

# streamline

The Migrant Health News Source

## Addressing a Silent Killer Among Migrants

*Sarah Henly-Shepard*

### Meet Don Carlos...

Don Carlos\* is a 53 year old migrant worker who went to seek services at a migrant clinic in South Carolina, in the summer of 2005. Don Carlos has lived in the United States for 15 years, and was born and raised in the state of Sonora in Mexico, where his wife and three children still live. In the summertime he works in agriculture and in the late fall he returns to Florida to work in various jobs including construction and landscaping, returning to see his family in Mexico every December. When he presented at the clinic, he reported frequent urination, constant hunger and exhaustion, as well as shooting pains and numbness in his feet and back, from standing and bending over in the fields all day. After an initial examination and an initial series of laboratory tests, the doctor at the clinic diagnosed Don Carlos as having diabetes, high cholesterol and hypertension. When examining his feet the doctor found advanced neuropathy including damaged nerve endings and lessened sensitivity; she discussed the need for regular monitoring and control of blood glucose levels and explained how diabetes affects the body.

Recognizing Don Carlos as a patient with diabetes who also moves to various states in search of work, the doctor discussed the MCN Health Network diabetes program, Track II, as an option to help him access free and confidential services for continuity of care when he moves again. The next day the MCN Health Network received Don Carlos' enrollment forms and his medical records from the clinic visit, and Health Network staff called him and explained the program's services and confidentiality policies. The patient mentioned he would be moving back to Florida in a few weeks with the rest of his crew, and that he had never been to a clinic in that area. MCN Health Network staff helped Don Carlos find a nearby Migrant/Community Health Center where he was able to continue receiving regular check ups, medication, and nutrition coun-

seling. Health Network staff continue to assist Don Carlos with accessing care whenever he moves and promoting an understanding of diabetes self-management, by sending him low literacy, culturally competent health education materials and calling him regularly to check in.

### Problems Migration Places on DM Management:

Migration can be viewed as contributing to the difficulties in maintaining good general health because of inadequate access to services as well as to information about disease risk and prevention. Migrants face health disparities far more serious than the general population. A mobile lifestyle combined with the vicissitudes of economic instability, cultural differences, language barriers and the hostile climate of immigration worsened by prejudice of some receiving communities, often result in isolation from mainstream community life and its related supportive services such as healthcare. Many migrants, regardless of their legal status, regularly lack access to reliable transportation, health insurance and prescription coverage, and are unable to afford medical visits, supplies for diabetes monitoring such as glucometers or strips, and lack funds needed to modify diets by purchasing fruits, vegetables, and low fat foods. In addition, migrants who have diabetes and live in substandard housing often lack refrigeration, creating additional challenges to maintaining adequate and nutritious diets to manage their diabetes. A demanding work environment further complicates needs associated with foot care, glucose monitoring, hydration, rest and self-medication. Most migrants work long hours of intense physical labor in extremely hot, cold and /or wet weather conditions. Employment is often informal and many of them work without legal documentation and immigration status, making them more vulnerable to exploitation and dangerous work environments. These difficult environments

can provide an ideal climate for worsening many migrant individuals' hereditary predispositions to developing diabetes and its complications, cardiovascular disease, as well as other serious health concerns.

Health providers around the nation continue to struggle to find adequate social, medical and pharmaceutical assistance programs and resources that meet the diverse needs of migrants. In addition, clinicians serving migrant workers with diabetes often face barriers to maintaining up-to-date medical records and encouraging continuity of care and self management. Efforts at providing culturally and linguistically appropriate health education can be impeded by limited English proficiency and low literacy or education levels. Diabetes education materials provided to migrants need to be created with consideration to their culture, language and literacy skills. With this in mind, the health care system faces enormous challenges for diabetes education and prevention initiatives, especially amongst migrant populations.

### MCN's Response: Assisting Mobile Patients with Diabetes & their Providers

The Migrant Clinicians Network launched its Diabetes Initiative seven years ago, in response to the growing demand among migrant health providers for support in addressing diabetes with migrant patients. As a national clinical network, MCN works directly with organizations and health care providers seeking to care for mobile underserved populations that fall outside of the standard framework of health care delivery systems. MCN has created several tools to address the various issues mentioned above, including free low literacy, culturally competent diabetes education materials, an online diabetes toolkit offering information and quality tools and resources around diabetes

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care for migrants, the online resource Links to Care for the Underserved offering local and national resource listings for health care and social services, and the Track II program.

Track II, the diabetes component of the MCN Health Network, was created to respond to the needs of migrant and community health centers to facilitate the transfer of key medical information to assure migrant patients' continuity of care. Since 2000, the Diabetes Track II program has been helping migrant workers manage their diabetes by advocating for them and helping them navigate and gain access to the health care system. When participants move, Track II staff provides bridge case management to connect them to their next point of care, and assist providers with accessing their most current medical records to encourage continuity of care and timely reporting.

