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FLORIDA FARMWORKERS' PERCEPTIONS AND LAY KNOWLEDGE OF OCCUPATIONAL PESTICIDES

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ABSTRACT: Despite federal regulations, farmworkers often lack access to basic information about pesticides applied at their worksites. Focus groups revealed that farmworkers have developed an extensive body of lay knowledge, based on personal perceptions, about pesticides and pesticide exposure including means of pesticide exposure, means of pesticide entry into the body, and the potential health effects of pesticide exposure. We describe how this lay knowledge, when combined with technical information that is required to be provided to workers by law, provides valuable data to consider before developing and implementing health interventions designed to reduce the adverse health effects of pesticide exposure.

KEY WORDS: Farmworkers; Pesticides; Lay knowledge; Florida.

INTRODUCTION

As a low-wage, primarily Hispanic, occupational community, farmworkers experience health disparities such as poor access to health care and disproportionate exposure to hazardous substances at the worksite. Although farmworkers and their advocates have long been concerned about the adverse health effects of occupational pesticide exposure,[1] there continues to be little federal regulatory protection.[2] The most important federal regulation designed specifically to address pesticide exposure is the

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Environmental Protection Agency's (EPA) Worker Protection Standard (WPS), under the Federal Insecticide, Fungicide, and Rodenticide Act. Provisions of the WPS that relate to informing employees about the hazards of pesticides describe when, how, and what information about certain pesticides should be posted; the display of a safety poster in a central worksite location; and a mandatory employee training.

Individual states, in cooperation with the EPA, are responsible for the implementation and enforcement of the WPS. The General Accounting Office has reported that this arrangement has led to a nationally inconsistent pattern of monitoring practices.[2] When violations of basic WPS requirements, such as the provision of basic information about pesticides and their application, are not enforced, the result is often that workers are uninformed about chemicals that can potentially affect their health. Other researchers have reported this to be the case. Arcury et al. reported that out of 270 farmworkers interviewed in North Carolina in 1998 and 293 interviewed in 1999, 48.1 percent reported that their employer told them when pesticides were applied, 11.3 percent reported that they knew the names of the pesticides applied at their worksite, and 37 percent reported that their employer posted information about treated areas where workers could see it.[3]

In 1997, the National Institute of Environmental Health Sciences funded the Together for Agricultural Safety (TAS) project to design, implement, and evaluate a health intervention in central Florida plant nurseries and ferneries that would reduce the adverse health effects of pesticide exposure among farmworkers. The TAS project was a community-based participatory research collaboration between health researchers from the University of Florida (UF); the Farmworker Association of Florida (FWAF); and Best Start, Inc., a social marketing research firm. The TAS project partners conducted extensive formative research, including focus groups, during the first three years of the project to strengthen the collaboration and gather needed introductory information.[4] Focus groups with farmworkers revealed that they have developed a detailed body of perceptions and lay knowledge about the occupational pesticides with which they work. This article will present these findings and discuss the potential value of farmworker lay knowledge in developing health interventions related to pesticide exposure.

METHODS

Focus groups have been used effectively with cross-cultural and socially marginalized groups such as farmworkers.[5–7] The TAS partners

conducted 16 focus groups with a total of more than 100 farmworkers to gain a better understanding of farmworkers' perceptions and knowledge related to occupational pesticide exposure, and to gather qualitative data that would be useful in designing a survey instrument. The groups were part of a larger research agenda that began with participant observation by academic partners who worked in the fields, and included personal interviews and surveys with health care providers serving farmworkers, employers and supervisors, and farmworkers.

For the focus groups, the TAS team hypothesized that certain variables, such as age, gender, ethnicity (Mexican or Haitian), industry (nursery or fernery), and the presence of children in the household would influence farmworkers' perspectives and an individual group's dynamics. In order to gather more information on these variables and test the drafts of the focus group questioning guide, three preliminary focus groups were held. These preliminary groups were not specific in terms of gender, age, or presence of children in the household (although gender was noted), but were homogenous in terms of ethnicity and industry. Results of the three preliminary groups were included in the final analysis of all focus groups. After the preliminary groups, all focus groups were homogenous in terms of all variables.

