to pesticides? Have you had contact or been exposed to pesticides in the following ways?
   Circle those that apply.
   1 Touching plants after they have been sprayed
   2 Breathing pesticides in the air
   3 Accidental spraying from an airplane
   4 Mixing, carrying, or applying pesticides
   5 Driving a tractor at work
   6 In the nursery
   7 Other (please explain)_____
   8 No contact

7. Are there ways that people can protect themselves from pesticides?
   1 Yes
   2 No

8. **If "yes"**, what things can people do to protect themselves from pesticides?
   _____
   _____
   _____

9. If there are pesticides where you work, do **you** use any protection against exposure?
   1 Yes, always
   2 Yes, but only sometimes
   3 No, never

10. **If "yes"**, what do **you** do to protect yourself from pesticides?
    _____
    _____

ID# __ __ __ __ - __ __
Interviewer _____

11. How did you learn about pesticides and other chemicals that are used in your job?
Mark all that apply.

1 Boss
2 Co-workers
3 Migrant Education
4 Books
5 Friends/ Family
6 School
7 Handouts
8 Other _____

12. Do you think that pesticides can cause health problems?

1 Yes
2 Not sure
3 No

13. **If yes,** what health problems do you think can be caused by pesticides?

_____
_____
_____

14. During the past month, how many times have you thought about or feared the effects of pesticides on human health?

1 Never
2 Once a month
3 Once a week
4 Daily

15. Do you know some of the effects that pesticides have had in you or your family?
Please mention:

_____
_____
_____

16. Do you think that you have gotten sick because you have been in a place where pesticides were used?

1 Enough to worry a great deal
2 Enough to cause a little concern
3 Not enough to cause concern
4 Not at all

17. Do you think that pesticides can affect the health of children born to farmworkers?

1 Definitely
2 Very possible
3 Possible
4 Impossible

18. What is the chance that a young person working in the camps will suffer health problems in the future?

1 Definitely
2 Very possible
3 Possible
4 Impossible

19. What is the chance that you will experience future health problems because of pesticides?

1 Definitely
2 Very possible
3 Possible
4 Impossible

20. According to you, how effective are the methods to prevent health effects from pesticides?

1 Totally effective
2 Very effective
3 A little effective
4 Not effective

ID# _____ -- _____
Interviewer: _____

Pesticide Knowledge Questionnaire

Your name: _____ Date: _____

In the job that you have now, have you received pesticide training?

Yes When? _____

No

Circle "True" or "False" to indicate your answer.

1.	Pesticides are used to kill weeds and insects.	T	F
2.	Pesticides are dangerous for people and animals.	T	F
3.	Some people can get sick from pesticides faster than others even though they work in the same place.	T	F
4.	It is ok to store water in containers that have been used for storing pesticides.	T	F
5.	Sometimes, contact with pesticides causes a blister or skin rash.	T	F
6.	With time, pesticides degrade in the environment.	T	F
7.	Pesticide poisonings may have immediate but not delayed health effects.	T	F
8.	It is good to apply pesticides on a windy day.	T	F
9.	It is important to read the signs and announcements at the border of the field or orchard before entering.	T	F
10.	It is very easy to identify a sickness triggered by pesticides.	T	F
11.	Eating, drinking, or smoking in the field increases the possibility of pesticides entering the body.	T	F
12.	Pesticides pose few health risks to pregnant women and children.	T	F
13.	Protective clothing should always be worn when mixing or applying pesticides.	T	F
14.	When working in the field, the pesticides can stick to your clothes and shoes.	T	F
15.	Pesticides can enter the body through the skin.	T	F
16.	Soap and water remove pesticides from hands.	T	F
17.	You can eat fruit directly from the tree or plant after it rains, because the rain rinses off the pesticide residues.	T	F
18.	If you get pesticides on you, immediately remove any contaminated clothing and rinse your skin with water.	T	F
19.	Emergency phone numbers don't have to be posted in a common meeting area.	T	F
20.	It is better to work in shorts, short sleeves, and sandals when it is sunny.	T	F

ID# __ __ __ – __ __
Interviewer _____

Work Practices
Pesticide Training for Adolescent Migrant Farmworkers

Name: _____ Date _____

1. What type of work do you usually do? (Please mark only one.)
   1 Field work
   2 Mix or apply pesticides
   3 Nursery
   4 Other _____

2. **Currently** do you apply or mix pesticides at work?
   1 Yes
   2 No

3. **If yes**, how often?
   1 Daily
   2 Once a week
   3 Once a month
   4 Sometimes

4. **In the past**, did you apply or mix pesticides at work?
   1 Yes
   2 No

If you have applied or mixed pesticides, do you personally use the following protective clothing or equipment at your work?

