Pesticide Exposures: Counseling Mexican Americans on Reducing Prenatal Risk

By

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Abstract

This paper focuses on improving nurses’ skills in counseling Mexican American women with prenatal risk for pesticide exposure through examination of the cultural and social factors. Organophosphates are of special concern because of adverse health effects associated with exposure, particularly negative pregnancy outcomes. Nurses can achieve culturally competent care by combining the professional and cultural care knowledge. The information presented here is in line with Competency IV and Practice Skill VI of the National Pesticide Competency Guidelines for Medical and Nursing Education (National Environmental Education & Training Foundation [NEETF], 2003).
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The Institute of Medicine expressed concerns regarding the preparation of health care providers in recognizing and caring for patients exposed or poisoned from pesticides (NEETF, 2003). The University of Washington, in collaboration with many medical and nursing programs, has begun a large-scale project to improve pesticide training by developing materials for integration into curricula (Appendix A). My research is part of the U of W’s project and explores the cultural care issues and environmental health recommendations when counseling Mexican American women at risk for organophosphate exposures through agricultural work. A real life case report of pesticide exposure involving Mexican American women employed as farm workers is provided (Appendix B).

Nurses are often the health care providers who provide the initial point of contact for those seeking health care and may be relied upon to provide patient education. Community health nurses, making home visits or visiting worksites, are in a unique position to gain first hand knowledge of pesticide exposure risks (Pope, Snyder, & Mood, 1995). Lastly, nurses may be asked to implement teaching intervention and prevention strategies regarding pesticide exposures with county extension offices, local groups, and farmers (NEETF, 2003). The environmental health information presented here is in line with Competency IV and Practice Skill VI of the National Pesticide Competency Guidelines for Medical and Nursing Education (NEETF).

Literature Review

Review of the literature provides evidence that farm workers are at increased risk for pesticide exposures. California’s mandatory reporting system indicates that 10,000 to 20,000 cases of pesticide poisoning occur annually in farm workers (Reigart & Roberts, 1999). Migrant farm workers in North Carolina reported exposures while applying pesticides, being sprayed
farm workers reported that employers did not consistently provide hand-washing supplies (Ciesielski, Loomis, Mims, & Auer, 1994). Washington State's data for 2005 also indicates many of the pesticide exposures were related to tank mixtures of several pesticides and drift from an unspecified or unknown pesticide (Washington Pesticide Program [WPP], 2005). Although the law requires employers of 11 or more farm workers to provide toilet facilities and drinking water to employees working in fields, compliance is not required of those who employ fewer than 11 farm workers (Quackenbush, Hackley, & Dixon, 2006).

Pesticides are commonly used in agriculture to kill or control pests in order to increase crop yield and improve product appearance. Exposure to cholinesterase-inhibiting pesticides such as organophosphates is a major health problem for farm workers because of implications for cancer, sterility, spontaneous abortions, and cognitive deficits (Ciesielski, Loomis, Mims, & Auer, 1994). According to 1996 data from the American Association of Poison Control Center's Toxic Exposure Surveillance, organophosphates were ranked first in the pesticides most often implicated in exposures and were also listed among those pesticides likely to cause significant symptoms requiring medical attention (Reigart & Roberts, 1999).

Mexican-American farm workers are of special concern regarding pesticide exposures. Over 80% of the 3 million farm workers are immigrants and 77% of the immigrants are from Mexico (Quackenbush et al., 2006). The National Agricultural Workers Survey of 2001-2002 indicates that 44% of farm workers could not speak English and 53% could not read English (Quackenbush et al.). The study by Quackenbush et al. found that pesticide training was often provided in English, which raises a concern that a language barrier may prevent Mexican American farm workers from receiving effective pesticide training. Some Mexican Americans have come to the United States illegally, which may prevent them from seeking services because
of fear of discovery and deportation (Giger & Davidhizar, 1999). New immigration laws may interfere with illegal farm workers obtaining services, and lower education levels and low wage jobs may create barriers to safe health practices (Giger & Davidhizar).

Coronado, Vigoren, Thompson, Griffith, & Faustman, (2006) conducted research in Washington State’s Yakima Valley and established a take-home pathway for organophosphates via farm workers vehicles and clothing. Farm workers who worked with pome fruits (apples, pears) along with their children had the highest concentrations of organophosphate (OP) metabolites in their urine, and 90% of those who worked with pome fruits had detectable azinphos-methyl in their homes and vehicles. Azinphos-methyl, a common organophosphate used in orchard fruit, is highly toxic through inhalation, dermal absorption, ingestion, and eye contact (Coronado et al.). Reentry period into treated fields for purposes of thinning or harvesting is 14 days for apples and cherries, during which time only workers wearing protective equipment are allowed into the fields (Washington State Department of Agriculture [WSDA], 2002).

