



## ***FARMWORKER JUSTICE EYEOPENER***

November 2006  
Volume 1, Issue 1

Welcome to the *Farmworker Justice EyeOpener*, an electronic newsletter covering important recent developments in research and regulation on issues affecting the health and safety of migrant farmworkers. This is a joint project of Farmworker Justice and the Migrant Clinicians Network, supported by the Health Resources and Services Administration's Bureau of Primary Health Care. Articles will provide both a brief summary and advice on how the information may help health professionals, outreach workers, *promotores de salud*, and advocates strengthen their efforts on behalf of migrants and their families. It will be published approximately every two months beginning with this issue. Instructions on how to subscribe and unsubscribe will be provided at the end of the newsletter. You are also encouraged to send us feedback on what you used, would suggest we change, or would like to see covered in future *EyeOpeners*. Please send comments by email to [sdavis@nclr.org](mailto:sdavis@nclr.org) or call Shelley Davis or Pamela Rao, co-authors, at 202-293-5420.

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## **1. Pesticide Exposure Linked to Poorer Performance on Neurobehavioral Tests**

Rothlein J, Rohlman D, Lasarev M, Phillips J, Muniz J, McCauley L. Organophosphate Pesticide Exposure and Neurobehavioral Performance in Agricultural and Nonagricultural Hispanic Workers. *Environmental Health Perspectives* 114(5):691-696, 2006. Available at <http://www.ehponline.org/members/2006/8182/8182.pdf>

Some problems caused by exposure to pesticides are obvious, such as eye injuries, breathing problems, and skin damage, particularly if the exposure was due to a spill, drift or other mishap. Less obvious are the problems that could be caused by chronic, low-level exposure to neurotoxic agricultural pesticides. Researchers in Oregon wondered if this type of exposure might lead to neurological problems for farmworkers.

To test this idea, Rothlein et al. (2006) conducted a study with 137 Hispanic immigrant workers, of whom 92 currently work in agriculture and 45 in hospitality and tourism. The two groups were selected to be similar with regards to age, sex, education, and length of time residing in the US. Both groups were asked to perform a series of simple, computer-based tasks to assess their attention span, ability to process information, and manual dexterity. The researchers then compared the two groups' results on the computer tasks to see if there were differences in performance associated with pesticide exposure. Finally, they grouped the agricultural workers according to the amount of pesticide metabolites found in their urine to see if workers with higher levels performed more poorly than those with lower levels.

The results of the study show that long-term, low-level pesticide exposure increases the risk of neurological problems (Rothlein 2006). Overall, the nonagricultural workers performed better on the majority of the computer tasks (12 of 16) than the farmworkers, even when matched by age and years of education completed in Mexico. Furthermore, farmworkers with higher metabolite levels performed more poorly than farmworkers with lower levels on five of the 16 tasks.

This study underscores the need to develop better methods for preventing pesticide exposure to farmworkers and their families. This could include making available comprehensive pesticide safety education to the farmworker community concerning risks in the workplace and the home as well as promoting improved enforcement of pesticide safety regulations.

## **2. Genetic Variations May Increase Susceptibility to Adverse Effects from Exposure to Organophosphate Pesticides**

Furlong CD, Holland N, Richter RJ, Bradman A, Ho A, Eskenazi B. PON1 status of farmworker mothers and children as a predictor of organophosphate sensitivity. *Pharmacogenetics and Genomics* 16:183-190, 2006.

Exposure to organophosphate insecticides (OPs), which are commonly used in agriculture, has been linked to a range of human health problems (e.g., nausea, vomiting, numbness in the limbs, neurobehavioral problems, etc.). Evidence continues to accumulate that newborns are more susceptible to adverse effects

from some OP exposure than are adults. In order to investigate a possible genetic cause of this increased susceptibility, researchers in California conducted a study with 130 farmworker mothers and their newborn infants. Furlong et al. focused on the role that paraoxonase (PON1), levels may play, in preventing pesticide injury. PON1 is an enzyme that allows the body to detoxify organophosphates which have been absorbed by the body. Adults and children have different PON1 levels, as do individuals within the same age group.

The study found that enzyme levels varied widely within the two groups. Among the newborns tested (using cord blood), there was a 26-fold difference between the lowest and highest levels; between the mothers, the difference was 14-fold. The overall difference between the lowest infant level to the highest maternal level was 65-fold. Infants did not achieve adult enzyme levels until they reached the age of six to 24 months. Infants below two years thus remain at increased risk for adverse effects from OP exposure, as do the mothers whose levels were low.