Work Clothes		Current Work		
		1 Always	2 Sometimes	3 Never
5.	Rubber boots			
6.	Goggles			
7.	Rubber gloves			
8.	Mask			
9.	Plastic clothing			
10.	Respirator			
11.	Other types, if *yes*, what?	_____ _____	_____ _____	_____ _____

12. When you are in the field, do you wash your hands ***before*** eating?
    1 Always
    2 Never
    3 Sometimes

13. When you are in the field, do you wash your hands ***before*** going to the bathroom?
    1 Always
    2 Never
    3 Sometimes

14. How long after arriving home do you change out of your work clothes?
    1 Immediately
    2 Within 30 minutes
    3 More than 30 minutes

15. Do you take off your work boots or shoes before entering your house?
    1 Yes
    2 No
    3 Sometimes

16. How long after arriving home do you shower or bathe?
    1 Immediately after arriving
    2 Within 30 minutes
    3 More than 30 minutes

17. Do you wash your dirty work clothes separate from your other dirty clothes?
    1 Yes
    2 No

ID # ___ ___ ___ - ___ ___
Entrevistador _____

Demográficas
Pesticide Training for Adolescent Migrant Farmworkers

Nombre y Apellido: _____ Fecha _____

1	Sexo	1 Hombre 2 Mujer
2	¿Cuántos años tienes?	_____ años
3	¿Dónde naciste?	1 México ¿Qué estado? _____ 2 Centroamérica ¿Qué país? _____ 3 Sur América ¿Qué país? _____ 4 Estados Unidos
4	¿Cuál es tu raza? Encierre todo que sea aplicado.	1 Hispano(a) 2 Caucásico(a) 3 Otro _____
5	Dónde vives cuando no estás en los EU?	_____
6	Dirección en Oregon:	_____ *(ciudad)*
7	¿Cuándo llegaste por primera vez a trabajar a los EU?	_____ _____ mes año
8	¿Hasta que grado llegaste en la escuela en tu país de origen?	0 1 2 3 4 5 6 7 8 9 10 11 12 12+
9	¿Has atendido a la escuela en los EU?	1 Sí 2 No
10	**Si contestas "si",** ¿hasta que grado llegaste en los EU?	0 1 2 3 4 5 6 7 8 9 10 11 12 12+
11	¿Cuál es tu idioma dominante o nativo?	_____
12	¿Puedes leer en este idioma?	1 Muy bien 2 Un poco 3 No
13	¿Hablas algún otro idioma(s)?	¿Cuál ? _____
14	¿Cuantas veces te has mudado durante el ultimo año, con el propósito de trabajar?	_____veces
15	¿En qué condado o ciudad trabajarás la mayor parte de este año? *(solamente trabajo de campo)*	_____
16	¿Cuáles de los siguientes haces?	1 Ves la televisión 2 Ves películas en el cine 3 Usas una computadora 4 Juegas video-juegos 5 Haces ejercicio (no incluyendo tu trabajo) 6 Fumas cigarrillos 7 Escuchas la radio

ID# ___ ___ ___ - ____
Entrevistador _____

Creencias Sobre Salud
Pesticide Training for Adolescent Migrant Farmworkers

Tu nombre y apellido: _____ Fecha: _____

En este estudio, no hay respuestas "correctas" o "incorrectas". Queremos saber lo que tu crees. "Expuesto a pesticidas" o "contacto con pesticidas" significa estar en un lugar donde han fumigado o han usado pesticidas.

1. Dime por favor, cuál de los siguientes describe tu trabajo:
   1 En este momento trabajas en el campo.
   2 En el pasado trabajaste en el campo.
   3 Piensas trabajar en el campo el próximo verano
   4 Nunca has trabajado en el campo.

2. ¿En los Estados Unidos has trabajado en otros tipos de trabajo que no esten relacionados con el campo, la huerta o el vivero / nursery?
   1 Si
   2 No

3. ¿Qué tan difícil sería para ti encontrar otro tipo de trabajo por fuera del campo?
   1 No sería muy difícil
   2 Un poco difícil
   3 Muy difícil
   4 Imposible

4. ¿Sabes si hay en este momento otros tipos de trabajo que te pagarian igual o quizás más de lo que ganas ahora?
   1 Piensas que hay muchas otras posibilidades
   2 Piensas que hay quizás una o más posibilidades
   3 No estás seguro(a) si hay otros tipos de trabajo que pagan igual

5. ¿Has estado en contacto con pesticidas en tu trabajo en el campo?
   1 A diario
   2 Una vez por semana
   3 Una vez por temporada
   4 Nunca
   5 No sé

6. Hay muchas maneras en que uno puede exponerse a los pesticidas. ¿Has tenido contacto o has estado expuesto(a) a pesticidas en las siguientes maneras?
   Marca lo que te ha pasado a ti.
   1 Has tocado plantas después de que las han fumigado
   2 Has respirando pesticidas del aire
   3 Has sido fumigado(a) accidentalmente por un avión
   4 Has mezclado, cargado o aplicado pesticidas
   5 Has manejando un tractor en el trabajo
   6 Has estado expuesto(a) en el vivero / nursery
   7 De otra manera (explica por favor)_____
   8 Ningún contacto