### Track II Program Evaluation and Adaptations

MCN conducted evaluations of Track II in 2002 and 2006 in order to better understand the impact of Track II activities on providers using the program as well as

mobile patients with diabetes enrolled in Track II. The Diabetes Initiative (DI) analyzed three components of Track II to determine the quality, effectiveness and impact of the Track II project, including clinician interviews, chart audits, and patient case updates. In 2006, MCN compared both reports to gather sound direction and feedback for our current and future work with clinicians and participants involved with Track II.

The clinician interview component of the Track II evaluation delivered results that were encouraging and also identified some key areas for improvement. The majority of the providers evaluated indicated that the need for and importance of bridge case management services, like those provided by Track II for patients with diabetes, are critical, and most did not have their own system in place to follow up with patients once they have moved out of the area. Unfortunately, the length of time historically required to enroll a patient in Track II, coupled with the complexity of the enrollment process, presented on-going barriers to increased utilization of Track II.

Based on these findings, MCN increased

its technological and staff capabilities to make the process faster and more streamlined, with **greater responsibility absorbed by the Track II staff for patient interviews, enrollment and completion of forms.**

Under the new system, a clinician's initial responsibility is to explain the Track II program. Once a patient agrees to participate, **all Health Network forms are completed over the phone with Health Network staff from MCN.** The clinician or other clinic staff must then make sure that the patient signs the completed forms which will be automatically faxed to the clinic. The signed form is then faxed back to MCN. This change in protocol cuts the amount of time needed for enrollments in half for clinic staff!

In other areas, clinicians indicated that closing the loop on records transfer was critical to keeping up to date medical records for reporting and continuity of patient care. However, clinicians indicated that an abbreviated list of critical documents would be more effective than a comprehensive set of medical records.

As a part of the 2006 evaluation, chart

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## New Bilingual and Culturally Appropriate Breast Cancer Patient Education Materials Available!

The Rural Women's Health Project (RWHP) has just released two excellent new patient education novelas on breast cancer designed for Hispanic women. RWHP designs and implements community-based, health education projects, training and materials to assist communities in strengthening their understanding of critical health and family issues. The RWHP's mission is to involve community members in the creation of informative and educational materials and campaigns, blending innovative techniques with a collaborative approach.

### Content of novelas:

*"Lo que dicen mis amigas sobre el cáncer del seno" (What My Friends Say About Breast Cancer)*

Hispanic women from different backgrounds share facts and advice on breast cancer and early detection. The booklet dispels popular myths, encourages proper women's health care, and provides illustrated instructions for the breast self-exam. Space is available for clinic personalization.

*"El susto de Marta" (Marta's Scare)*

After having found what she thinks is a lump while doing her breast self-exam, Marta



teaches her female relatives about the benefits of monthly breast self-exams, clinical exams and the mammogram, the dangers of breast cancer and late detection. She then shows her family the proper steps for carrying out the breast self-exam. Space is available for clinic personalization.

The RWHP developed these materials with funding from the Florida Breast Cancer Coalition Research Foundation and the Migrant Clinicians Network. Community Education Sessions were facilitated in Florida to gather an understanding of breast health and breast cancer knowledge, concerns and advice that women would share with others on breast health. Additionally, 308 surveys, carried out by 30 promotoras in four organizations were carried out among Hispanic women aged 10-74. This study specifically

sought out the knowledge of women younger than 40 in order to better understand how to respond to previous study findings which address Hispanic women (over 40) late initiation of the use of mammograms or consistent use of self and clinical breast exams. This project could not have been done without the dedication of the promotoras of Alianza de Mujeres Activas [AMA], Project Claridad and Healthy Start of Manatee County, Florida and the Promotoras of NC Kentucky AHEC in Lexington, KY.

The project is now in its second phase. The developed materials are being used by the RWHP in education sessions with Hispanic women in Central Florida as part of a Department of Health grant with RWHP collaboration with the ACORN Clinic of Brooker, FL. Additionally, with funds from the American Cancer Society of Florida, the RWHP will be carrying out further testing of the materials through a *promotor* outreach project with Creando Nuestra Salud's original partner, the Alianza de Mujeres Activas [AMA] in Florida.

To obtain copies of these resources contact Andrea Caracostis acaracostis@migrant-clinician.org or 281-496-7522.

# How to Identify Victims of Human Trafficking

Vanessa Garza

**H**ow many times have you seen a patient whose problem seemed obvious on the surface, but was much more complicated than you originally thought? *An injury that was indicative of a larger problem...An illness that had deeper roots than the surface symptoms of a cough or rash...An infection that did not quite fit with your patient's explanation.* These could be signs of misinformation or confusion – or they may point to a more horrific explanation: human trafficking.

Human trafficking – in its simplest terms, modern-day slavery – is a devastating human rights violation taking place all over the world and here in the U.S. This issue is particularly pervasive in the migrant population, where language and cultural barriers deter frightened victims from coming forward. Whether it takes the form of commercial sex exploitation or forced labor, human trafficking is the fastest-growing criminal industry today, tied with illegal arms trade as the second-largest criminal business in the world.