These findings have important implications for setting pesticide safety standards. In its risk assessments, the U.S. Environmental Protection Agency (EPA) uses a 10-fold safety factor to account for the range of susceptibility of adults to the toxic effects of pesticides. However, the range among the adults in this study was wider. Similarly, under the Food Quality Protection Act (1996), EPA may add an additional 10-fold safety factor if infants and children have more susceptibility or greater exposure to a pesticide than adults. The 10-fold factor too, may be inadequate, in light of this study that shows that variations in enzyme levels amongst infants may be as high as 5-fold. These findings also may explain why individuals who have had the same level pesticide exposure may not suffer the same ill effects. For example, when a farmworker crew is exposed to pesticides through drift, this genetic difference may explain why some workers become ill and others do not.

### **3. Behavioral and Environmental Factors that Predict Pesticide Exposure for Farmworkers**

Quandt SA, Hernández-Valero MA, Grzywacz JG, Hovey JD, Gonzales M, Arcury TA. Workplace, Household, and Personal Predictors of Pesticide Exposure for Farmworkers. *Environmental Health Perspectives* 114(6): 943-952, 2006. Available at <http://www.ehponline.org/members/2006/8529/8529.pdf>

Exposure to pesticides in the workplace and in the home is affected by a range of factors that depend on individual behavior, the household situation and the overall environment. Numerous studies have been conducted around the country by researchers from different disciplines to identify those most predictive of farmworker risk for pesticide exposure. Quandt et al., (2006) reviewed and summarized a collection of studies to identify a set of measures that researchers can use collect uniform and comparable data on farmworker exposure throughout the country.

Quandt et al (2006) sorted studies concerning exposure by: (i) behavioral practices that occur in the workplace and (ii) environmental factors in the workplace, home,

and community. They then looked at influences that moderate these conditions, such as psychological and physical stress, the social structure of the workplace, and workers' knowledge and beliefs about pesticides. The final set of recommended measures for predicting pesticide exposure included behaviors such as frequency of hand washing, proper handling of soiled work clothes, bathing soon after leaving work, and avoiding physical contact with others while still in work clothes. Work environment measures included the type of work, such as fieldwork, mixing and loading, availability of sanitation and personal protective equipment, and level of communication with supervisors. Home environment measures included distance from the fields, type and general repair status of the home, number of residents, and availability of bathing and laundry facilities. Measures pertinent to the community environment included agricultural acreage and the amount of pesticides applied per year.

The information presented in this review is helpful to health care providers, educators and advocates who need to assess potential risks of pesticide exposure and provide safety/prevention education to individuals, families, and/or the community. It also suggests steps that individuals, families and employers can take to reduce possible exposure, such as engaging in personal protective behaviors, improving pesticide safety measures in the workplace, and alerting the community to the potential for pesticide exposure that exists in their environment.

#### **4. North Carolina Health Department Finds a “Plausible” Connection Between Pesticide Exposure of Pregnant Ag-Mart Worker and Baby Born with Severe Birth Defects**

Occupational and Environmental Epidemiology Branch, Division of Public Health. *Assessment of Maternal Occupational Pesticide Exposures during Pregnancy and Three Children with Birth Defects: North Carolina 2004*. Raleigh, NC: North Carolina Department of Health and Human Services, 2006. Available at <http://www.epi.state.nc.us/epi/oii/Agmartreleasereport.pdf>.

It is “plausible” to conclude that occupational pesticide exposure to a pregnant Ag-Mart field worker caused her son, Carlitos, to be born with no arms or legs, according to a May 2006 report issued by the Occupational and Environmental Epidemiologic Branch (OEEB) of the North Carolina Department of Health and Human Services. Between December 2004 and February 2005, three babies with severe birth defects were born to farmworker women who planted and harvested grape tomatoes for Ag-Mart farms in Florida and North Carolina. In addition to Carlitos, there was Violeta, who had multiple deformities (e.g., no discernable genitalia, a hole in the heart, cleft palate, no nose or ear) and died within three days, and Jesus, who has Pierre Robin’s syndrome (i.e., deformed jaw, which impedes swallowing and speech). OEEB also noted that while pesticide exposure may have contributed to Jesus’ defects, his father’s family also had a history of jaw deformities (i.e., micrognathia), so no firm conclusions could be reached about the role of pesticides. The third mother did not work in North Carolina during the critical period of her pregnancy, so OEEB reached no conclusion about her case. Six pesticides used by Ag-Mart in North Carolina have been shown to cause birth defects in animal studies.