Findings from five organophosphate monitoring studies in Washington State between 1994 and 1999 demonstrated the highest concentrations of OP metabolites in the urine of children who lived with an adult who applied pesticides, adults who thinned apples, and children living in an agricultural community during spray season (Fenske, Lu, Curl, Shirai, & Kissel, 2005). Organophosphate exposure through food consumption was established in a small study of children ages 3-11 years in Seattle, Washington. Urine samples varied significantly during conventional and organic diet phases for two organophosphate metabolites, malathion and chlorpyrifos. On days that the children ate their conventional diets, there were detectable levels of these metabolites in their urine. On days the children ate an organic diet these metabolites
dropped to a non-detectable level (Lu, Toepel, Irish, Fenske, & Barr, 2006). Malathion and chlorpyrifos are used in agricultural production of fruits, vegetables, and wheat (Lu et al.).

Organophosphates inhibit cholinesterase, which may pose a risk to the developing embryo. Anticholinesterase activity has been noted to affect fetal neuronal differentiation thus delaying neurodevelopment (Rull, Ritz, & Shaw, 2006). “Critical early events in the development of the central nervous system include the closure of the neural tube around day 22 of embryonic life and neurogenesis, which is complete at 16 weeks” (Gale, O'Callaghan, Godfrey, Law, & Martyn, 2004, p.321). Rull et al. found an increase in neural tube defects associated with maternal exposures to organophosphates occurring 3 months before to 3 months after conception. The maternal exposure was defined by a residential proximity of 500 meters and 1000 meters to agricultural applications of organophosphats. A study conducted in Costa Rica found an increase in total childhood leukemias with maternal organophosphate exposure during the first trimester of pregnancy, an increase for acute lymphocytic leukemia for exposures during the first and third trimester, as well as increased odds ratios for childhood leukemias with paternal exposure before conception and during the first trimester of pregnancy (Monge, Wesseling, Guardado, & Lundberg, 2007).

Method

Nurses may experience barriers related to the clients’ culture, which inhibits the nurse from providing effective guidance. Madeleine Leininger’s Theory of Culture Care Diversity and Universality provides nurses with a theoretical framework for exploring differences and commonalities among cultures (Leininger & McFarland, 1995). The goal in Culture Care Theory is to “provide culturally congruent and competent nursing care” (1995, p.97). The Sunrise Model is a framework for assessment of the client’s worldview through examination of the client’s
culture and social structure (1995, p.117). Assessment of the Cultural Values/Lifeways, Kinship/Social Factors, Religious/Philosophical Factors, Economic Factors, and Education Factors are of particular value when providing anticipatory guidance related to pesticide exposures. The case report (Appendix B) is a real situation in which three Mexican American women, exposed to organophosphates during pregnancy, experienced negative pregnancy outcomes. Case reports or studies can be used to stimulate discussion and help nurses, particularly in multicultural practices, see the relevancy of the information (Sandstrom, 2006).

*Assessment using the Sunrise Model*

**Cultural Values/Lifeways**

At the initial contact it is important for the nurse to establish rapport and trust. The Mexican people value respect and personhood, which is demonstrated by appropriate deferential behavior toward others (such as use of the titles “Mr.” or “Mrs.”), and conducting conversations in an unhurried manner using diplomacy and tact (Leininger & McFarland, 1995). The nurse allows the making of “small talk” before getting down to the business of the interview and avoids confrontation, arguments, or kidding (Giger & Davidhizar, 1999). Spanish is the primary language of many Mexican Americans; however, those having an Indian heritage may speak one of 50 dialects. The nurse assesses the client’s language, birthplace, and background. If necessary a translator if provided to assure the information shared is accurate (Giger & Davidhizar).

Because many of the measures to reduce organophosphate exposure are related to food consumption and hygiene practices, it is important to determine if the client’s health care practices conflict with recommended practices. Behaviors that reduce exposure to organophosphates include hand-washing before eating, washing and peeling fruits and vegetables before eating, avoidance of eating while in the fields, washing with soap and water
within 30 minutes of direct pesticide contact, bathing at the end of the workday, and separate laundering of work clothes (Sanborn, Cole, Abelsohn, & Weir, 2002).