7. ¿Hay maneras de protegerse de los pesticidas?
   1 Si
   2 No

8. **Si la respuesta es "Sí"**, ¿Qué cosas se pueden hacer para protegerse de los pesticidas?
   _____
   _____
   _____

9. ¿Si hay pesticidas donde trabajas, usas algún método de protección contra los pesticidas?
   1 Sí, siempre
   2 Sí, pero solamente algunas veces
   3 No, nunca

10. Si la respuesta es "Sí", ¿Qué métodos usas para protegerte?
    _____
    _____

ID# ___ ___ ___ - ___ ___
Entrevistador _____

11. ¿Cómo aprendiste sobre pesticidas y otros productos químicos que se pueden usar en tu trabajo? *(Marca todo lo que sea apropiado)*

1 Tu patrón
2 Compañeros del trabajo
3 La Educación Migrante
4 Libros
5 Familia / amigos
6 En la escuela
7 Folletos
8 Otros Medios

12. ¿Piensas que los pesticidas pueden causar problemas de salud?

1 Sí
2 No estas seguro(a)
3 No

13. **Si la respuesta anterior es "Sí"**, ¿Qué problemas de salud piensas tu pueden ser causados por los pesticidas?

_____
_____
_____

14. ¿Durante el mes pasado, cuántas veces has pensado o has tenido miedo acerca de los efectos de los pesticidas en la salud de las personas?

1 Nunca
2 Una vez
3 Una vez a la semana
4 Todos los días

15. ¿Sabes de algunos efectos que los pesticidas han causado a ti o a tu familia? (Por favor menciona todos los problemas que recuerdes)

_____
_____
_____

16. ¿Piensas que te has enfermado por estar en un lugar donde han usado pesticidas?

1 Sí, ¡te preocupa muchísimo!
2 Sí, suficiente para preocuparte
3 Sí, pero no tanto para alarmarte
4 No

17. ¿Piensas que los pesticidas pueden afectar la salud de los hijos de los campesinos?

1 Definitivamente
2 Es muy posible
3 Es posible
4 Imposible

18. ¿Cuáles son las posibilidades de que un(a) joven que trabaja en el campo sufra problemas de salud en el futuro?

1 Definitivamente
2 Es muy posible
3 Es posible
4 Imposible

19. ¿Cuáles son las posibilidades de que tu tengas problemas de salud en el futuro a causa de los pesticidas?

1 Definitivamente
2 Es muy posible
3 Es posible
4 Imposible

20. Según tu, ¿qué tan seguros son los métodos para prevenir los efectos de los pesticidas en la salud?

1 Totalmente seguros
2 Muy seguros
3 Un poco seguros
4 No son seguros

ID# ___ ___ ___ - ___ ___
Entrevistador: _____

Cuestionario Sobre Información de Pesticidas

Tu nombre y apellido: _____ Fecha: _____

¿Ahora en tu trabajo has recibido algún entrenamiento sobre el uso de los pesticidas?
Sí ¿Cuándo? _____
No

Encierre "Cierto" o "Falso" para indicar tu respuesta.

1.	Los pesticidas se usan para matar las hierbas y los insectos.	C	F
2.	Los pesticidas son peligrosos para las personas y animales.	C	F
3.	Algunas personas se pueden enfermar por los pesticidas con más rapidez que otras personas, aunque todas estén trabajando en el mismo lugar.	C	F
4.	Se puede guardar agua en envases que han sido usados para guardar pesticidas.	C	F
5.	A veces, el contacto con pesticidas causa un sarpullido o ronchas en la piel.	C	F
6.	Con el tiempo, los pesticidas se deshacen en el medio ambiente.	C	F
7.	Los pesticidas pueden afectar la salud inmediatamente, pero no a largo plazo.	C	F
8.	Está bien aplicar pesticidas en un día con mucho viento.	C	F
9.	Antes de entrar, es importante leer los letreros o rótulos al rededor del campo o la huerta.	C	F
10.	Es muy fácil identificar una enfermedad causada por pesticidas.	C	F
11.	Comer, beber o fumar en el campo aumenta la posibilidad de meter los pesticidas dentro del cuerpo.	C	F
12.	Las mujeres embarazadas y los niños tienen pocos riesgos de salud por los pesticidas.	C	F
13.	Siempre debe usar ropa protectiva cuando mezcle o aplique los pesticidas.	C	F
14.	Cuando está trabajando en el campo, los pesticidas pueden pegarse a su ropa y a sus zapatos.	C	F
15.	Los pesticidas entran al cuerpo solamente por la piel.	C	F
16.	El agua y el jabón lavan los pesticidas de las manos.	C	F
17.	Si ha llovido, usted puede comer fruta directamente del árbol o arbusto porque la lluvia limpia los residuos.	C	F
18.	Si le cae encima un pesticida, quítese la ropa contaminada y enjuáguese la piel inmediatamente.	C	F
19.	Los números de teléfono de emergencia no tienen que ser colocados en un lugar común de la granja.	C	F
20.	Cuando hace sol, es mejor que trabaje en pantalón corto, camisa con manga corta y huaraches.	C	F

