

NFSTC researcher solves environmental puzzles

Quietly and without fanfare, Dr. John Giesy of the Zoology Department and National Food Safety and Toxicology Center (NFSTC) at Michigan State University, influences the world as we know it. Some of the major concerns Giesy and other scientists at the NFSTC share are where and how pollutants and other chemicals enter the human food chain, and what effects those chemicals have on human health. His work in environmental toxicology is internationally recognized and he is much in demand as an advisor to government agencies and businesses around the world, but public relations is not what he's about. "My way is in the boardrooms, where I tell them, 'This is how it is,'" Giesy said. "It doesn't get a lot of headlines, but it can have a huge impact."



Most recently, he and his team of 30 researchers and students worked with 3M to help investigate the movement and potential effects of some perfluorinated organic chemicals in the environment, such as POSF, an organic fluorine which can turn into a second fluorine, PFOS, when it gets into mammalian cells. POSF is used in hundreds of products ranging from microwave popcorn bags to paper used to wrap fast foods to the popular Scotchgard fabric protector, and represents a multibillion-dollar industry. In the environment POSF can be transformed into PFOS, which is very stable and can be accumulated into animals. His team is still assessing the spread of the chemicals in wildlife worldwide, finding out how this supposedly inert substance invades the cells of animals, and

brainstorming ideas about what the future may hold for this chemical. Because tiny amounts of this chemical that 3M had made for nearly 40 years showed up in blood drawn from people living across the country, 3M sought out Giesy to investigate implications in the food chain.

Solving environmental puzzles is a daunting job, but Giesy takes it in stride. "We're sort of the court of last resort," said Giesy. "People come to us when no one else knows how to approach the problem, and we figure out how to do it. Not only do we measure the amount of chemical in an organism, but we also find the mechanisms of action—how a chemical causes its toxic effect—and how it enters the food chain. Sometimes there aren't methods to analyze the chemical yet, and we have to develop new techniques in order to study it."

The really unique aspect of Giesy's research is his multidisciplinary approach to complex environmental issues. Professor Giesy sees his role as the quiet voice of reason providing the best science to assist society in making rational decisions about environmental issues. Giesy's group is frequently involved in environmental audits for private companies or governmental agencies. In an environmental audit, Giesy looks over an organization's environmental programs, either before a new chemical is released into the environment or after the release (as in 3M's case) to research chemicals already in the environment. If he sees something wrong he is brutally honest, as 3M executives learned after his initial examination of POFS.

"I told them, 'You really need to know much more about chemicals used in such large amounts and have the potential to become so widely distributed in the environment. You need to look and see how much of these chemicals are in the environment.'"

They listened to his advice, found out that the chemical can be toxic in high doses, and pulled many products containing POSF from the shelves. 3M will stop producing the chemical, in all forms, by the end of this year. These changes, costing 3M hundreds of millions of dollars, were based on Giesy's preliminary research, research by 3M scientists, and prior to action that may have been taken by the Environmental Protection Agency. His team is about

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The Director's View

Dr. Ed Mather

It's been a little more than a month since our conference "Risk Communication in Food Safety...Motivating and Building Trust." Without gloating...well, maybe just a little...the conference was tremendously successful. This workshop addressed one--risk communication--of the three legs supporting risk analysis and was a natural followup to our 1998 conference, "Comparative Risk in Food Safety: The Future Direction for Risk Analysis." The other two legs--risk assessment (see front page article) and risk management--will receive no less attention in future conferences and newsletters.

Briefly, I'd like to offer some highlights of the conference's keynote speakers. One of our keynoters, Dr. Peter Sandman, gave us a lesson in hazard and outrage and the importance of inclusion of stakeholders in a shared crisis situation. Sandman presented his formula for "risk = hazard + outrage" and suggested that risk is a function of hazard and outrage. For example, experts concentrate on hazard and ignore outrage whereas the public focuses on outrage and ignores hazard. If stakeholders are left out of risk awareness, they become more radical and upset. Once they're angered, no presentation of data or video will quell their negative emotions. His strategy of outrage management includes acknowledging the problem and taking responsibility for it. Sandman proposed a five-step management program:

1. Admit it.
2. Apologize.
3. Provide restitution.
4. Say it will not happen again.
5. Offer penance.

Participants agreed with the five-step program and offered suggestions on presentation and implementation of Sandman's concepts. He added that in businesses like government, academia and industry it is difficult to build trust and that caution should be exercised; perhaps just trying to be accountable is a more realistic goal.

