National Institute of Environmental Health Sciences

Protecting Farmworkers and Families From Pesticide Exposure

The National Institute of Environmental Health Sciences (NIEHS) funds researchers to work with agricultural communities to prevent exposure to organophosphate pesticides, which are commonly used in commercial agriculture to control insects.

Exposure to these pesticides can cause both acute and long-term health effects, ranging from nausea and headaches to nervous system problems and respiratory failure.[29] NIH-funded work has also established a connection between parental occupational pesticide exposure and childhood leukemia.[1,2]

With NIEHS funding, Elaine Faustman, Ph.D., a professor at the University of Washington and director of the Institute for Risk Analysis and Risk Communication, aimed to identify pathways of pesticide exposure for children and reduce their risk of health effects. According to Faustman, take-home contamination — when farmworkers inadvertently take pesticides home on their boots, clothing, and skin — can introduce a source of exposure to farmworkers' families.

There are more than 2 million farmworkers in the U.S., many of whom may breathe in harmful chemicals while they mix or apply pesticides. (Photo courtesy of Tim Mossholder, Unsplash.com)

Children's Pesticide Exposure Matches Mothers

"We found high levels of pesticides in the urine of mothers who worked in agricultural fields," Faustman said.

"Then, we measured pesticide levels in their children. If the mothers had elevated pesticide exposures, then their children did, too."

Impacts of Addressing Pesticide Exposure Among Farmworker Families

Understanding Exposure Pathways
Scientists developed new methods to characterize exposure and measure pesticides in household dust, air, and biological samples.[5,6,10-17]

Implementing Interventions
Community-based behavioral interventions — such as wearing gloves during work, washing hands, and removing work shoes before entering the home — minimize the transfer of pesticides from work clothes to the home.[7-9]

Informing Policy
Based on the success of interventions to reduce take-home contamination, the U.S. Environmental Protection Agency (EPA) established the Agricultural Worker Protection Standard to reduce pesticide-related health effects among farmworkers and pesticide handlers.[9]

Reducing Exposures
Following the implementation of the Worker Protection Standard, pesticide exposures among children in farmworker families were reduced.[26]

Building Community Capacity
Researchers facilitated community forums to discuss the risks of pesticides, and promotores — individuals from largely Hispanic agricultural communities trained to work as community health promoters — visited homes to distribute exposure results and health advice in both Spanish and English. Participants were able to explain the results back to the researchers, indicating they understood the results and felt prepared to protect themselves and their families from pesticides.[27]

Then and Now

Then

- Scientists were unaware of the extent to which children were exposed to pesticides in the home from their parents' agricultural work and the potential health risks.
- Agricultural families lacked clear guidance for how best to reduce the amount of pesticides that ended up back in their homes.

Now

- Researchers documented links between pesticide exposure and childhood cancers[1,2] and developed robust methods to characterize and document exposure to pesticides in the home.[5,6,10-17]
- Effective intervention strategies empower families to reduce the amount of pesticides they take home.[7-9,26]
- Clear guidance for protecting farmworkers and their families from pesticide exposure is available.[18,25]

Protecting Farmworkers and Families From Pesticide Exposure

1987-1990

Identified connection between childhood leukemia and parental occupation.[1,2]

1995-2000

Found that dust in farmworkers' homes contained pesticides and documented higher pesticide exposures among children in agricultural communities, providing evidence of take-home exposure pathways.[3,4]

2000-2005

Developed new wipe sampling method to assess pesticide levels in household dust.[5,6]

2008-2009

Implemented behavioral interventions to minimize transfer of pesticide residue from work clothes to the home.[7-9]

2000-2012

Developed new methods to assess pesticide exposure using surveys and self-reports,[10,11] individual-level activity data,[12,13] and analyses of blood, urine, and teeth.[9]

2005

Informed implementation of the EPA Worker Protection Standard for farmworkers.[18]

2008

Documented lower pesticide levels with implementation of the Worker Protection Standard.[19]

2013-2014

Developed new sampling methods to assess pesticide levels in ambient air.[20,21]

2014-2017

Used silicone wristbands to assess individual pesticide exposure levels.[22-24]

2015

EPA updated the Worker Protection Standard for farmworkers.[25]

2015

Implemented randomized controlled intervention to change farmworker behaviors.[26]

2017

Informed communities of research findings.[27]

2021

Systematic review of interventions to promote pesticide safety showed that multifaceted programs — a combination of education, home visits, and personal protective equipment — are most effective in changing farmworkers' behavior.[28]

NIH National Institute of Environmental Health Sciences

NIEHS supported research for all of the milestones highlighted above.

Children's Environmental Health at NIEHS

Children's environmental health research is a priority for NIEHS funding and activities. Protecting children's health from environmental risks requires collaboration among communities, health professionals, and local, state, and federal governments.

NIEHS research focuses on chemicals and childhood cancer, environmental exposure and vaccine response, childhood exposure to lead, air pollution and children's health, as well as asthma and allergies, among others.

Current children's health research programs at NIEHS include the Children's Environmental Health Translation Centers, Environmental Influences of Child Health Outcomes, and Project TENDR: Targeting Environmental Neuro-Developmental Risks.

These initiatives explore how a range of environmental exposures from conception through early childhood may influence the health of children and adolescents. By protecting children, we may also improve their health as adults.

"Working in environmental public health, from benchtop science to fieldwork with communities, has allowed me to solve problems on a population basis and influence policy changes," Faustman said.

Research Challenges and Lessons Learned

Challenge:

Families typically only have one car, which farmworkers use to commute to work. Though the worker may follow other protective practices, such as changing clothes once they get home before interacting with children, the family will use the same car later, increasing their risk of exposure.

Lesson Learned:

Researchers support moving intervention activities closer to the source of contamination (i.e., the workplace) to reduce take-home pesticide exposure. Providing changing areas, storage facilities, and proper pesticide safety training at the work site reduces pesticide exposures for both workers and their families.[30]

Challenge:

Returning research results to study participants in an easy-to-understand way can be challenging. The way that risk communication messages are framed can influence participants' perceptions of risk and their understanding of exposures.

Lesson Learned:

Researchers incorporated community feedback to tailor pesticide risk messages in a way that participants could understand. They developed a graphic of a thermometer with a gradient of color — green for low, yellow for medium, and red for high exposure — for study participants to compare their pesticide exposure results to a national average exposure level.[27]

For references, supplementary information, and more on the impact of NIEHS research, please visit **https://niehs.nih.gov/research/programs/translational/examples**.