As a clinician who works with migrant populations, you are in a unique position to “look beneath the surface” to determine if your patient could also be a victim of human trafficking. By learning the physical and psychological signs to look for and the right resources to tap into, you may be able to help identify and rescue these victims of modern-day slavery.

## The Face of Trafficking

An estimated 600,000 to 800,000 victims are trafficked across international borders each year, with 14,500 to 17,500 individuals trafficked here in the U.S. Approximately 80 percent of these individuals are women and 50 percent are minors, representing both U.S. citizens and those who come from countries in Southeast Asia, Latin America, the former Soviet Union and Africa.

Sex trafficking is by far the most common form of human trafficking, constituting up to 70 percent of women in the trafficked population. Women who are abused as sexual victims may be found in obvious places such as strip clubs or massage parlors, but may also be sold for sex to migrant farm worker camps, tourists and military personnel. One example paints a vivid picture of the horrors that are taking place in our backyards: Traffickers used caves made of reeds as brothels at the edge of fields, where farm workers were bussed to sexually assault the captive women.<sup>1</sup>

Labor trafficking, which may occur simultaneously with sex trafficking, materializes in



sectors from domestic servitude to sweatshop factories, janitorial jobs, construction sites, service industries and farm work.

Human trafficking is a problem that many think cannot happen where they live, but it is taking place in our backyards. In St. Louis, 20 Latino males who had entered the country legally on work visas became trafficking victims. The men were coerced to St. Louis by a contractor who took their visas and identification documents. The men were kept at a remote farm and were charged \$56.00 a week for rent. The trafficker transported the men to worksites early in the morning and returned them late in the evening with no wages and little money for their labor. When one of the men broke his arm at the worksite, the contractor left the man at a local hospital and dropped the rest of the crew off at a vacant lot without money or identification. Fortunately, the men were helped by a local advocacy group and the case was turned over to the United States Attorney's Office.

While the type and severity of exploitation varies, all victims of human trafficking have one thing in common: they have been coerced, deceived, manipulated or forced into their situation. Traffickers are masters of control – using force, fraud and manipulation to enslave victims, giving them no choice but to cooperate. An exploited individual who experiences this form of torture can suffer severe physical and psychological damage.

## Severe Physical and Psychological Effects of Human Trafficking

Migrating individuals are, by nature, more vulnerable to disease and illness, simply because they are traveling and lack access to health services, medication, education and information. They may come from disadvantaged backgrounds and be forced into dangerous activities such as prostitution and hard labor. Also, they are abused physically and/or mentally. As such, victims of trafficking are particularly vulnerable to health problems.

Physical abuse is a common method of force and oppression used by traffickers. Victims may come to an emergency room or clinic displaying various medical problems that have serious health implications including:

- Bruises
- Broken bones
- Headaches
- Hearing loss
- Cardiovascular problems

They may also exhibit chronic back pain or visual and respiratory problems from working in agriculture, construction or manufacturing fields under dangerous conditions. In addition to these problems, victims may suffer from infectious diseases, untreated illnesses and malnourishment.

In addition to physical abuse and torture, many traffickers use psychological tactics that can result in a general feeling of helplessness, shame and humiliation for the victim. Victims may suffer from shock and denial or display symptoms of sleeping and eating disorders, post-traumatic stress disorder, phobias, panic attacks and depression.

In some cases victims are addicted to drugs and/or alcohol, as a result of traffickers using drug or alcohol dependence as a control method. In other cases, victims may turn to drugs and alcohol as a way to cope with this indefensible situation.

## Health Effects Specific to Females Trafficked for Sex

Approximately 80 percent of trafficking victims are female; of those about half are trafficked for sex and suffer multiple health effects from violence and commercial sexual exploitation.

In 2002, the National Center for Missing and Exploited Children released a report that stated 80 percent of female sex trafficking victims in the United States reported bruises to medical personnel; 35 percent reported broken bones.

Reproductive health problems are also prevalent among these victims. These exploited women come in with a range of symptoms including sexually transmitted diseases, urinary tract infections, pelvic pain and sexual assault injuries. They may even be unwillingly pregnant, resulting from rape or prostitution.

## Victim Identification and Communication: Challenges and Barriers

Human trafficking victims are similar to victims of domestic violence or child abuse: Many may be fearful of reporting the crime

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made against them. They may not even realize that what is being done to them is illegal, or they are silenced by threats from the trafficker. They have a host of barriers that keep them from trying to escape their situation. Victims may be uncooperative and fearful of authority figures, even medical staff. They may not consider themselves victims and may even have loyalty to their trafficker.

It is crucial to know the signs to identify victims. These individuals may not even be able to communicate with people who can help because of language barriers. People who do not speak English are isolated linguistically and may be unable to communicate with authorities.