In its investigation, the OEEB drew on many sources, including data collected by the Florida and North Carolina Departments of Agriculture and Consumer Services (FDACS and NCDACS, respectively) and the Collier County (Florida) Health Department (CCHD). These sources included: (i) medical information for two of the three mothers and infants as well as the actual medical records for Carlitos and his mother; (ii) information obtained by CCHD from in-depth interviews with the six affected parents concerning their possible use of medications, alcohol and drugs, their dietary, work and lifestyle habits, and their family and medical histories; (iii) a literature review of articles addressing the possible association between pesticides and birth defects; (iv) a review of the North Carolina Birth Defects registry; (v) information from an interview with Carlitos' mother by OEEB; (vi) Ag-Mart/North Carolina pesticide application and payroll records; and (vii) Ag-Mart/North Carolina work assignment records, covering all workers supervised by a particular crew leader. OEEB researchers focused on the period beginning three months prior to the babies' conceptions through the mothers' thirteenth week of pregnancy. From this information, OEEB learned when the pregnant women were exposed to pesticides associated with birth defects and when these exposures occurred in possible violation of restricted entry interval requirements (REI). The only significant medical information obtained was that Jesus' father's family has a history of deformed jaws. OEEB also noted that both FDACS and NCDACS have charged Ag-Mart with committing many pesticide safety violations. They include putting workers back into fields prior to the expiration of the REIs, failing to provide adequate training or label information to pesticide handlers, failing to provide workers with adequate supplies of hand washing or drinking water, allowing the open burning of pesticide containers, etc. NCDACS alleged that Ag-Mart committed 369 violations and fined the company \$184,500; FDACS charged Ag-Mart with 88 safety violations and fined it \$111,200. The company is challenging both the alleged violations and the penalties.

Based on its investigation, OEEB issued seven recommendations. They included the suggestion that: i) NIOSH or EPA investigate the aggregate pesticide exposures of the three Ag-Mart mothers from their work in Florida and North Carolina; ii) North Carolina state agencies collaborate more closely to ensure consistent, comprehensive protections for farmworkers from pesticide exposure which includes sharing information about pesticide safety violations; iii) a public health surveillance system be established to collect incidents of acute pesticide exposure and require doctors to report such cases; iv) improve health providers' education to enable them to recognize, manage and report pesticide-related illnesses; v) add parental occupation to birth certificates, which would enable the birth defects registry to compare incidents affecting agricultural and non-agricultural workers; and vi) the Environmental Protection Agency strengthen the Worker Protection Standard to require documentation of the workers' field locations to improve investigations of possible REI violations.

## 5. EPA Acts to Ban all Agricultural Uses of Lindane, but FDA Continues to Allow its Medicinal Use in Shampoos and Lotions for Lice and Scabies

On August 1, 2006, the EPA moved to ban all remaining agricultural uses of lindane. According to Deputy EPA Administrator Jim Gulliford, lindane “is recognized internationally as one of the most toxic, persistent, bioaccumulative pesticides ever registered...” Lindane is a chlorinated hydrocarbon insecticide, which is in the same chemical family as DDT. Epidemiological studies have linked lindane exposure to cancer in adults and children. (See, e.g., Blair A, Cantor KP, Zahm SH. 1998. Non-Hodgkin’s lymphoma and agricultural use of the insecticide lindane. *American Journal of Industrial Medicine* 33(1): 82-87; and Eriksson M, Karlsson M. 1992. Occupational and other environmental factors and multiple myeloma: A population based case-control study. *British Journal of Industrial Medicine* 49(2):95-103.) Fifty-two other countries have already banned use of lindane.

A large-scale study in Missouri also found an increased cancer risk for children whose parents used lindane shampoo to get rid of lice (OR=2.6) (Davis JR, Brownson RC, Garcia R, et al.1993. Family pesticide use and childhood brain cancer. *Archives of Environmental Contamination and Toxicology* 24:87-92). Even though an increased cancer risk has been found from use of lindane shampoos, the A is allowing continued use of lindane in shampoos and lotions to combat lice and scabies. Non-toxic and less toxic alternatives to lindane exist and should be used. Alternatives include Lice B Gone from Safe Effective Alternatives ([www.licebgone.com](http://www.licebgone.com)) or Lice Away Enzyme Shampoo (Nature’s Best, [www.naturesbestenzyme.com](http://www.naturesbestenzyme.com)).

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*The contents of this publication are solely the responsibility of Farmworker Justice and Migrant Clinicians Network and do not necessarily reflect the official views of the Bureau of Primary Health Care or the Health Resources and Services Administration.*

Please send comments, questions or suggestions for future topics you would like to see covered to [prao@nclr.org](mailto:prao@nclr.org), or contact Shelley Davis or Pamela Rao, co-authors, at 202-293-5420.

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