Age and the presence of children in the household were interrelated in that groups consisted of individuals that fell into one of the following three groups: farmworkers of ''childbearing age'' (generally younger individuals with no children or with children less than 10 years old in the household); workers with children older than 10 in the household (generally workers older than 30); and older workers with no or only adult children. Gender, ethnicity, and industry were easily defined. Table 1 describes the composition of each focus group and Table 2 provides total focus group composition by variable. Questioning guides for each type of focus group differed only to reflect the demographic variations of the groups. Questioning guides were translated into the appropriate language for the group (Spanish or Haitian Creole). Table 3 shows the English version of questions used for one type of focus group, Women of Childbearing Age.

Community-based, bilingual partners from the FWAF recruited group participants; attended training conducted by academic partners on moderating focus groups, and moderated all the groups. Academic partners attended and recorded all groups as co-moderators. Groups generally lasted from two to four hours, depending on the number of participants and their responses. The co-moderator debriefed the moderator after each

TABLE 1

Description of Individual Focus Group Composition

	Group description	*Number of participants*	*Gender*	*Ethnicity*	*Industry*
Group 1	Preliminary	6	Male/female	Hispanic	Nursery
Group 2	Preliminary	7	Male/female	Hispanic	Fernery
Group 3	Preliminary	4	Male/female	Haitian	Nursery
Group 4	Childbearing age	6	Male	Haitian	Nursery
Group 5	With older children	2	Male	Haitian	Nursery
Group 6	Childbearing age	9	Male	Hispanic	Nursery
Group 7	Childbearing age	11	Male	Hispanic	Fernery
Group 8	Childbearing age	8	Male	Hispanic	Fernery
Group 9	Older	3	Female	Hispanic	Nursery
Group 10	With older children	7	Male	Hispanic	Nursery
Group 11	Childbearing age	6	Female	Haitian	Nursery
Group 12	Older	11	Male	Hispanic	Fernery
Group 13	With older children	6	Female	Haitian	Nursery
Group 14	With older children	6	Female	Hispanic	Nursery
Group 15	Childbearing age	2	Female	Hispanic	Fernery
Group 16	With older children	8	Female	Hispanic	Fernery

Childbearing age = workers generally younger than 30 with no children or with children younger than 10 years old.
With older children = workers generally older than 30 with children older than 10.
Older = workers older than 40 with no or only adult children.

group by asking a set of questions pertaining to the moderator's impressions of the group's progress. Community and academic partners transcribed tape recordings in their original language (Spanish or Haitian Creole), then translated the transcripts into English. Recorded debriefing sessions were also transcribed. Each transcript was then reviewed and edited by other team members for accuracy.

A team of four (two community partners and two academic partners) coded and categorized the transcripts according to major topics that arose during the focus groups. Data were then summarized into a thematic format that responded to inquiries about the knowledge and actions of farmworkers regarding pesticide exposure (for example, ''What do Farmworkers Know about the Pesticides with which they Work?'' and ''How do Farmworkers Believe they are Exposed to Pesticides?'')

The focus group summary was reviewed by individual team partners and discussed at TAS meetings. The following focus group results relate to

TABLE 2

Total Focus Group Composition by Variable

Variable	*N*
Age	
Childbearing age	43
With children > 10 yrs.	29
Older	14
Unknown (prelim groups)	17
Gender (includes prelim groups)	
Male	67
Female	36
Ethnicity (includes prelim groups)	
Haitian	24
Mexican	79
Industry (includes prelim groups)	
Fernery	47
Nursery	56
Total in each variable group	103

three areas of farmworker knowledge about pesticides: description and classification of pesticides, means of pesticide exposure, pesticide entry into the body, and adverse health affects of pesticide exposure.