In addition to the physical and mental signs described, there are other clues that are unique and can help differentiate a victim of human trafficking:

- Not allowed to give his/her own medical information; someone else insists upon providing this information on the patient's behalf
  - Not in control of identification documents (ID or passport)
  - Evidence of being controlled
  - Evidence of an inability to move or leave a job
  - Exhibits fear, anxiety, depression, submission, tension, and/or nervousness
  - Non-English speaking
  - Recently brought to the U.S. from Latin America, Africa, Eastern Europe, or Asia
  - Poor hygiene, dirty, unwashed
  - Have a loss of sense of time or space
  - Same clothes every day; clothes torn or dirty
- If you think you have encountered a victim, there are questions you may ask yourself that may help you to identify a victim:
- Is the person accompanied by another, seemingly controlling, person?

- Does the person accompanying the potential victim insist on giving information to you?
- Can you see or detect any physical abuse?
- Does the potential victim seem submissive or fearful?
- Does the potential victim have difficulty communicating because of language or cultural barriers?
- Does the potential victim have any identification?
- Is the potential victim suffering from common health problems experienced by trafficking victims?

There are important elements to keep in mind before you begin communicating with a potential victim:

- Separate the potential victim, without raising suspicions, from the person that is accompanying her/him
- Be sensitive to cultural and language barriers and enlist a trusted translator or interpreter
- Maintain strict confidentiality to ensure the victim's safety
- Determine the victim's status carefully and indirectly

As with victims of domestic violence, there are questions you may pose to a potential trafficking victim without directly asking them if they have been abused or held against their will:

- What are your working or living conditions like?
- Where do you eat and sleep?
- Do you have to ask permission to eat, sleep or go to the bathroom?
- When you are not working, can you come and go as you please?
- Is there a lock on your door or windows so you cannot get out?
- Can you leave your work or job

situation if you want?

- Have you been threatened with harm if you try to quit?
- Has anyone threatened your family?

The first and most fundamental step in establishing rapport with a victim is to build trust. Without a foundation of trust, it will be difficult to effectively communicate and to help them. Once the trust is established, then you can begin a discussion with the victim and let them know that you can help them.

### Resources Available to You

You are one of the few people in a position to directly help trafficking victims since you are possibly the only outsider with the opportunity to speak with a victim. These individuals need help in many ways, but the immediate essentials include housing, food, medical assistance, safety and security and language interpretation.

In addition, they will need various forms of assistance, which could include counseling, income and legal assistance. If you are doing outreach to a migrant community to contact a trafficking victim, we encourage you to take advantage of resources available from the U.S. Department of Health & Human Services (HHS). As part of the federal government's ongoing efforts to combat human trafficking, HHS created the Rescue & Restore Victims of Human Trafficking public awareness campaign. Rescue & Restore provides victims access to shelter, counseling and healthcare services. There are Rescue & Restore brochures, posters, fact sheets and pocket cards, in multiple languages, specifically for healthcare professionals.

If you suspect you have encountered a vic-

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audits were done on 19 randomly selected Track II participant records. Each chart was audited for thorough documentation of all case management and medical records transfer activities, as well as evaluated for the quality and comprehensiveness of the services provided. The audits were conducted by outside reviewers following a standard protocol. The mean score of the 19 Track II chart audits was 97.5%, indicating a very high level of performance and service by Health Network staff on behalf of Track II participants.

The final component of the evaluation was a review of all Track II case updates, which are a twice yearly opportunity for enrolling health centers to receive a summary review of their patients' health status and

their Track II enrollment status. If known, each patient's current whereabouts, most recent medical visit and changes to health status are discussed, allowing health centers to monitor their patients' conditions, prepare for their arrival and anticipate changes to their care plan. A comparative report of the findings of both evaluations showed that 100% of Track II participants requesting assistance received them in a timely manner, showing continued effective and comprehensive follow up and care coordination on the part of Health Network staff.

In conclusion, providers using Track II provided useful and positive feedback that Health Network has already used to improve services to Migrant/Community Health

Centers using Track II, to increase their ability to encourage continuity of care and maintain up-to-date medical records for mobile patients with diabetes. MCN looks forward to continuing to serve migrants seeking assistance to access healthcare services, as well as the providers helping them maintain continuity of care, and recognizes diabetes amongst migrant populations as a primary issue needing further attention and services throughout the country. ■

**For more information about MCN's Diabetes Initiative and the Track II program go to our website [www.migrantclinician.org](http://www.migrantclinician.org) or call 800-825-8205**

# Pesticide Urinary Metabolite Levels of Children in Eastern North Carolina Farmworker Households

Thomas A. Arcury, Joseph G. Grzywacz, Dana B. Barr, Janeth Tapia, Haiying Chen, Sara A. Quandt

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## Introduction

Farmworker children, as well as their parents, are exposed to pesticides<sup>1-7</sup>. Pesticide exposure has health consequences for all persons exposed<sup>8</sup>. Immediate consequences of limited pesticide exposure include rash, nausea, vomiting, and blurry vision. Immediate effects of significant exposure include disorientation, loss of continence, coma, and death. Delayed consequences of limited or significant exposure may include sterility, birth defects, neurodegenerative disease, and cancer<sup>8</sup>.