Steve Curwood, executive producer of National Public Radio's *Living On Earth*, our second keynote speaker,

addressed trust and distrust. Curwood believes that distrust of the government stems historically from its failure to regulate business and from taxes. Industry is distrusted because it doesn't always tell the truth, i.e., the effects of DDT and nuclear power. Science seems to say the wrong thing for what the consumer needs to hear, leaving doubt, to which science says "You can't prove it!" Curwood said that we--the experts and the media--



need to bridge this gap by using language that is honest, such as "We don't know for sure yet." Curwood cited that problems arise during interpretation of data from the scientist to the marketing department to the company representative to the consumer, pointing out the need for good risk communication practices between the risk assessor and risk manager. He believes that the consumer is interested in social responses whereas the scientist believes the logic of the scientific data may be more important. A distinction can be drawn in that what the consumer really wants is the discussion, not the "answer."

From the breakout sessions and the conference as a whole, many risk communication characteristics were defined and refined. The following deserve center stage:

- Risk communication demands **honesty, frankness and openness**--trust and credibility are difficult to obtain; once lost, they are almost impossible to regain.
- Risk communication is interactive, ongoing and enables an organization to share information within its various divisions as well as with the public.

- Risk communication calls for listening to the stakeholders' concerns.

What was effectuated at this conference may not be rocket science, and we may not have unearthed any revelations about food safety and risk communication. Our accomplishment was to bring together members of the government, industry, media and academia to engage in a dialog that reminds us of the crucial role of risk communication and the supreme need to accept and involve all partners in the process.

Though the conference ended July 12, it is the intent of the NFSTC to pursue and employ strategies of risk communication. We take our responsibility seriously to ensure that any decisions made in the public interest will be cooperative and will be made using the best available information and resources. The NFSTC will continue its effort in information-sharing, and we look forward to "teaming for success."

"The best hope of solving all our problems lies in harnessing the diversity, the energy, and the creativity of all people."

Roger Wilkins, Journalist and Former U.S. Assistant Attorney General

National Food Safety Education Month

September marks the sixth annual National Food Safety Education Month. *Be Smart, Keep Foods Apart--Don't Cross-Contaminate* is the theme for the month. The Center for Food Safety and Applied Nutrition, FDA, and the Food Safety and Inspection Service completed a "2000 Planning Guide for Food Safety Educators." The guide includes fact sheets, media materials, games, activities, and other information about food safety. The guide is available online at www.FoodSafety.gov.



Partnerships thrive at the NFSTC

Nearly 20 years ago, members of academia, industry and the legislature discussed the notion of collaborating on biotechnology research. Those seeds of discussion grew into a partnership between Michigan State University and the Neogen corporation, a Lansing-based company that develops and markets products and services dedicated to food and animal safety.

Through the MSU-Neogen partnership, Dr. Paul Satoh of Neogen conducts research with MSU scientists, such as Dr. James Pestka of the National Food Safety and Toxicology Center (NFSTC). Pestka’s research includes a detection system for the presence of certain toxins in foods. Together they developed a test known as ELISA, enzyme linked immunoassay, which can determine the presence of mycotoxins in grain before it is exported to other countries. Mycotoxins can be found in grains, cereals and nuts and can lead to organ damage if ingested by people or animals.

“We (scientists at the NFSTC, MSU and Neogen) publish papers together—it’s a collaboration, not a competition at all,” said Satoh. “Being a scientist, I like to share my experience when I can.”

Satoh, retired from a long career as a research scientist at Pharmacia and Upjohn, formerly known as The Upjohn Company, joined Neogen as Vice President of Research and Development and is also an adjunct professor at the NFSTC. He advises student researchers who intern at Neogen, and he examines new technology produced by MSU for its industrial applicability. In fact, Satoh advised MSU’s team of biosystems engineering students who took first place at an international competition (see article below), and Neogen provided the reagents and methodology for the team.