Appendix B

Focus group session questions

Focus group session guide

OHSU Pesticide Training for Adolescent Farmworkers—2001
Moderator's Guide for Conducting Focus Groups

Arrive at the site at least 20 minutes ahead of start time to set up. Distribute demographic questions/sign up sheet and pencils for participants to complete while waiting for the group to start.

Thank you for coming. Your participation is very important to us.
Introduce self and co-facilitator.

We are meeting today to explore how you view health hazards associated with pesticide exposure. As part of the agricultural community, your opinion is valuable. The reason we are doing this in a group setting is that it lets us learn in more detail what people your age think about pesticides. All of your comments will be completely confidential, and no one outside the group will know what you said. The ideas and comments from each of you are important and there are no wrong answers for the things we will talk about. All comments are welcomed. Because your experience may be different than that of someone else, we expect you will have many different opinions and points of view. It is okay to disagree with what someone else might say. We are taping this discussion, so please remember to speak one at a time.

Have each member introduce self by first name (make it clear that you are not interested in last names or personal identifiers) and share something about yourself that has to do with pesticides.
Icebreaker: Tell me about the fieldwork you have done.

1. **(INTRODUCTORY Q)** How old were you when you started working in the field?
   - Who taught you how to do this work?
   - Who else in your family / friend circle do this work?
   - What do you like/dislike about this work?
   - Why do you work in the fields?
   - What do you do with the money?
   - What other work is available for you?
2. **(TRANSITION Q)** What are the health hazards from pesticide exposure?
   - Do you think that working in the fields is dangerous? Please describe what aspects of this work are dangerous.
   - Please describe your experience mixing or applying pesticides.
     - What kind of special training did you receive before mixing or applying?
     - Tell me how you felt about performing this job.
3. **(KEY Q)** Where did you learn about pesticides?
   - What kind of training did you receive in your job or from your boss?
   - What did your parents tell you?
   - What did you learn from your friends?
   - Where else have you heard about pesticides?
4. **(KEY Q)** What did these people tell you about protecting yourself from pesticides?
   - What special clothing did they recommend wearing?
   - What kinds of protective actions did they teach you?

5. **(KEY Q)** Two weeks ago you watched a presentation about how to protect yourself from pesticides. Now that you learned something about pesticides, what kinds of things will you do this summer to protect yourself from pesticides?
    - You learned that there are many things you can do to protect yourself from pesticides. Are there any of these things that you won't do? Why won't you do them? (wash your hands before using the bathroom, washing clothes separately, reading the warning signs before entering a field, mixing or applying pesticides without proper training)
    - How do you decide to wear protective clothing? How do you decide to do protective actions like washing your hands? (family, boss, friends, personal safety concerns)
6. **(KEY Q)** What would you do if an adult (boss, father, friend) told you to do something that you knew was unsafe?
    - Is there something you won't do in your job now that you know about pesticides? What? Why?
    - What do you think should be done to protect farmworkers from pesticides? What kind of laws or rules should there be?
    - Do you ever have problems understanding things that people tell you about your work? (Macroenvironment)
7. Summarize.
8. **(FINAL Q)** What have we missed?

Those are all the questions we have for you today, is there anything else you will like to contribute to this discussion before we leave today? THANK YOU.

OHSU Pesticide Training for Adolescent Farmworkers—2001
Field Notes Reporting Form

Moderators: please complete this form immediately after the focus session.

Information about the Focus Group

Date of Focus Group	
Location of Focus Group	
Number and Description of Participants	
Moderator Name	
Assistant Moderator	
Note taker	

Q1. How old were you when you started working in the field?

Brief Summary/ Key Points	Notable Quotes

Q2. What are the health hazards from pesticide exposure?

Brief Summary/ Key Points	Notable Quotes

Q3. Where did you learn about pesticides?

Brief Summary/ Key Points	Notable Quotes

Q4. What did these people tell you about protecting yourself from pesticides?

Brief Summary/ Key Points	Notable Quotes

Q5. Two weeks ago you watched a presentation about how to protect yourself from pesticides. Now that you learned something about pesticides, what kinds of things will you do this summer to protect yourself from pesticides?

Brief Summary/ Key Points	Notable Quotes

Q6. What would you do if an adult (boss, father, friend) told you to do something that you knew was unsafe?