The potential consequences of pesticide exposure are greater for children than for adults<sup>9-11</sup>. Due to short stature and characteristic behaviors, children have greater exposure to pesticides in the environment than do adults. Children have a greater surface to volume ratio than do adults; therefore, they receive a greater dose from the pesticides to which they are exposed. They metabolize toxicants slower than do adults, so the pesticide dose they receive remains with them longer.

The research reporting farmworker child pesticide exposure has considered only the concentrations of dialkylphosphate metabolites of organophosphorus (OP) pesticides<sup>12</sup>, with one exception<sup>13</sup>. Analyses from Washington<sup>7, 14-18</sup>, Oregon<sup>4</sup>, California<sup>19-20</sup>, the Rio Grande Valley of Texas<sup>21</sup>, and North Carolina<sup>1-2</sup>, indicate farmworker children are exposed to OP pesticides, and that the concentrations of dialkylphosphate metabolites in their urine are high. However, measurement of the dialkylphosphate metabolites does not provide information on the specific OP pesticides to which these children are exposed<sup>22</sup>. Further, these analyses do not provide information on the exposure of these children to the non-dialkylphosphate OP pesticides (e.g., acephate) or to other non-OP pesticides. While knowledge of the general levels of dialkylphosphate OP pesticides in farmworker children is valuable, knowing specific pesticides to which farmworker children are exposed is important because it will indicate the sources of this exposure. For example, knowing that the metabolite specific to parathion is present in a

large percentage of children's urine samples will direct efforts to identify, and then eliminate, the sources of parathion exposure.

Only Fenske and colleagues (2002) have reported pesticide-specific metabolite levels in urine samples collected from farmworker children. Focusing on the major metabolites of the OP pesticides chlorpyrifos (TCPY) and parathion (PNP) among 75 children of farmworkers and pesticide applicators, they found TCPY in urine samples from 18 (24%) of the children, and PNP in urine samples from 5 (7%) of the children. PNP had no statistically significant predictors, while the only statistically significant predictor of TCPY was living in a household that used an OP pesticide in a garden.

This analysis has two objectives. The first objective is to describe specific urinary pesticide metabolite concentrations for young children living in farmworker households located in eastern North Carolina and the number of metabolites detected for each child. The second objective is to delineate the para-occupational, residential and environment risk factors associated with the number of pesticide metabolites present. This analysis uses data collected from 60 Latino children, 1 to 6 years of age, living in eastern North Carolina farmworker households during the 2004 agricultural production season.

## Materials and Methods

Data for this analysis were collected as part of Casa y Campo, a 4-year community-based participatory environmental justice project in which environmental health scientists, health care providers, and farmworker advocates collaborated to reduce pesticide exposure among farmworkers and their families. Casa y Campo was implemented in a six county area of eastern North Carolina, including Duplin, Harnett, Johnston, Sampson, Wake, and Wayne counties. For 2004, the North Carolina Employment Security Commission estimated that 21,614 migrant and seasonal farmworkers (not counting dependents) worked in these counties during peak harvest, accounting for one-quarter of the 86,040 migrant and seasonal farmworkers in the state. Agriculture in these six counties is diverse. Most of the farms in these counties producing tobacco (1,329 farms), sweet potatoes (188 farms), and vegetables (435 farms) would employ migrant and seasonal farmworkers. All of these farms, as well as the large number of farms producing grains, soybeans, and cotton would use pesticides to which farm-

workers and their families could be exposed. Results describing the dialkylphosphate urinary metabolites of OP pesticides for participants in this analysis have been published<sup>2</sup>.

## Sample and Data Collection

Sampling, recruitment and data collection have been described in detail<sup>2</sup>. Briefly, from July through August, 2004, as part of a larger survey, 60 households with an adult resident who was employed in farm work and at least one resident child aged 1 to 6 years were recruited to participate. A site-based sampling approach was used to locate and recruit eligible participants<sup>25</sup>. All 60 eligible households agreed to participate. The mother of each child completed an interview questionnaire, and she was asked to collect a first morning urine void from the resident child between 1 and 6 years of age who was closest to age 5 years.

The frozen urine samples were shipped overnight on dry ice to CDC in Atlanta, Georgia, for analysis.

## Results

### Exposure, Safety Behavior, and Personal Characteristics

The 60 children considered in this analysis varied in para-occupational, residential, and environmental sources of pesticide exposure, as well as safety behaviors and personal characteristics. The majority of their mothers (68.3%) and fathers (56.7%) were employed as farmworkers at the time of data collection. Over two-thirds (36.7%) lived in households with two farmworkers, and 25.0% lived in households with three or more farmworkers. Most (53.3%) of the children lived in rented homes, while 33.4% lived in farmworker-owned homes and 13.3% lived in homes of other tenure. Over half (58.3%) lived in homes that their mothers described as easy to clean. Over half (53.3%) of these children lived in dwellings with one bathroom. Most (91.7%) lived in dwellings with at least one carpeted room, and almost 70% lived in dwellings with three or more carpeted rooms. The dwellings in which over half (56.7%) of the children lived were not adjacent to agricultural fields.

