Pesticide Exposure and Potential Health Effects in Young Children Along the U.S. - Mexico Border: Methods Development

Start Date: 6/1999 **Completion Date: 6/2002**

Project Purpose:

To develop or adapt conventional methods for field studies (Phase III studies-see above) which can be utilized for estimating the pesticide exposure of small children or infants. Methods to be developed/adapted include urine collection and dermal surrogates (wipes, and clothing). In addition, another project was established to compare the different methods of detection of the metabolites of organophosphate pesticides (six alkyl phosphates) to allow comparison of data from other research projects.

Project Description:

As the Environmental Work Group focuses on the exposure of children to pesticides, there are concerns about the effectiveness of "standard" components of conventional exposure sampling procedures originally developed for adults as they pertain to young children and infants. One of the components of concern is how to collect urine samples for analysis of pesticide metabolites from infants and other pre-toilet trained children. The current technology for collecting these samples is designed for use in a clinical setting and is too difficult or unpleasant for parents to use at home. The concept is to evaluate various diapers and diaper inserts that would be convenient for a parent to use and be readily amendable to extraction of urinary metabolites without adding interferences or changing metabolite concentrations. The primary compounds of interest are the metabolites of organophosphorus and carbamate pesticides.

Another study is investigating the use of commercial baby wipes for collecting samples from children's skin for pesticide analysis and the use of cotton sleeper suits as surrogates for dermal exposure. Conventional dermal wipe techniques often use isopropyl alcohol as a solvent in conjunction with a cloth wipe to obtain samples from the hands of adults. While isopropyl alcohol is generally considered innocuous, the use of commercially available products (e.g., hand wipes) to obtain samples could eliminate concerns about exposure to alcohol and alleviate parental concerns about the use of foreign materials on their child. This is especially important as new techniques and methods are developed for collecting pesticide residue samples that include the use of wipes. For example, one proposed new method would use wipes to collect residual food from a child's face, bib, tray, etc. for exposure estimates. This study on dermal wipes would evaluate the potential for using commercially available baby wipes for collecting pesticide samples from skin and other surfaces. Dermal exposure is obviously not limited to the hands. Conventional sampling techniques often use coupons or coveralls to estimate worker exposure. We are investigating the use of cotton suits (infant sleepers - Winnie-the-Pooh type outfits) as an indicator of the potential dermal exposure of children to pesticides. The concept is to determine if commercially available cotton suits can suitably adsorb pesticide residues and allow for the subsequent accurate extraction and quantification of the parent pesticide without cross-contamination or residual interferences that may originate from the cotton suit. Organophosphorus ,carbamate, organochlorine and other pesticides (permethrins) are the compounds of interest for both the commercial wipe and cotton sleeper projects.

The metabolism of organophosphorus pesticides results in the production of alkyl phosphates waste products that are excreted from the human body in urine. The alkyl phosphate metabolites can, in turn, be used as an indicator of exposure to organophosphorus pesticides. At least four laboratories routinely analyze urine samples for the alkyl phosphate metabolites for exposure studies involving children. These laboratories are: the Centers for Disease Control and Prevention (CDC), Pacific Analytical, Centre de Toxicology, and the University of Washington (under the direction of Dr. Richard Fenske). The objectives of this task are to compare and validate methods used for the analysis of the urinary alkyl phosphate metabolites of organophosphorus pesticides. Comparison and validation will be performed using both spiked and authentic urine samples. The completion of this project will allow for the comparison of results from other research studies using similar techniques.

Accomplishments:

- 9/99 - A laboratory study evaluating materials for possible use as diaper inserts to collect urine samples from infants for pesticide metabolite analysis. (Work assignment in place)
- 9/99 - A laboratory study evaluating commercial baby wipes and cotton infant suits for collecting pesticide residues from a child's environment to estimate dermal exposure. (Work assignment in place)
- 5/00 - A multilaboratory study to determine the comparability of analytical methods for measuring the alkyl phosphate metabolites of organophosphate pesticides. (Work assignment in place)
- 9/03 – An EPA Report EPA/ 600/R-03075 Comparison of Methods for the Determination of Alkyl Phosphates in Urine
- 10/04 – An EPA Report EPA/600/R-04/087 Evaluating Commercially Available Dermal Wipes, Cotton Suites, and Alternative Urinary Collection Materials for Pesticide Sampling from Infants.

Expected Outcome(s):

The development of suitable exposure estimation methods for young children and infants is a critical step for completing the goals of the overall project. Valid methods will allow investigators to develop accurate profiles of pesticide exposure. Publications include:

- 9/03 – An EPA Report EPA/ 600/R-03075 Comparison of Methods for the Determination of Alkyl Phosphates in Urine
- 10/04 – An EPA Report EPA/600/R-04/087 Evaluating Commercially Available Dermal Wipes, Cotton Suites, and Alternative Urinary Collection Materials for Pesticide Sampling from Infants.

Project Contacts:

Brian Schumacher, EPA/ORD	(702) 789-2242	schumacher.brian@epa.gov
Gary Robertson	(702) 798-2215	robertson.gary@epa.gov

Participant(s):

EPA/ORD, CDC/NCEH,