Brief Summary/ Key Points	Notable Quotes

OHSU Pesticide Training for Adolescent Farmworkers—2001
Focus Group Questions--Spanish

1. **(PREGUNTA INTRODUCTORIA)** ¿Cuántos años tenías cuando empezaste a trabajar en el campo?
   - ¿Quién te enseño a hacer este trabajo?
   - ¿Quién mas en tu familia o en tu círculo de amigos hace este trabajo?
   - ¿Qué es lo que te gusta o que te disgusta de este trabajo?
   - ¿Por qué trabajas en el campo?
   - ¿Qué haces con el dinero que ganas?
   - ¿Qué otros trabajos hay disponibles para ti?

2. **(PREGUNTA DE TRANSICION)** ¿Cuáles son los peligros para la salud causados por la exposición a los pesticidas?
   - ¿Crees que es peligroso trabajar en el campo? Por favor describe que partes de este trabajo te parecen peligrosas.
   - Por favor describe tu experiencia cuando mezclas o aplicas pesticidas.
     - ¿Qué clase de entrenamiento especial recibiste antes de aplicar o mezclar pesticidas?
     - Dime como te sentiste al hacer este trabajo.

3. **(PREGUNTA CLAVE)** Hace dos semanas viste una presentación sobre como protegerte de los pesticidas. Ahora que aprendiste algo sobre los pesticidas, ¿que clase de cosas vas a hacer este verano para protegerte de los pesticidas?
   - Aprendiste que hay muchas cosas que puedes hacer para protegerte de los pesticidas. ¿Hay alguna cosa de las que aprendiste que no vas a hacer? ¿Por qué razón no la vas a hacer? (lavarte las manos antes de usar el baño, lavar la ropa de trabajo separadamente, leer los letreros de precaución antes de entrar al campo, mezclar o aplicar pesticidas sin tener el entrenamiento apropiado)
   - ¿Cómo decides que ropa protectiva usar? ¿Cómo decides que acciones hacer para protegerte, por ejemplo lavarte las manos? (Te dice tu familia, tu patrón, amigos o es que personalmente estás preocupado(a) por tu seguridad)

4. **(PREGUNTA CLAVE)** Qué harías si un adulto (tu patrón, tu padre o un amigo) te dice que hagas algo que tu sabes es peligroso?
   - Ahora que sabes sobre los pesticidas, ¿existe algo que no harás en tu trabajo? ¿Qué? ¿Por qué?
   - ¿Qué crees que se debería hacer para proteger a los agricultores de los pesticidas? ¿Qué clase de leyes o reglas deberían haber?
   - ¿Algunas veces tienes dificultades para entender cuando la gente te explica cosas sobre tu trabajo? (macroambiente)

5. **(PREGUNTA CLAVE)** ¿Dónde aprendiste sobre los pesticidas?
   - ¿Qué clase de entrenamiento recibiste en tu trabajo o te dió tu patrón?
   - ¿Qué te dijeron tus padres?
   - ¿Qué aprendiste de tus amigos?
   - ¿Dónde mas has escuchado sobre los pesticidas?

6. **(PREGUNTA CLAVE)** ¿Qué te dijeron estas personas sobre como protegerte de los pesticidas?
   - ¿Qué tipo de vestiduras o ropa te recomendaron usar?
   - ¿Qué te enseñaron sobre que clase de acciones puedes hacer para protegerte?

7. **Resumen**

8. **(PREGUNTA FINAL)** ¿Qué creen que nos ha faltado?

Estas son las preguntas que tenemos para ustedes el día de hoy, ¿hay algo mas que quieran agregar a esta discusión antes de terminar? GRACIAS

Appendix C

Interview questions for adolescents who mix and apply pesticides

OHSU Reducing Pesticide Exposure in Minority Families
Individual Interview Questions for Pesticide Mixers / Appliers

Conduct the following as individual interviews with teens who say they mix and apply pesticides. Explore to point of saturation.

1. You indicated on your interview that you have experience mixing and applying pesticides. Please describe where and when you performed these tasks. What city/state was it in? What time of year? What crop?

2. Describe different types of chemicals you applied (aim is to identify the class of pesticides). What did they look like? Were they liquid, gas, or granules? What equipment did you use (backpack sprayer, tractor, etc.)? By whom, if anyone, were you supervised?

3. What was the chemical used for (weeds, insects, certain disease, etc.)?

4. What were you wearing when you mixed and applied the pesticides?

5. Describe the training (formal or informal) you have received to mix and apply pesticides. (check out 'certification card' if the participant thinks he has one.)

6. Why do you mix/apply (money, pressure from family/boss, prestige, just part of the job)?

OHSU Reducing Pesticide Exposure in Minority Families
Individual Interview Questions for Pesticide Mixers / Appliers

Entrevistas individuales con jóvenes que dicen haber aplicado y mezclado pesticidas. Explorar hasta punto de saturación

1. En las entrevistas tu dijiste que tenías experiencia en aplicar y mezclar pesticidas? Puedes describir por favor dónde y cuándo hiciste este trabajo? En qué ciudad o en qué estado? En qué época del año? En qué clase de cultivos?