Twenty-three of 41 mothers (38.3% of total sample) and 17 of the 34 fathers (28.3% of total sample) employed in farm work had not received pesticide safety training. Three-fifths of the children lived in households in which indi-

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viduals employed in farm work did not shower immediately after work, and 83.3% lived in households in which individuals changed out of their soiled farm work clothes inside the dwelling. However, 15% lived in households in which farm work clothes were stored with other laundry, and 20% lived in households in which farm work clothes were laundered with other work clothes.

More of these children were girls (56.7%) than boys (43.3%). Most were 3 or 4 years of age (60.0%), with one-third 5 or 6 years of age, and 8.3% 1 or 2 years of age. Over half of their mothers had less than a secondary education. About one-quarter of their mothers did not work outside the home, with one-quarter working part-time and one-half working full-time.

### **Pesticide Metabolite Levels**

The metabolites for 13 of the 14 pesticides were present in the urine samples of the 60 children. Among these metabolites were those

of 7 organophosphorus (OP) insecticides. PNP was the most common OP insecticide present.

The pyrethroid insecticide metabolite 3PBA was present in 40.0% of the farmworker child urine samples. The metabolite for DEET repellent was present in 10.0% of the farmworker child urine samples. The herbicide 2,4,5-T was present in one of the samples. The herbicide 2,4-D was present in 41.7% of the samples, ACE was present in 21.7% of the samples, and ATZ was present in 6.7% of the samples.

### **Discussion**

Urine samples from most study children living in farmworker homes have a variety of pesticide metabolites. At least one specific pesticide metabolite was found in the urine samples for 59 of these 60 children; the urine samples for 88.3% of these children had three or more specific pesticide metabolites present. Analysis of the general dialkylphosphate OP pesticide metabolites for these same children found at least one of these six metabolites in every sam-

ple<sup>2</sup>.

The specific pesticide metabolites present indicate multiple sources and pathways of potential exposure among children in farmworker homes, and illustrate the length of time these pesticides remain in the environments of farmworker children. The pesticide metabolites present in these children's urine indicate at least four pathways of exposure: (1) a para-occupational take-home pathway in which workers bring pesticides into their homes on their person or on their clothing; (2) an environmental pathway in which pesticides applied to nearby fields drift into the residential environment; (3) a residential pathway of pesticides applied in the home; and

(4) a residual pathway in which pesticides deposited inside the home from any of the pathways at an earlier time remain active. Earlier research in North Carolina showed that farmworkers had little knowledge of the pesticides used where they work, and that they did not have information about pesticides applied to dwellings that were rented or grower-provided<sup>26-27</sup>. Drift has been shown to result in the dispersal of agricultural pesticides to dwellings on surrounding land<sup>16, 28-29</sup>. Finally, agricultural communities have generally higher levels of environmental pesticides compared to non-agricultural communities, with residues from discontinued pesticides found in contemporary rural environments and homes<sup>5, 30-31</sup>. However, the possible sources and pathways of exposure for several pesticide metabolites found in the samples from these children remain unclear.

In discussing the sources and pathways of potential exposure it is important to remember that the urine samples used in this analysis were collected in June and July, 2004. Exposure of these children to pesticides in Mexico should be discounted as the source of the metabolites; these are the children of seasonal rather than migrant farmworkers, who have been settled in North Carolina for several years. Many of these children were born in the U.S., and have limited direct or indirect contact with sources of exposure from Mexico.

Chlorpyrifos and diazinon have been used for residential as well as agricultural applications. However, chlorpyrifos was banned for residential use by the end of 2001, while diazinon was banned for residential use at the end of 2004. Fifty of the 60 children had TCPY, the chlorpyrifos metabolite, in their urine. This would indicate that chlorpyrifos exposure for these children did not result from recent residential application, but could result from the take-home and drift pathways, as well as from residual deposition. The diazinon metabolite

### **Environmental and Occupational Resources**

The following resources are available from MCN's Environmental and Occupational Web Page – [www.migrantclinician.org/excellence/environmental](http://www.migrantclinician.org/excellence/environmental). These resources address many of the critical environmental issues brought up in the Thomas A. Arcury article.

#### **Clinician Resources**

*Recognition and Management of Pesticide Poisonings* — covers 1,500 pesticide products in an easy-to-use format. Toxicology, signs and symptoms of poisoning, and treatment for various types pesticides are addressed. Also includes a chapter on taking an environmental and occupational history. It is edited by Dr. Routt Reigart and Dr. James Roberts, and is published by EPA's Office of Pesticide Programs. Both English and Spanish versions are available.

