ARTICLE

Integrated Pest Management Intervention in Child Care Centers Improves Knowledge, Pest Control, and Practices

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ABSTRACT

Introduction: To reduce young children's exposure to pests and pesticides, an integrated pest management (IPM) intervention was provided for child care center staff.

Methods: The 7-month IPM education and consultation intervention was conducted by trained nurse child care health consultants in 44 child care centers in California. IPM knowledge surveys were completed by child care staff, objective IPM assessments were completed by research assistants pre- and postintervention, and activity logs were completed by the nurses.

Results: There were significant increases in IPM knowledge for the child care staff who attended workshops. There were reductions in the prevalence of pests and increases in IPM practices at the postintervention compared with the preintervention time point. The nurses consulted an average of 5.4 hours per center.

Discussion: A nurse-led IPM intervention in child care centers can reduce exposure to harmful substances for young children attending child care centers. J Pediatr Health Care. (2016) ■, ■-■.

KEY WORDS

Child care, child care health consultation, integrated pest management, pediatric nurse, pesticides, public health

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Conflicts of interest: None to report.

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0891-5245/$36.00

http://dx.doi.org/10.1016/j.pedhc.2016.07.004

INTRODUCTION

Children exposed to pesticides early in life are at risk for long-term cognitive, neurologic, respiratory, and developmental problems (Bouchard et al., 2011; Lanphear, Vorhees, & Bellinger, 2005; Liu & Schelar, 2012; Makri,

Goveia, Balbus, & Parkin, 2004). Chronic exposure to indoor residential pesticides in early childhood is associated with an increased risk of developing childhood leukemia and lymphoma (Chen, Change, Tao, & Lu, 2015). Young children are more vulnerable to the harmful health effects of pesticides than adults because of their body size, behavior, physiologic development (Moya, Bearer, & Etzel, 2004), and exposure through multiple routes and pathways (Bearer, 1995; Roberts, Karr, & Council on Environmental Health, 2012). Young children may have dermal contact and/or may inhale pesticides in the air and/or suspended dust because they spend a lot of time on the floor, where pesticides accumulate (Fenske et al., 1990; U.S. Environmental Protection Agency, 2007). Young children engage in frequent hand-to-mouth activity, increasing their ingestion of contaminated dust or residues on hands or objects (Roberts et al., 2012). Compared with adults, young children absorb chemicals at proportionately higher rates because they have a higher intake of air, water, and food per unit body weight, resulting in proportionately higher exposures (American Academy of Pediatrics, 2012; Bearer, 1995; Landrigan, Kimmel, Correa, & Eskenazi, 2004). Children's organs and bodily systems are growing and rapidly changing, and chemical exposure during critical ages may disrupt their development and lead to long-term health and neurodevelopmental problems (Bearer, 2000; Lanphear et al., 2005; Moya et al., 2004).

California accounts for over 20% of all agricultural pesticide use in the United States (California Environmental Health Tracking Program, 2014) and has 2.5 million children under 5 years of age (Child Care Aware of America, 2015). California also has more licensed child care centers than any other state; there are 11,302 licensed child care centers and approximately 1.5 million children under 6 years whose parents work outside the home. Children spend an average of 35 hours per week in out-of-home child care settings (National Center on Child Care Quality Improvement, 2013). Because 62% of children in California under 6 years of age spend a portion of their day in regular child care arrangements (Laughlin, 2013), interventions should be targeted to address harmful chemical exposures in child care programs.

Studies show that young children attending child care centers are exposed to pests and pesticides (Bradman et al., 2012; Mir, Finkelstein, & Tulipano, 2010; Morgan et al., 2005; Starr, Graham, Stout, Andrews, & Nishioka, 2008; Tulve et al., 2006; Wilson, Chuang, Morgan, Lordo, & Sheldon, 2007). In a survey of 481 child care centers in California, 85% of respondents reported pest problems, and 39% reported applying high-exposure pesticides, which include sprays, foggers, powders, or uncontained pellets (Messenger, Livingstone, & Kerschner, 2015). In another survey of 637 child care centers in California, 90% of the directors reported problems with at least one indoor or outdoor pest (Bradman, Dobson, Leonard, & Messenger, 2010). The most common pests included cockroaches, fleas, ants, stinging insects, spiders, and rodents. The presence of pests increases the risk of health problems for young and vulnerable children. Mosquitoes and rodents can spread diseases, and rodents (Torjusen et al., 2013; Wang, Abou El-Nour, & Bennett, 2008) and cockroaches can trigger asthma and allergy symptoms (Gruchalla et al., 2005; Morgan et al., 2004; Sheehan et al., 2010). Indoor environments in homes and child care facilities have moderate temperatures and humidity throughout the year, which contributes to conditions conducive for most, if not all, of these pests to multiply. In addition to health problems, some pests can damage the building's structural integrity and infest stored foods.

Most of the 637 child care facilities in the California survey used pesticides, such as sprays and total release foggers, to manage cockroaches, ants, or spiders (Bradman et al., 2010). The routine application of pesticides amplifies the toxicity of the environment by increasing children's exposure to harmful substances. Additionally, 20% of the centers applied pesticides weekly or monthly, even if there were no pests present. Another study of 194 child care centers in California found that 33% of the center directors reported applying pesticide sprays once a month, and another 33% reported making such applications a few times per year (Messenger et al., 2015). An observational study investigating the presence of pesticide residues in 40 California child care centers found that pyrethroid insecticides were detected in all of the centers and organophosphate insecticides were detected in the dust samples of over 90% of the centers (Bradman et al., 2012). Young children in child care centers may be exposed to harmful chemicals because of the use of these high-exposure pesticides in these environments.

To reduce young children's exposure to pests and pesticides, the California legislature expanded the California Healthy Schools Act in 2007 to include licensed child care centers. This expansion of the California Healthy Schools Act encouraged licensed child care centers to incorporate the use of integrated pest management (IPM). IPM is a preventive approach to managing pests designed to reduce or replace the use of pesticides by providing more effective long-term solutions than can be achieved by reactive pesticide use. IPM simultaneously minimizes the health risks to people and harm to the environment (American Academy of Pediatrics, 2012; Geiger & Tootelian, 2005; State of Illinois, 2009; University of California Agriculture and Natural Resources & Statewide Integrated Pest Management Program, 2014). The benefits of IPM programs in school environments have been recognized by U.S. government agencies (U.S. Environmental Protection Agency, 1993; U.S. General Accounting Office, 1999) and demonstrated by