RESULTS

The TAS researchers found that farmworkers have detailed lay knowledge of pesticides, the means of exposure and entry into the body, and of various acute health effects based on their observations and personal experiences:

Description and Classification of Pesticides

Farmworkers said they do not have access to information such as the names of pesticides with which they work and that no one tells them what is being applied. A few farmworkers knew the common names of well-known products like ''Roundup,'' but they had difficulty remembering the names of others. The few farmworkers who were more knowledgeable about product and pesticide names had either worked in their industries

TABLE 3

Focus Group Questions for Women of Childbearing Age

1. Please introduce yourself by telling us your first name, the type of work you do and how long you have done that type of work.
2. What health problems are most common among the people you work with?
3. What types of health problems are caused by the type of work you do?
4. What are the things you use at work that you call ''pesticides?''
5. Are all pesticides dangerous? Are there any pesticides that are not dangerous?
6. How do pesticides affect women like you?
7. Imagine that a woman who is planning to get pregnant applies for a job at the place you work. If she asked you if it was safe for her to work there, what would you tell her?
8. What would you tell her if she told you that she was already pregnant?
9. How do pesticides affect women's pregnancies?
10. How do pesticides affect the fetus (an unborn baby)?
11. How do pesticides affect newborns?
12. How do pesticides affect young children?
13. How do pesticides affect men who want to have children?
14. Have you, a friend, or a family member ever had a serious health problem or a behavior problem that you think was caused by pesticides?
15. If you or someone you know ever had a problem related to pesticides, what was done to take care of that problem?
16. Have you or someone you know ever used a ''home remedy'' or medicine from Mexico to treat a problem caused by pesticides? What was it?
17. What would you recommend that women do to protect themselves and their families from pesticides?
18. Which of these things do you do to protect yourselves?
19. Which can't you do regularly? What makes these things hard to do?
20. What is one thing that you wish the owner of your work place would do to protect your health?

for a long time or had been applicators in the United States or in Mexico (pesticide use is less common in Haiti).

Haitian and Hispanic farmworkers rarely use the direct Haitian Creole or Spanish translation of the words ''chemical'' and ''pesticide''. Instead, Haitian farmworkers often used the Creole word *pwodwi* (product) that is also used in Haiti. Hispanic farmworkers used the Spanish word *veneno* (poison) or *medicina* (medicine). Farmworkers believed that pesticides actually included a variety of workplace chemicals, such as fertilizers,

herbicides, fungicides, as well as substances used to mature plants and increase the shine on plant leaves.

The majority of farmworkers believed that all pesticides were dangerous and they reiterated this several times. Only a few farmworkers said that some specific pesticides, such as fertilizers and ''the things that make plants grow'' were not dangerous. Many farmworkers said some pesticides were more dangerous than others. Some farmworkers believed that the degree of danger depended on the amount of pesticide used.

Farmworkers often described pesticides according to their physical form. For example, Hispanic farmworkers use the word *polvo* to refer to pesticides in powder form, residue left on plant leaves, fine dirt (which sometimes contains chemicals), or the down on fern stalks (*pelusa*) which gets rubbed off and drifts through the air. They use *liquida* to refer to pesticides sprayed in liquid form through hoses and *agua* to refer to irrigation water sprayed through sprinkler systems. Other chemicals that farmworkers describe according to form are: a granulated fertilizer that is ''like salt,'' a chemical that is ''like a dry fungus,'' a chemical that ''looks like ash,'' and a pesticide that is ''oily.''

> What is a pesticide? Sometimes when I am inside, they water the plants with many different kinds of water and I don't know if there are chemicals in the water. There is blue water, black water, white water.

Sometimes farmworkers described pesticides according to how they are applied. For example, fernery workers often talked about a white powder that was mixed with water, sprayed on the ferns, and left to dry. This pesticide left a white residue on the plants. Finally, a few workers identified particular pesticides according to certain adverse health effects they experienced after exposure.

Knowledge of Means of Pesticide Exposure

Only a few farmworkers said they or someone they knew had been sprayed directly with pesticide at the workplace. They felt they were most commonly exposed to pesticides at their workplaces when they entered a treated area either before the allowable re-entry interval or shortly thereafter. They also said they were exposed when pesticides were applied in a nearby area and then drifted onto them while they were working.