EXTOXNET— <http://extoxnet.orst.edu/>

Objective, science-based information about pesticides - written for the non-expert

National Pesticide Monitoring Program—<http://oregonstate.edu/npmmp/>

Provides informational assistance in the assessment of human exposure to pesticides.

PAN Pesticide Data Base <http://www.pesticideinfo.org/Index.html>

One-stop location for current toxicity and regulatory information for pesticides.

Pesticide Exposure and Lead Poisoning Template. A newsletter template developed by US EPA Region 5 to help clinicians integrate assessment and prevention into clinical practice.

*A Migrant Farmworker Occupational Health Reference Manual for Clinicians*

<http://www.nycamh.com/resources/manualindex.htm>

Produced by NYCAMH and MCN, contains information on the diagnosis and treatment of occupational injuries, including pesticide exposure. This online resource provides information on farmworker crop profiles, diagnosis and treatment, patient education, cultural competency, and much more.

National Environmental Education Foundation [www.neetf.org](http://www.neetf.org)

– National Pesticide Practice Skills Guidelines for Medical & Nursing Practice

– Pediatric Environmental History Screening Form

#### **Patient Resources**

*Aunque Cerca...Sano/ Pesticides Nearby...But Staying Healthy*: This 16-page Spanish or English language comic book targets migrant and seasonal farmworker families to educate parents about children's risks to pesticide exposure and ways to minimize these risks.

*Digale Adios a las Plagas/Send Pests Packing Comic Book*: This Spanish or English educational comic book was developed by Wake Forest University and offers practical preventative tips to keep unwanted pests away from your home.

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## ■ Pesticide Urinary Metabolite Levels of Children continued from page 6

IMPY was present in 33 of the 60 samples. Because it was still available for residential use at the time these data were collected, it is possible that diazinon exposure could result from any of the pathways.

Malathion has outdoor residential use, while parathion has no residential use. Yet 54 of the 60 children had the parathion metabolite PNP and 17 had the malathion metabolite MDA. Farmworkers may be exposed to malathion at work (e.g., picking peppers), but it is unlikely that they would work in fields to which parathion has been applied (e.g., cotton). Therefore, exposure resulting in the presence of PNP is most likely the result of the drift and residual deposition pathways, while MDA could result from the take-home, drift, or residual pathways.

Pyrethroid insecticides are widely used for residential and agricultural applications. The 24 children with 3PBA, the pyrethroid metabolite, in their urine sample could be exposed through any of the pathways. The herbicides 2,4-D and acetochlor are widely used for residential and agricultural applications, and their metabolites could result from exposure through any of the pathways.

Atrazine is used on corn (85% of all usage), sorghum (10%), and sugar cane (3%). Three-quarters of all corn has atrazine applied. Corn and sorghum are grown in North Carolina. However, field corn and sorghum are machine cultivated and harvested. Sweet corn is hand picked, but few farmworkers are employed for this task. The most plausible explanation for 4 farmworker children having the metabolite for atrazine in their urine can be limited to drift or contaminated water supplies.

The sources and pathways of exposure among farmworker children to the OP pesticides coumaphas, pirimiphos methyl, and isazophos, and to the herbicide 2,4,5-T are not apparent. Coumaphas is used to control insects on livestock, and farmworkers in North Carolina seldom work with livestock. However, CMHC, the metabolite of coumaphas, was detected in samples from 7 of the children. Pirimiphos methyl is used post-harvest to treat stored corn and sorghum grain, activities with limited farmworker participation. Yet, DEAMPY, the metabolite of pirimiphos methyl, was detected in samples from 3 children. Isazophos was used to treat lawns and turf; isazophos was cancelled in North Carolina at the end of 1998, and cancelled by the U.S. Environmental Protection Agency in mid-1999. Yet, CIT, the metabolite of isazophos was found in one child. Finally, the herbicide 2,4,5-T has been banned for use in the U.S. since 1986, years before most Latino farmworkers had immigrated to North Carolina. The metabolite for 2,4,5-

T was detected in the sample of one child. The metabolites for isazophos and 2,4,5-T were found in samples from different children.

Earlier studies have not considered the number of different pesticide metabolites present in individual children. Combining doses from several pesticides in a single child may result in interactions beyond the effects of a single toxicant (Eskenazi et al. 1999). Among these 60 children, 54 had 2 or more pesticide metabolites, with 9 children having 6 pesticide metabolites and 3 children having 7 pesticide metabolites. There was no discernable pattern in the combinations of pesticide metabolites present in the samples. Boys versus girls, and those living in rented housing versus owned or other housing had a greater number of pesticide metabolites in bivariate analysis. This may reflect gender differences in behavior. More importantly, it reflects how control of a dwelling may decrease exposure. Children whose mothers worked part-time versus full-time or who did not work had a greater number of pesticide metabolites in the bivariate and multivariate analysis. The interpretation of this association is not clear. Further analysis was conducted to examine whether mothers working part-time were more likely to be employed doing farmwork; this was not the case. It is possible that mothers working part-time are less able than unemployed women to attend to household hygiene, while mothers working full-time could count on more help in home care. Research is needed that has greater precision in measuring of pesticide exposure risk factors<sup>2, 24</sup>.