2. Describe los diferentes tipos de químicos que aplicaste (el propósito es identificar la clase de pesticidas). (queremos saber la clase de pesticidas). Cómo eran estos químicos? Eran líquidos, gases o gránulos? Qué equipo utilizaste (un fumigador en tu espalda, un tractor, etc.)? Alguien te supervizó? Quién?

3. Para qué se utilizó el químico (para matar malezas, insectos, alguna enfermedad, etc)?

4. Cuándo estabas aplicando o mezclando los pesticidas, qué vestiduras tenías puestas?

5. Describe la clase de entrenamiento (formal o informal) que has recibido para mezclar o aplicar pesticidas? (revisar la "tarjeta de certificación" si el participante piensa que tiene una.) ¿Cómo aprendiste a mezclar o aplicar los pesticidas? Quién te enseño?

6. Por qué aplicas o mezclas pesticidas (por el dinero, por presión de tu familia o tu patrón, por prestigio, o porque es simplemente parte de tu trabajo)?

Appendix D

Transcripts of interviews with adolescents who mix and apply pesticides

Interviews with Adolescents who Mix and Apply Pesticides

Training and Experience. Sixteen interviews conducted with teenagers 18 years and younger that indicated their work included working directly with agricultural chemicals. All of the participants were males. Half of these young men indicated that they had mixed and/or applied chemicals in the United States and the other half indicated their experience was in Mexico. None of the youths interviewed indicated they had formal training or had received a certificate entitling them to do this work. In most cases, they received informal training from the boss or family member (father, brother or uncle). Only about ½ of the youth indicated that they were supervised during this work.

Knowledge of Chemicals. Only one of the teenagers was able to recite a name of the product he applied. The young men described the chemicals as granules, powders and liquids of different textures and colors. The large majority indicated they applied the chemical using a backpack pump. They didn't know exactly what plagues the chemicals were targeting, but explained that the chemicals were used to "kill weeds", "worms" and "animals that entered the plants" and that they were good for treating "plant infections". Occasionally the youths would mix the chemicals as well as apply them, but only one youth indicated he followed directions on the label. One young man referred to the chemicals as "medicine".

Personal Protection. Most of the teenagers protected themselves with long sleeves and pants and appropriate footwear, with a large number indicating they work plastic suits or rubber boots and gloves. Sometimes the youths had to purchase their own protective clothing. Several indicated wearing cloth gloves, which are not recommended for chemical applications. For face protection, goggles were occasionally utilized, but more common were handkerchiefs and in two cases, a respirator.

Reasons for Mixing and/or Applying Chemicals. The youths indicated that they did the work out of family obligation if they worked on a small family farm. One participant, who was trained and supervised by his brothers, described his experience:

> "I learned (how to use agricultural chemicals) from my brothers and they supervised me. They told me to be careful so it doesn't get on my hands and to cover my nose. I wore long pants, a mask on my nose, and gloves that I bought myself. I learned how to tell the difference between different chemicals. It was fun for me to learn how to use the liquid chemicals."

Still, one youth, who has lived in the United States for a number of years, indicated, "It is very hard work. I didn't want to work in the field but my father took me there. I did it to work with my parents and earn some money."

Though money is definitely the impetus for working in the fields, only a couple of youth indicated that they earned additional money for mixing and/or applying the chemicals. The general sentiment is that the activity of mixing and/or applying pesticides was just part of the job and the youth did not view it as beyond the call of duty. In fact, in some cases the youth showed pride in their work, as is the case of one participant who said,

"This was my own job and no big deal (to handle chemicals)". In the words of another, "It's my job. I like to work with the insecticides. It's the first job that I had."

RESULTS

584RC: 15 years old, interviewed in Marion County

I applied pesticides in May on the Oregon blueberries at Camp Townsend. I would take cups of granules from the bucket and put them in another bucket. I would also have a backpack with some sort of gas that I would put on the plants. The boss supervised me. I wear long sleeves, jeans, rubber boots and a mask. "In Madera (California) they came to school to show us how to apply pesticides." Also here at Townsend Farms I saw a video and received a book. When asked why you mix or apply pesticides, he said, "It's my job. I like to work with the insecticides. It's the first job that I had."

562UC: 17 years old, interviewed in Clakamas County

I mixed pesticides on and off for a year in Oaxaca on the chile and corn crops. We used liquids. I don't know what they were called or what they were supposed to kill. I wore a pump on my back. My dad showed me how to do it, but nobody supervised me. I wore disposable plastic clothing that was purchased in a chemical store, rubber boots and goggles. I did this work because "it was part of the work we did on our small family farm."