**Kinship/Social Factors**

The father is seen as the head of the house and the decision maker, while the mother is responsible for family cohesiveness (Leininger & McFarland, 1995). Giger and Davidhizar (1999) note stable out-of-wedlock relationships are common in the lower socioeconomic levels. The nurse should include the father during counseling related to prenatal pesticide exposure regardless of marital status. Familism is a cultural value among the Mexican people. It refers to a sense of collective pride among the family, which goes beyond the immediate family members to the extended family of aunts, uncles, cousins, godparents, and close friends. The local extended family is tightly integrated, keeps in close contact, and provides support to one another (Leininger & McFarland, 1995). When discussing measures to reduce organophosphate exposure the nurse may need to include other family members who live in the home, or frequent the home, or provide transportation to and from work.

The take-home pathway for organophosphates is eliminated by removal of work shoes and clothing before entering vehicles for the return home (Quackenbush et al., 2006). If the residence is adjacent to agricultural land, the nurse advises to shut windows and outside doors and keep children and household pets indoors during spraying, and prohibit children from playing in the fields. If the client is reluctant to adopt a particular intervention, the nurse may suggest that the client consult with family members. This shows the nurse's respect for the family, and an intervention may be more likely adopted if the family is supportive (Giger & Davidhizar, 1999).

**Religious/Philosophical Factors**
Mexican-Americans are more likely to believe that life events are God's will, or that one is at the mercy of the environment. Associated with this is the belief that personal efforts are unlikely to change the outcome (Leininger & McFarland, 1995). Although many are practicing Catholics and may adhere to the church's teachings regarding birth control and abortion, a study by Browner, Preloran, & Cox (1999) found that it was women's understanding of the risks, their perceived fear of birth defects, their faith in traditional medicine, and their relationship with their provider that most influenced their decision making in terms of prenatal testing and abortion. An adverse outcome in a previous pregnancy is a significant predictor of future risk; therefore clinic visits should be used to provide additional interventions to women at risk (Graham & Armstrong, 2006). Women who are pregnant or attempting to conceive should notify their employer and be provided with alternative work. The nurse should counsel the couple to avoid conception during the season in which the male or female has high pesticide exposure, and for 3 months following the season (Sanborn, Cole, Abelsohn, & Weir, 2002).

Because Mexican women were equally concerned with ensuring a healthy pregnancy but made different decisions when it came to prenatal testing and abortion, it is important to avoid assumptions (Browner et al., 1999). Those whose primary language is Spanish may have difficulty understanding terms. It is important the nurse checks for understanding and allows ample opportunity for questions (Giger & Davidhizar, 1999).

Economic/Education Factors

Mexican Americans remain the most undereducated segment of the U.S. population. It is difficult for them to find good paying jobs with benefits, such as health care (Leininger & McFarland, 1995). Statistics from the 1995 National Center for Farm Worker Health show the annual income of most migrant farm workers is below the poverty level (Giger & Davidhizar,
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A low education level or limited language skills may impact their ability to read and understand pesticide labels. They may have difficulty understanding the rationale for personal protective equipment or the associated reproductive risks. If they are sharing housing and transportation with others, laundering and bathing practices may be difficult. The nurse should assess barriers related to education and economic factors that may prevent the client from adopting recommended health care practices aimed at reducing organophosphate exposure or obtaining necessary health care.

Summary

Understanding the risks associated with organophosphates and how to reduce exposures is particularly important for nurses providing care to farm workers. In serving the Mexican American client the nurse assesses factors that makeup the client’s worldview in order to increase the likelihood of adoption of measures to reduce exposures. The Sunrise Model offers a framework for a comprehensive assessment of the client’s cultural and social structure. These factors will affect the client’s knowledge, understanding, and choices they make in relation to pesticide exposures. Barriers may exist that could compromise the client’s ability to follow recommended health care practices. Careful assessment by the nurse can help uncover unsafe practices and barriers. Linking cultural values to health promotion and disease prevention provides opportunity to reinforce lifestyle strategies to reduce pesticide exposures. The goal of the nurse who works with culturally diverse populations is to provide guidance, which is both professionally sound and culturally appropriate.
References