Certain jobs or tasks result in more exposure than other. Some farmworkers felt that working inside covered areas, such as nurseries, was more dangerous than working in environments that are not enclosed, such

as fields. Some nursery workers who had tasks in packing and shipping areas, which are outside the covered areas, believed they had little or no exposure to pesticides. In contrast, fernery workers never described their jobs as safe from pesticide exposure.

The climates inside covered areas at nurseries and ferneries are often extremely hot and dry or hot and humid. Farmworkers felt these extreme conditions affected their bodies and made them more vulnerable to pesticide exposure and absorption.

Dry conditions

When worksites are dry, farmworkers felt they were exposed to several forms of dust-like substances (*polvo*), such as pesticide residue, powdered or dry form of pesticides, fine fern hairs, and dirt. The most common type of pesticide residue is left on plants after a liquid pesticide dries. Farmworkers said they were exposed to pesticide residue in the following ways: inhaling it, handling plants coated with dried residue or residue that had become wet again, and cutting long plants (such as ivy) that were hung above their heads, causing the residue to fall from the plants onto their bodies.

Farmworkers also described pesticides that are packaged in a powdered or dry form and said they were exposed to these types of pesticides in the same ways that they were exposed to residue. Exposure to powdered pesticides caused symptoms such as sneezing, runny and irritated noses, sore and irritated throats, hoarseness, red and irritated eyes, allergies, congestion, rashes, and nosebleeds.

Fernery workers said they were exposed to *pelusa*, the down on the stalks of fern fronds. This down becomes rubbed off during harvesting and flies loose in the air. Farmworkers breathe in these hairs, which irritate their throats and noses and can cause allergies.

When fernery workers discussed ''dirt'' they referred to the ground in which the ferns are planted. Nursery workers referred to potting soil. Farmworkers believed most types of dirt contains chemicals, such as fertilizers, which enters their bodies in the following ways: through their noses and mouths when they breathe; through their mouths when the dirt is in the air and they are talking; and through their skin when they handle contaminated dirt. The presence of dirt in the air can be so prevalent that some farmworkers said they had to clean it out of their noses and mouths at night after work. Farmworkers said they believe this dirt causes problems such as uncontrollable coughing, respiratory problems, lung disease, itching, and cancer.

> When you empty a bag of soil, there is dust. It can make you sick for two to three months. When you empty the soil there is a powder, very fine. It rises up, gets in your brain and it makes you sneeze. When you breathe it in, it makes. you feel sick. But I don't think there is a solution to this problem, every time you work with this soil, when you turn it with your hands, you make this dust and you breathe it in. It's the cause of sickness.

Wet conditions

Farmworkers expressed concerned about being wet while they work. Nursery workers said they become wet from perspiration, dew, irrigation water, liquid pesticides or when they unhook hanging plants and water spills out of the pot. Fernery workers often have full bodily contact with wet ferns in the morning because they have to bend over and thrust their arms into the plants to cut them and then they had to hold the fronds close to their bodies to stack and carry them.

When farmworkers are wet, drifting pesticides or residue can stick to and dry on their skin and clothing. Farmworkers described many health problems associated with being wet at the worksite. Some of these problems are weak bones; aching backs, joints, knees, and hands; pneumonia; and allergies. Irrigation water causes swelling and irritation in the hands and feet, skin rashes, and itching.

> If we go in very early, it's very wet because of the dew or because they watered the night before. Like, where I work, when it's very cold, they leave the water on all night. The next day we go in and everything is wet. The water goes through my shoes and, look at my feet, they are very irritated from the *medicina* in the water from the plants.

Pesticide Entry into the Body

Nursery workers described more than 50 ways in which pesticides enter their bodies. Fernery workers described about half this many ways. The most common means of entry for both groups are: through the skin and pores, through inhalation, and through hand-to-mouth contact.

