

Detecting Chemicals on Farmworkers' Hands

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Felix is a seasonal farmworker. He has worked hard all day in the fields. His back aches from repetitive bending over the crops, and he looks forward to sitting down and relaxing at home. Felix's hands are dirty. He wishes he could wash them but the worksite has no hand-washing facility. He wipes his hands on his pants before he gets into his truck to drive home. Felix's family greets him at the door. He gently pats his elderly father on the shoulder and warmly embraces his wife. His kids cling to his legs vying for attention. Felix makes his way to his chair to sit down where he is handed the baby.

How often are chemicals and pesticides carried beyond the fields? Is there a risk of poisoning to the individual or a risk of potential contamination of vehicles, housing, and family members?

It is estimated that more than 3 million migrant and seasonal farmworkers work in the United States. These farmworkers support the \$28 billion US fruit and vegetable industry. Of these crops, 85 percent are hand harvested or cultivated. The plants and soil are often treated with chemicals and pesticides. Precautions are taken to protect the farmworkers from exposure, but poisonings do occur. The Environmental Protection Agency (EPA) estimates

that 300,000 farmworkers suffer from acute pesticide poisoning each year, and many more go unreported or are misdiagnosed.

Public health workers need a simple, easily tolerated method to detect chemicals and pesticides on the skin surface to identify whether the chemical contaminants are carried beyond the fields. The authors tested a potentially useful, non-invasive method of detecting metals and organics present on the skin surface in a pilot project in southwest Idaho during spring and fall 2005.

Recruiting participants

To find participants for the test group, we visited health fairs at three migrant farm worker camps in southwest Idaho on three consecutive Saturdays in November 2005. A bilingual undergraduate white male student greeted all people attending the health fair and invited them to participate in the project. All study activities with the farmworker group were conducted in Spanish. A convenience sample of students from two university Health Science and Chemistry lecture classes in spring 2005 served as the control group.

Participation was voluntary for each of the study groups, and the gender of the participants was evenly weighted between men and women. Prior to the study, each participant was informed of the nature of the study, the collection process, and its possible risks. They were also assured of the complete anonymity of each sample. Participants were also asked if they had recently used any known pesticides, poisons, or other chemicals that could give skewed results. If they had, their collection sample was discarded, since we wanted to see what was on the hands of "clean" participants.

In the control group, twenty-four students chose to participate in the study. In the targeted Hispanic farmworker group, twenty-four people agreed to participate. This number of farmworkers was surprisingly low, since twenty-nine members of the local farmworker community had become ill in July 2005 after working in an onion field, and their illnesses were widely attributed to agricultural pesticide exposure.

Many of the farmworkers at the three health fair locations expressed great interest in studies that could potentially lead to safer working conditions, but when asked to partici-



John Kelly/Boise State University

Boise State University students discuss health promotion with a Hispanic farmworker in a work camp in SW Idaho.

pate in the study, most of them respectfully declined. A Hispanic field foreman shared his opinion that many of the farmworkers may believe that if they test positive for pesticide exposure, it could be traced back to them and ultimately cost them their employment, their housing, or their residency in the United States. He also thought that workers might have had reservations about a non-Hispanic heading the sample collection effort. These factors may have contributed to the lower than expected number of farmworker participants.

Participants were instructed to use generic, hypoallergenic baby wet wipes to thoroughly clean their hands, taking extra precautions not to pre-contaminate the wipes. Latex gloves were used to hand out the wipes, and the researcher put on a new pair with each participant. After the wipe was used to clean the hands of the volunteer, it was placed in a sealed plastic bag, using one plastic bag to collect all the wipes for each sample group. The aggregate samples preserved the anonymity of the participants, ensuring that no individual could be identified from the results.

Analyzing for chemicals

Chemical analysis was performed to determine what metals and organic compounds, if any, were removed by the wipes from the farmworkers' hands. Three sets of samples were collected from farmworkers at the three migrant camp locations, and a similar set of samples were collected from the control group students, who were presumably not exposed to agricultural chemicals, in order to compare the results. This analysis could not tell how farmworkers may have been exposed to the chemicals, but only that at some point they had been exposed.

The chemicals were extracted from the wipes using standard methods published by the US Environmental Protection Agency. This procedure produces a water-based solution containing the organic compounds and the metals. The solution is split into two parts, one for analysis of the organics and the other for analysis of the metals. Organic compounds were analyzed using an EPA standard method on a gas chromatograph with mass spectral detection (GC-MS) and a capillary column. This method is very similar to the method used to determine if Olympic athletes have used illicit drugs. The metals were analyzed using EPA standard methods appropriate to each metal.

The results showed different findings for the two study groups. In the farmworker group, significant amounts of lead and organics were found. Most of the organics could have come from non-agricultural activities. For example, a number of the organics were non-hazardous compounds found in cooking oils and personal hygiene products such as lotions, sunscreens, and cosmetics.

However, several hazardous and toxic organics were detected, including compounds used in pesticides, herbicides, and veterinary pharmaceuticals. One of the organics identified (9-hexadecenoic acid) is used as its lead salt in some pesticides. Significant levels of lead (0.1 to 0.4 mg/kg

sample mass) were also found. Cadmium and arsenic levels were examined but were not detected. These two metals may have been present at levels below the detection limit of the method (2.5 and 0.025 mg/kg, respectively).

In contrast, analysis of wipes from the control group of university students showed several compounds commonly found in personal hygiene products, but none of the compounds found in herbicides and pesticides. Also none of the metals measured was detected in the student sample.

Evaluating the research

The results of this pilot project demonstrate that chemical analysis of samples collected with wet baby wipes can detect metals and organics on the surface of the skin. Further study is needed to refine the process. However, use of wet wipes to collect samples from the surface of the skin is non-invasive, easily accepted by the participants, and inexpensive. It may be possible to gather samples from surfaces of vehicle interiors and the home environment for chemical analysis using a similar sampling process.

The presence of toxic organics and metals on the farmworker wipes does not necessarily indicate pesticide poisoning. Additional studies should be conducted to correlate the presence of metals and organics on the skin of the hands with sources of contamination and pesticide poisoning.

Further research should also take into account possible levels of distrust in the farmworker community toward non-Hispanic researchers. Involving farmworkers in the development and planning of research projects and, in particular, using Hispanics to solicit farmworker participants and collect the samples may help ease any distrust, and result in a higher number of study participants. ■

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