415WM: 17 years old, interviewed in Washington County

In May I applied chemicals on the tomato and corn crops in Oaxaca. They were liquids that were in a backpack sprayer. I work regular clothes like a short sleeved shirt, long pants, and a handkerchief. I didn't have any formal training but I was supervised. The boss told me to do this job.

414WM: 17 years old, interviewed in Washington County

In March I applied liquid chemicals on the strawberries in Oxnard California. I didn't have any training in California, but the manager supervised me. In Oregon the boss showed me a training video. I wore gloves, rubber boots, a mask, respirator, and plastic clothing. I did it as part of my job.

407WM: 18 years old, interviewed in Washington County

In March and April I applied chemicals on the lawns to kill weeds. It was a liquid that was stored in a backpack and the boss supervised me. I wore pants, long sleeved shirt, closed shoes, gloves, a hat and a handkerchief. The boss showed me how to use the pump and how to apply the pesticides. It was just a part of my job.

419WM: 17 years old, interviewed in Washington County

I applied chemicals last summer on the strawberry in Cornelius. They were liquids and granules. I don't know what class they were but I work a respirator, long pants, long sleeved shirt, boots, hat, cloves and a mask. I didn't receive any training or certificate. I reed the directions and the boss showed me how to mix and apply. Nobody supervised me. I did it to earn money.

384WM: 18 years old, interviewed in Washington County
I used chemicals in the US and in Mexico. In Mexico it was on the beans and corn; in the US it was on the grapes. My father taught me and supervised me. I used liquids in a pump. The chemicals were used to kill weeds and plant infections. I wore long sleeved shirt, pants, long rubber boots that I bought myself. This was my own job and no big deal.

385WM: 18 years old, interviewed in Washington County
I was 14 and applied chemicals on the corn and watermelon in Mexico. The liquid chemical was used to kill grass. I learned from my brothers and they supervised me. "They told me to be careful to it doesn't get on my hands and to cover my nose." I wore long pants, a mask on my nose, and gloves that I bought myself. I learned how to tell the difference between different chemicals. "It was fun for me to learn how to use the liquid chemicals."

394WM: 18 years old, interviewed in Washington County
In North Plains I used chemicals in the summer on blueberry, strawberry and blackberry. It was a yellow or white liquid that I pumped out of a backpack to kill weeds and animals. The boss supervised me. I wore boots and gloves. The mayordomo explained how to apply the medicine and told us to keep it off of our clothes. It was just part of my job.

395WM: 18 years old, interviewed in Washington County
In Mexico my father and I would apply chemicals on the jitomate. We used a pump with liquids and powders to kill worms. My father supervised me. I work rubber boots and glasses. My father knows how to do this so he trained me. I did it to help my father.

369WC: 18 years old, interviewed in Washington County
In Mexico I applied chemicals on strawberries and tomatoes. It was liquids and powders that you mix and pump onto the plant to kill worms. The boss showed me how to do it and supervised me. I wore a plastic suit. The boss told me to do the work. It was the only kind of work available. The strawberry was very young and we had to put the chemicals on.

256CM: 18 years old, interviewed in Marion County
On weekends and summers in Salem last year I used Round Up, a white powder, and used it on the lawns and pine trees to kill plagues and weeds. We used a pump. My boss and father showed me how to measure it but I didn't have any supervision. I work long sleeves, rubber boots, long pants and cloth gloves. I did it to work with my parents and earn some money. "It is very hard work." "I didn't want to work in the field but my father took me there."

227SM 16 years old, interviewed in Marion County
I helped my dad with mixing. " I don't know much about mixing but my dad knows more. Sometimes I help him apply if he needs it. Dad owns a farm." The chemicals were

brown colored solids that we apply with a tractor. Sometimes I help on the tractor. They kill weeds and it keeps the insects away for 2 weeks. I work school clothes with a long sleeve and long jacket. I wore double sweaters that are warm and thick and long even when it was hot. Also I wore rubber pants an a rubber coat and rubber boots. " I don't use goggles." I didn't have formal training. Sometimes my dad tells me what to mix and what not to mix. "I don't touch it because I don't want Dad to get mad." We use the chemicals to make sure the strawberries are good. I get paid for helping out but not extra for mixing and applying. I don't feel pressured to do the work but can help out my Dad sometimes."

259CM: 13 years old, interviewed in Marion County
I used chemicals in Mexico on grape, peas, and spinach. It was a liquid to kill weeds, a green and pink powder that we mixed with water and put in a fumigator on our backs. It was used to kill the animals that entered the plants. I wore a suit, boots, handkerchief, hat. My father and brothers showed me how to do this work. I did it to learn how.

233SM: 18 years old, interviewed in Marion County
I used chemicals in Mexico last year on the corn and sugarcane. They were white granules. We would empty them in a bucket and dissolve them then put them in a backpack. I worked with an uncle but not with a supervisor. It was used to kill weeds and rats. I wore a short-sleeved T-shirt, pants, street shoes, and sometimes a mask or respirator. They paid me more to do this work.