> Everything that your skin is exposed to will reach the blood. Everything you breathe in goes to your brain. If you don't take precautions and the smell enters you because you went inside the greenhouse, maybe you thought your health was fine and nothing would happen. You can get an allergic reaction, it can enter your brain, and it can give you infections. Because when the smell enters your brain, it corresponds with your whole body. The same thing could happen if you enter a greenhouse and touch the leaves of a plant. Then you forget about it and then you have a rash. Even if it has been 24 hours and you enter the greenhouse, the leaves may still have the pesticide and if you forget and touch them and then rub your eyes, the pesticide has entered your eyes.

Pesticide Odors

Most of the time, farmworkers did not know when or where pesticides were applied at their worksites. The said they used their sense of smell to detect whether pesticides had been recently applied in an area where they worked, if pesticides were being applied in another part of the nursery or field at the same time they worked, or if a pesticide that had been applied was a strong pesticide.

Some nursery workers felt that the pesticide odor itself could cause physical symptoms such as dizziness, nausea, headaches, sneezing, coughing, and allergies. Haitian nursery workers specifically described how pesticides' odors entered their bodies through the sinuses and went directly into the brain, where it could cause a variety of symptoms. These farmworkers felt the ability to handle the pesticide smells determined whether or not someone could work in a nursery.

> The smell is the pesticide. It enters your brain through your sinuses. It gives you allergies, headaches, and red eyes. It can enter you easily.

Adverse Health Effects of Pesticide Exposure

Farmworkers sometimes compared themselves to the things pesticides kill. While few farmworkers had either personally experienced a pesticide poisoning or known someone else who had, farmworkers mentioned 93 different specific health problems they thought were related to pesticide exposure. The most common problems were headaches, general itching, rashes, swollen hands, and allergies.

Farmworkers were less certain about the causes of other health problems they often experienced, including bone and joint aches, watery eyes, burning eyes, red eyes, vomiting, memory loss, cancer, ''nerves,'' sneezing, and dizziness. A few farmworkers also believed pesticides directly or indirectly affected their emotional state and a few believed their daily exposure to pesticides might cause long-term health conditions, such as cancer and memory loss.

> Sometimes I will suddenly feel dizzy when I am inside with the plants and sometimes I ask my co-worker, ''Is it possible I have cancer?'' So my co-worker responds, ''You always think about this.'' Sometimes we don't believe it but in the long term all of this is going to harm us.

Only a few farmworkers believed that pesticides affected older farmworkers differently than younger farmworkers in the short-term. More often, farmworkers noted that pesticides could have a delayed impact,

creating problems years after exposure. Some farmworkers believed that men and women were at equal risk of developing exposure-related health problems and some believed women were ''weaker'' and thus are at a greater risk. One farmworker pointed out that men were at a greater risk because their work tasks often involve more pesticide exposure.

There was much uncertainty and anxiety about the effects of pesticides on reproductive health. Farmworkers attributed this uncertainty to a lack of open communication within their communities. They explained that people who experienced reproductive problems or had children born with health problems did not often talk about it with others in the community. If farmworkers did know of a problem, they did not generally know whether it was related to pesticide exposure. A lack of communication between farmworkers and their health care providers exacerbates this uncertainty.

Many farmworkers believed that long-term exposure to some pesticides could cause sterility in men and some believed that long-term exposure could also cause infertility in women. Many also believed that a fetus could be exposed to and affected by pesticides that a mother inhaled or touched. Some believed that pesticides could enter a pregnant woman's blood stream and be transmitted to a fetus, in the same way that drugs are transmitted. A few farmworkers believed that a woman who has accumulated agricultural pesticides in her body should detoxify before she becomes pregnant.

Almost all farmworkers believed that children were more vulnerable to exposure-related health problems than adults. This is attributed to a variety of factors. For example, children's pores are still ''open,'' their defenses are lower, and they are considered to be weaker than adults. The most common means of exposure for children who did not go into the fields is through contact with their parents' contaminated work clothes and skin. Some farmworkers find it difficult to avoid physical contact with their young children when they first see them after work. Workers want to hug and pick up their children when they first greet them at daycare. Children also come in contact with contaminated work clothing that has been removed at home but is within their reach. Finally, some older children actually work in the fields when not in school, especially in the ferneries.