Appendix A

Pesticide Effects: Integration into Health Care Provider Curricula

Executive Summary

The goal of this project is to improve the training of health care providers in the recognition, diagnosis, treatment, and prevention of pesticide poisonings among those who come in contact with pesticides. The project intends to develop, test, and distribute innovative materials for integrating the core competencies as outlined in *National Pesticide Competency Guidelines for Medical and Nursing Education* into the curricula of medical, nursing, physician assistant schools, and advanced nurse practitioner and residency programs. The project will enlist key faculty and students in these schools and programs to help develop, introduce, and disseminate these modules in their schools, developing a new cadre of “champions” in this and the next generation. Additionally, the project will carefully monitor and evaluate the process and impact of introducing pesticide content across a broad range of curricular models in order to identify the most successful approaches to integrating these materials into the curricula. The program products will then be tested regionally in preparation for national distribution.

The project is led by Dr. Matthew Keifer, MD, MPH, a well-respected researcher and educator in occupational pesticide health effects, and Helen Murphy, ARNP, MHA, a seasoned educator with extensive national and international administrative, teaching, outreach, and evaluation experience. The assembled team includes academic leaders, deans, program directors and academic administrators from nursing, medical, physician assistant and nurse practitioner (NP) programs, residency programs in Internal Medicine, Family Medicine, Neurology, Pediatrics and Occupational Medicine at the University of
Washington (UW) as well as the NP program at Seattle Pacific University, and the Licensed Practical Nursing program at Heritage University. To further test and evaluate appropriateness and adaptability of the training modules, this project will take advantage of the Northwest's concentration of health care training institutions and the expansive UW WWAMI medical education network, which includes Wyoming, Washington, Alaska, Montana, and Idaho.

The team members have direct influence over curricula in their own institutions and extensive national connections to academic decision-making bodies in their own specialties. This ample variety of institutions with differing teaching methods, differing specialties and differing levels of training will provide a wide range of experience from which conclusions can be drawn regarding strategies for successful curricular integration.

Expected products include a wide variety of tested modules and packaging approaches geared to differing styles and levels of training. These will range from case vignettes for resident training and case based training, to slide presentations for insertion into classical didactic programs such as pharmacology, physiology or pathology courses. They will be distributed locally and regionally and evaluated for ease of use and quality of content and presentation. Additional products and strategies will be tested for introduction into professional health care provider training by a cadre of committed faculty and student champions from different health care disciplines. This project will advance EPA's goal to protect human health and address the intent of the Pesticide Registration and Improvement Act by enhancing the scientific and regulatory activities related to worker protection through improved poisoning reporting.
Appendix B

Case Report: Three farm workers who gave birth to infants with birth defects (Calvert et al., 2007).

Case Presentation: In February 2005, three infants with congenital anomalies were identified in Collier County, Florida, who were born within 8 weeks of one another and whose mothers worked for the same tomato grower. The mothers worked on the grower’s Florida farms in 2004 before transferring to its North Carolina farms. All three worked during the period of organogenesis in fields recently treated with several pesticides. The Florida and North Carolina farms were inspected by regulatory agencies, and in each state a large number of violations were identified and record fines were levied.

Case 1: This infant was born with tetra-amelia (absence of all 4 limbs). The parents had no known birth defect risk factors, and this was the mother’s first pregnancy. The period for limb development is 24-36 days after fertilization. During this period the mother had worked up to 4 days in violation of the restricted reentry day (REI) involving several pesticides, including mancozeb.

Case 2: This infant was born with mild Pierre Robin syndrome (micrognathia, high arched palate, and mild persistent palatine rugae). The father of this child has micrognathia. During gestational days 14-57, this mother worked in violation of the REI up to 8 days. Pesticides applied to the fields during the days the mother was in the fields included methamidophos, mancozeb, abamectin, and methylpyrrolidone. The mother has 3 other living children, none of whom have birth defects. The mother had one previous stillbirth but without obvious birth defects.
Case 3: This infant had multiple severe malformations including cleft lip and palate, imperforate anus, solitary kidney, vertebral anomalies, dysplastic low-set ears, and ambiguous genitalia. These findings are quite reminiscent of a severe type of the Goldenhar Syndrome. Death occurred at 3 days of age. During gestational days 14-59, the other worked in violation of REIs for up to 10 days. On 8 of these days the mother was exposed to methamidophos. On two other days the mother may have been exposed to abamectin and methylpyrrolidone. The mother had two previous pregnancies. One pregnancy 3 years earlier involved a malformed fetus and ended in miscarriage. The mother could not recall any toxic exposures during that pregnancy. The other pregnancy resulted in a normal child.