The results of this study should be considered in light of its limitations. The cross-sectional design limits analysis to association rather than causation. The lack of environmental pesticide samples does not allow for consideration of the location of exposure. Data on residential pesticide application were not collected. The metabolites present in the urine may also include exposure to the less toxic environmental degradates of the target pesticides. The determination of whether a metabolite was detected in a child's urine sample, and therefore the total number of metabolites detected in a child, may be limited by the LOD of current analytical procedures; therefore, the number of metabolites detected is a conservative estimate. Finally, the measurement of risk factors may lack precision. This study also has several strengths. It is based on a relatively large sample of children. It is one of the few studies of farmworker child exposure on the East Coast. Finally, it is one of the only studies to examine a large number of specific pesticide metabolites for farmworker children.

Several implications for environmental and occupational health practice and research can

be drawn from our results. Pesticide exposure pathways for farmworkers and their children are multiple and complex. Pathways include take-home, drift, residential application, and residues. The sources of exposure to several of the pesticide metabolites found in the urine samples are not clear. Farmworkers must be educated about the take-home pathway. Current United States Environmental Protection Agency Worker Protection Standard training<sup>32</sup>, when workers receive it<sup>26,33</sup>, provides little information about pesticides that can be taken home on the clothes, boots and skin of workers, and about how to reduce or eliminate the amount taken home. Regulations on pesticide application to reduce drift must be reviewed. Farmworker and all

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## calendar

### Rural Clinicians Conference

July 26-28, 2007  
Hyatt Regency,  
Kansas City, MO  
<http://www.nrharural.org/conferences/sub/clinical.html>  
(816) 756- 3140

### Binational Policy Forum on Migration and Health

VII Binational Health Week  
October 14 – 16, 2007  
Los Angeles, California  
<http://www.ucop.edu/cmhi/binational.shtml>  
(510) 643-4087 or  
[emerito.lopez@ucop.edu](mailto:emerito.lopez@ucop.edu)

### East Coast Migrant Stream Forum

October 18-20, 2007  
Royal Plaza  
Lake Buena Vista, Florida  
<http://www.ncchca.org/>  
(919) 469-5701

### National Advisory Council on Migrant Health Meetings

July 30-31, 2007  
Ann Arbor, MI  
AND  
October 16-18 2007  
Lake Buena Vista, FL  
For more information contact: Gladys Cate  
Health Resources and Services  
Administration  
Bureau of Primary Health Care  
[gcate@hrsa.gov](mailto:gcate@hrsa.gov)  
(301) 594-0367

### Midwest Migrant Stream Forum

December 6-8, 2007  
Omni San Antonio Hotel  
San Antonio, TX 78230  
<http://www.ncfh.org/>  
(512) 312-2700



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rural families must be educated about drift and how to reduce exposure. Farmworker housing regulations must be improved to reduce need for residential pesticide application<sup>27, 34</sup>. Farmworkers need to be educated about alternatives to using pesticides, such as residential integrated pest management. Farmworker and other rural homes need to be deep cleaned to remove pesticides from indoor environments. Procedures for this deep cleaning need to be developed and tested<sup>35</sup>.

Research is needed that includes more precise measures of exposure pathways. Laboratory techniques measuring pesticide metabolites in urine and other matrices, as well as environmental monitoring have improved

substantially<sup>36-37</sup>. However, measurement of exposure pathways in epidemiological research has not improved greatly. For example, asking about recent employment as a farmworker needs to be changed to the amount of farm work conducted in the three days before samples for biomonitoring are collected.

Research on the health effects of concurrent exposure to multiple individual pesticides and classes of pesticides is also needed. Current knowledge of health effects of pesticides in general is limited, but documentation is beginning<sup>38</sup>. Examining health effects in light of the interactions of several different pesticides will provide greater insight into the actual risks to those exposed. ■

### ■ How to Identify Victims of Human Trafficking continued from page 4

tim of human trafficking, please call the HHS National Human Trafficking Resource Center – 1-888-3737-888. This toll-free, multi-lingual, 24 hours a day hotline connects victims of trafficking to available local service organizations that provide support services.

For more information on services available to victims and the Rescue & Restore campaign, please visit [www.acf.hhs.gov/trafficking](http://www.acf.hhs.gov/trafficking).

HHS urges medical professionals like you to become aware of the issue and to look for

all the signs – even those hidden beneath the surface.

*Vanessa Garza is Director of the Trafficking in Persons Program, Administration for Children and Families, U.S. Department of Health and Human Services.*

1. Hernandez A (2003) The Sex Trafficking of Children in San Diego: Minors are prostituted in farm labor camps in San Diego. *El Universal*. Mexico City. January 11, 2003. ■



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