“To have a student come to Neogen and work as an intern— that’s a great experience for them— and also for us, to learn how these young people think and bring academics into our lab,” said Satoh. It’s very rewarding for both MSU and Neogen.”

MSU undergrads win international competition with salmonella test

They entered the international competition last fall thinking that it would be fun to visit New Mexico in April. The competition quickly turned into a challenging, rewarding experience for six Michigan State University undergraduates.

The team, comprised of seniors Jennifer Davis, Keith Depp, Tricia Huddas, Jamie McConville, April Pasutti and Sharon Vennix, entered a contest sponsored by Waste-management Education and Research Consortium (WERC) as a senior project for Department of Agricultural Engineering visiting assistant professor Dr.

Evangelyn Alocilja’s biosystems engineering class. WERC is an association that combines the expertise of research, education, technology transfer and public outreach.

The students worked on an assigned task called “Pathogen

Detection in Fresh Fruits and Vegetables,” and to win they needed to develop a test that would indicate the presence of minute amounts of salmonella on strawberries, melons, celery and parsley. Conventional tests can detect the bacteria in about 48 hours. The students were challenged to design a new system that could detect the same number of bacteria in just 24 hours. They surpassed all expectations by using different technologies to develop a test that could detect

salmonella in less than an hour. Salmonella, which can cause serious illness, may contaminate food if sewage sludge (a byproduct of human waste treatment) is used as a fertilizer to help the produce grow. This is a problem in states such as California, where foods like strawberries are imported from Mexico, and this growing practice is not



“We had never been to a WERC competition before—we didn’t know what was going to happen there,” said Alocilja, the team’s faculty advisor. “The project involved a lot of preparation time, a lot of work. You are developing a technology that is new, and at the same time you are teaching students to be holistic. The kind of experience undergraduate students get at this competition is extremely valuable.”

Giesy means business

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halfway through a two-year \$800,000 grant from 3M to pursue the global impact of the chemical on wildlife, and Giesy is already fielding requests to evaluate similar replacement chemicals for POSF.

Giesy has also been heavily involved in work on agricultural chemicals, including chlorpyrifos (the active ingredient in Dursban), atrazine and glyphosate (Roundup). He was instrumental in the development of the food safety protection act and served on a National Academy of Science panel that wrote a book on endocrine disruptors that has been influential in shaping national policy in this area. He has written a book based on his evaluation of chlorpyrifos, an insecticide commonly used in grain farming. His team found several urban wastewater treatment plants that contained small, but toxic concentrations of the chemical. It tracked the source to flea-control pet shampoos that were rinsed down the drain, and chlorpyrifos has since been removed from all household products. He is currently working on atrazine, an herbicide (weed killer) used extensively in corn farming. It has recently come under fire, and Giesy is performing the risk assessment that will help decide if it is safe for continued use.

His evaluation of glyphosate, the active ingredient in Roundup, found that it was very safe and effective against weeds when used with Monsanto's genetically modified soybeans, which are tolerant of the chemical. Giesy found that Roundup's detractors are really against genetically modified organisms (GMOs), but are using the possible toxicity of glyphosate in the environment to enhance their argument against GMOs. His book, based on this risk assessment, will be published soon.

Giesy's previous work on PCBs and dioxins is considered a benchmark for environmental toxicology. "We're doing global work," said Giesy. "Most countries base their allowable levels for dioxins and PCBs on work that was done by my group. All of the major issues relative to chemicals in the environment...we're right in the middle of all of them."

In addition to solving problems, Giesy loves his role as teacher and mentor to young scientists. "We have a student-based research program. We do research, but our real product is our people, many of whom have gone on to have a huge impact on society as researchers and decision makers in industry and government." Giesy is pleased to have realized his lifelong ambition of being a faculty member at MSU, an institution that is making a difference every day.



Since there will be no shortage of environmental problems in the near future, Professor Giesy and his team continue to forge ahead in pulling together answers to these puzzles--piece by piece.

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