264CM: 17 years old, interviewed in Marion County
I used chemicals in Mexico on the corn, garbanzo, squash, tomato, chile, and strawberry. They were green liquids and fertilizers, white and black granules, and we used a backpack sprayer. "They just left us there to work." I wore a long sleeved shirt, hat, mask and boots. "I believe I was more or less protected." Someone else mixed it and we (the fumigators) applied it. "I learned how to do this alone." This was just a part of my job, but they paid us a little bit more.

Publications:

Present:
Pesticide Knowledge and Risk Perception Among Adolescent Latino Farmworkers
LA McCauley, D Sticker, C Bryan, MR Lasarev, JA Scherer

Planned Manuscripts:

- Salazar MK, Napolitano M, Scherer JA, McCauley LA (in review). Factors Affecting Pesticide Exposure among Hispanic Adolescent Farmworkers: A Descriptive Study.
- Validation of Pesticide Knowledge Inventory
- Youth in Agriculture: Mixing and Handling Agro-chemicals
- Research with Adolescent Migrant Farmworkers: Challenges and Opportunities
- Pesticide Knowledge and Health Beliefs: Comparison of Adult and Adolescent Farmworkers.
- Worker Protection Standard: Adequate for Youth Workers in Agriculture?

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service
Centers for Disease Control
and Prevention (CDC)

Memorandum

Date: February 7, 2003

From: Adele M. Childress, Ph.D., Program Official
Office of Extramural Programs, NIOSH, E-74

Subject: Final Report Submitted for Entry into NTIS for Grant 5 R01 OH004230-03.

To: William D. Bennett
Data Systems Team, Information Resources Branch, EID, NIOSH, P03/C18

The attached final report has been received from the principal investigator on the subject NIOSH grant. If this document is forwarded to the National Technical Information Service, please let us know when a document number is known so that we can inform anyone who inquires about this final report.

Any publications that are included with this report are highlighted on the list below.

Attachment
cc: Sherri Diana, EID, P03/C13

List of Publications

McCauley LA, Sticker D, Bryan C, Lasarev MR, Scherer JA: Pesticide Knowledge and Risk Perception Among Adolescent Lationo Farmworkers. Journal of Ag Safety & Hlth 8(4):397-409

McCauley L, Sticker D, Bryan C, Lasarev M, Phillips J: Work Practices, Pesticide Knowledge, and Risk Perception among Adolescent and Adult Migrant Farmworkers. Journal of Agriculture Safety and Health, in review, 2001

Title:	Pesticide Training for Adolescent Migrant Farmworkers
Investigator:	Linda A. McCauley, Ph.D.
Affiliation:	Oregon Health Sciences University
City & State:	Portland, OR
Telephone:	(503) 494-2501
Award Number:	5 R01 OH004230-03
Start & End Date:	9/30/2000–9/29/2002
Total Project Cost:	$453,000
Program Area:	Special Populations
Key Words:	child agriculture, education, pesticides

Final Report Abstract:
This project was designed to evaluate the effectiveness of commonly used pesticide safety training materials with migrant adolescent farmworkers. Most migrant farmworkers are poorly educated and do not speak English as a primary language. While materials are available to train farmworkers on pesticide safety, few of the training methods have been evaluated with non-English speaking populations and no studies have addressed the effectiveness of agriculture health and safety training with adolescent migrant farmworkers. The purpose of the project was to determine if cultural, developmental, and age-related factors are associated with the adolescent's knowledge and beliefs of pesticide hazards and safety precautions and to what extent these factors influence the effectiveness of pesticide safety training. Specifically the project compared 1) the effectiveness of video methods of training and more interactive "flipchart" approaches to training, 2) the effectiveness of training delivered in the context of an educational program versus traditional methods of grower initiated training, 3) the effectiveness of traditional methods of delivering the training (audio-visual materials, training packets) when compared to an individualized computer-assisted approach. The educational interventions used in this project are built upon previous community-based projects with the migrant agricultural community and were dependent upon collaborative relationships with organizations that serve and advocate for the Latino agricultural community. Results from this project provide a model for future educational intervention research in agricultural occupational safety and health and contribute to the knowledge of workplace exposures and health effects in this vulnerable population.

Publications

McCauley L, Sticker D, Bryan C, Lasarev M, Phillips J: Work Practices, Pesticide Knowledge, and Risk Perception among Adolescent and Adult Migrant Farmworkers. Journal of Agriculture Safety and Health, in review, 2001

McCauley LA, Sticker D, Bryan C, Lasarev MR, Scherer JA: Pesticide Knowledge and Risk Perception Among Adolescent Lationo Farmworkers. Journal of Ag Safety & Hlth 8(4):397-409