The most common exposure-related health problem for children is skin problems. Children of farmworkers get hives, welts, rashes, and swelling when exposed to pesticides on adults' clothes, skins, or on plants. Farmworkers believe that children can have allergies, cancer, and various flu-like symptoms (such as dizziness, fever, headaches, diarrhea, and

vomiting) when exposed to agricultural pesticides. Several farmworkers mentioned that these pesticides can kill a child, and a few had stories of children who became violently ill and/or died as a result of direct or indirect contact with pesticides.

Farmworkers are unsure whether children's exposure to pesticides can affect their emotional and behavioral development. Some farmworkers think pesticides could cause a child to be mentally retarded, experience developmental delays (e.g., problems with walking, poor academic achievement) or suffer from ''nervous symptoms.'' Others dispute this by pointing out the difficulty in attributing these problems to pesticide exposure rather than to other causes.

DISCUSSION

These findings are similar to those found by Quandt et al. in focus groups with North Carolina farmworkers. Like the North Carolina researchers, TAS researchers found that farmworkers: rely largely on their senses to detect the presence of pesticides, believe that exposure is worsened in wet conditions, report that it is rare that farmworkers are sprayed directly with pesticides, believe that individuals are affected differently by pesticides, and know little about the long-term health effects of pesticide exposure.[8] The TAS focus groups also revealed that, despite lacking access to certain basic information about pesticides, farmworkers still have developed a body of knowledge based on their personal experiences with the substances. This type of lay health knowledge is important to consider when designing and implementing health interventions in an affected community.

Brown related how lay knowledge can inform professional knowledge in health research by identifying the problems and biases in the scientific research process; in pushing for alternative processes; and by offering data that would be difficult for scientists to otherwise obtain.[9] Popay and Williams discussed how lay knowledge can improve understanding about the relationship between social circumstances and individual behavior, explanations for ill-health, and an individual's predictions of their future health.[10] Research focusing specifically on farmworkers suggests that their lay knowledge is important to consider in activities such as developing educational programs [11] and health care policy for farmworkers.[12] Researchers have examined how certain types of farmworker knowledge of pesticides are associated with issues of control and use of precautionary practices at the worksite. They have reported that

farmworkers generally have little sense of control over their workplace conditions;[13] that access to certain types of knowledge increases farmworkers perceived control over pesticide exposure;[14] and that an increased sense of control is associated with increased use of safety practices .[11,14]

Despite the richness of the farmworker lay knowledge that emerged during the focus groups and any value it may have in designing health interventions related to pesticide exposure, farmworkers at their worksites still need access to basic technical information about pesticides. A provision of the WPS requires that farrmworkers have access to information such as the names and properties of applied chemicals. There are several reasons why farmworkers need this basic information. One important reason is that in order for health care providers to properly diagnose and manage pesticide-related illnesses they must at least know the names of the substances to which a farmworker has been exposed.

Information such as the names, properties, and potential adverse health effects of pesticides does not necessarily conflict with farmworker lay knowledge; in fact it may enhance or adjust it where necessary. Some of the lay knowledge discussed accurately reflects the known bio-medical information about pesticides. For example, farmworkers believe that pesticides are absorbed into the body through inhalation, ingestion, and skin penetration. This perception is supported by medical experts.[15] Other farmworker perceptions, however, may not reflect medical knowledge. Farmworkers reliance on their sense of smell to detect the presence of pesticides, for example, could be misleading and even dangerous if an applied substance has no odor. In such a case, farmworkers should be able to rely on the information that is required to be posted about pesticide applications.

Without access to basic, technical information, farmworkers have no choice but to rely on their own lay knowledge. Although farmworkers in the TAS focus groups knew pesticides are dangerous they had fear and uncertainty about issues such as long-term health effects. Accurate information, such as that required by law, would help alleviate these uncertainties and, when combined with farmworkers lay knowledge, help all parties in the agricultural community to work together toward adequate prevention of potential adverse health effects of pesticide exposure.

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