MCEARD News

Assuring the Safety of Chemicals

Research results provide means for large-scale field studies to collect information on dietary sources of exposure

A person's exposure to pesticides from their diet can be measured through the collection and analyses of duplicate diet samples. In many large field studies, traditional duplicate diet collection and analyses are more burdensome and costly than available resources can support. As a response, **Lisa Jo Melynk** (MCEARD) produced findings that suggest that *a priori* determination of permethrin, using existing databases is useful in creating composites of individuals' diets.

To accomplish the research, Melynk led a pilot field study that included nine participants who provided up to eight individually prepared foods from their homes. The samples were analyzed to evaluate a new, community based methodology. To minimize cost and participant burden, while maximizing the quality of information obtained from the duplicate diet data, a food sample compositing scheme was developed and tested. Since there were strong correlations found between composite and averaged individual sample measurements for nearly all analytes, the compositing scheme was successful.

By using existing food consumption and residue databases to provide upfront information to improve food sample collection, Melnyk's research

provides an alternative collection protocol for determining a community's dietary exposure to pesticides.

The research provides a means for large-scale field studies to collect information on dietary sources of exposure that may have been too costly to obtain otherwise. These findings suggest that a project, such as the National Children's Study, could composite food samples to provide adequate exposure information and reduce the cost and number of samples analyzed.

Melynk's results also suggest that using existing databases alone should not replace actual measurement because she was not able to ensure that measurable levels could be detected in every sample. However, the approach is valuable for developing a compositing scheme that yields similar numbers of detectable levels.

Melynk will present new results of her research "Comparison of Individual Food Analyses to Composites for Pyrethroid Pesticides" at the Joint Conference of International Society of Exposure Science and International Society for Environmental Epidemiology in Seoul, South Korea August 28 through September 1.

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Protecting America's Waters

NERL expert presents new research on arsenic in food and drinking water

Research recently concluded by **Jack Creed** (MCEARD) provides evidence that exposure to arsenic via the diet and drinking water could pose less of a public health risk than it would if toxic intermediates were formed. Creed's research has resulted in an extraction procedure for arsenic containing compounds that mimics the human digestive tract.
Arsenic toxicity is dependent on its chemical form (species). If information

on the amount and species of arsenic being liberated from dietary matrices in the human digestive tract is available, EPA could more accurately asses risk for dietary arsenic exposures.

The new technique provides chemical-form specific information about arsenicals extracted from various matrices; and also indicates that there are specific arsenic compounds which may be metabolized via a route without toxic intermediates. The distributions of inorganic arsenic concentrations, as determined by this procedure, were then used in a probabilistic model to estimate a population exposure profile for various dietary components.

His invited presentation (Species Specific Dietary Arsenic Exposure Assessment: The Need to Estimate Bioaccessibility and Assessing the Implied Presystemic Metabolism Implications) was made at the 56th International Conference on Analytical Science and Spectroscopy (ICASS). Attendees who are interested in improving understanding of the impact of trace metals in the environment and in biological systems met August 15-18, 2010, in Edmonton, Alberta, Canada.

Creed's co-authors are **Patricia Creed, Tatyana Pinyayev, Madhavi Mantha, Carol Schwegel,** and **H. Trenary**, from MCEARD. Additional EPA co-authors include Mike Kohan, Karen Herbin-Davis, and David Thomas.

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Egyptian scientists consult with MCEARD and other EPA scientists; Express interest in Memorandum of Understanding

Egypt has unique drinking water issues, in part because of a large population density and a proportionally small land mass. **Shay Fout** (MCEARD) and others are hosting Egyptian scientists from the Holding Company for Water and Wastewater, which includes all water and wastewater utilities in Egypt. The visiting researchers are consulting with MCEARD scientists about ensuring drinking water quality validation, audits of method performance, and drinking water certification programs. They hope to implement similar tools and techniques in Egypt.

The visiting microbiologists are Kareem Farouk Muhammed Ismail and Mr. Ahmad Kamal Abdelhady Abdelaziz Abouelsoud. Although they are focusing on learning about method development and validation on this trip, they have suggested establishing a Memorandum of Understanding with MCEARD to bring training in laboratory certification and methodological issues to Egypt, and to collaborate on research issues of mutual interest.

Fout hopes that working with Egyptian water officials and scientists will improve U.S. methods for newly emerging pathogens, strengthen NERL's ability to conduct sustainable water research, and provide a better understanding of possible climate change outcomes.

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MCEARD expert presents ORD-wide research on protozoan viability to the environmental community

Eric Villegas (MCEARD parasitologist) has been invited to co-chair a platform session at the 11th Annual International Workshop on Opportunistic Protists, and to make two presentations involving ORD-wide research. The platform session will focus on occurrences, factors relative to the ability of a microorganism to cause disease, and molecular epidemiology of opportunistic one-celled organisms (Protists). The two high-yield research projects he will discuss include (1) *Toxoplasma* disinfection and (2) a molecular viability assay for *Cryptosporidium*. As an integrated research effort, this work provides valuable data to the environmental community about protozoan viability.

This research is important to EPA's ability to understand the risk posed by waterborne protozoans, and our ability to determine whether the pathogens are alive and infectious, or dormant and dead.

NERL scientists have studied *Toxoplasma* disinfection because it is important in determining what water treatment methods will be effective on this pathogen. The new *Cryptosporidium* rapid detection method takes only minutes to complete, and may replace a current multi-day cell culture method currently used to determine viability.

The work completed for *Toxoplasma* will result in delivery of a "Report on occurrence of *Toxoplasma gondii* in water before and after chemical disinfection and irradiation." The research for the *Cryptosporidium* method will be published as an "Investigation into techniques to specifically detect viable organisms."

Villegas is presenting the work of MCEARD scientists **Michael Ware, Swinburne Augustine, Larry Wymer, Shannon Griffin, Eunice Varughese, Dave Erisman, Mary Jean See, Leah Villegas** , **Cristin Brescia;** other EPA scientists Frank Schaefer, Alan Lindquist , Sam Hayes, Andrey Egorov; and J.P. Dubey (USDA). The meeting is being held Aug 1-5 in Hilo, Hawaii.

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New CRADA expected to enhance EPA ability to detect *E. coli* and *cryptosporidium* in source waters

Scientists from MCEARD and NanoLogix, Inc., have entered into a Cooperative Research and Development Agreement (CRADA) to test a procedure for increasing recovery rates of *Cryptosporidium* and *E. coli* O 157:H7 from source water samples.

NanoLogix has a new filter membrane that MCEARD expects will provide a more efficient procedure for recovering pathogenic microbes from environmental samples. Initially, the scientists will seek to improve recoveries of *Cryptosporidium* oocysts in source waters via the new filter

membrane procedure. Increasing recovery rates and establishing greater consistency in results over time can allow more accurate quantification of *Cryptosporidium* oocysts. This, in turn, can provide more reliable scientific information on which to base water treatment decisions.

During the second phase of the research, scientists will seek to improve recoveries of *E. coli* O157:H7 from source water via the same technology. The scientists expect that the NanoLogix membrane procedure also will enable them to identify *E. coli* O157:H7 more rapidly than current methods allow. Improved recoveries and rapid identification of *E. coli* O157:H7 will assist EPA in gathering more accurate data on the occurrence of these organisms in recreational waters and drinking water sources for use in performing quantitative microbial risk assessments.

MCEARD's role in this research will be to provide microbiological expertise in handling the organisms and identifying them in environmental samples. MCEARD will also provide cultures of *Cryptosporidium parvum* and *E. coli* O157:H7 for this research.