

Study Shows Master's Program in Food Safety Needed

Food safety is of great international importance. In the United States alone, the Centers for Disease Control and Prevention reports that annually there are 76 million illnesses, 5,000 deaths and 325,000 hospitalizations due to foodborne pathogens. At the National Food Safety and Toxicology Center (NFSTC), scientists conduct research to develop a safer food supply and establish a greater public understanding of food safety issues.

"Understanding and knowledge are based on timely and accurate information, training and education," NFSTC Deputy Director Ed Mather said, "and I have long believed that the NFSTC can play a major role in all areas of food safety education."

To assess the needs and support for this view, a market research study was conducted by NFSTC faculty member, Janet Lillie, in October 2000. Lillie interviewed key representatives from government, industry and related associations to determine their interest in food safety education; what format--short courses, traditional courses, certificate programs, master's degree, internship--for education would be usable; if their organizations would sponsor employees to participate; and how attractive Michigan State University would be in offering a master's program in food safety. The study found:

- A master of science program in food safety is greatly supported.
- One- to two-day workshops on current food safety topics as well as a certificate program are also supported.
- Some supported the idea of having a series of certificate programs contribute to a master's degree.
- Distance learning is seen as the means of staying competitive when offering continuing education.
- Most organizations either fully or partially offer financial support to employees pursuing relevant opportunities for continuing education.
- MSU has a strong academic reputation and would be considered as an attractive and highly recognized sponsor for such a program.

Given this strong show of support, the NFSTC is pursuing a variety of avenues to "kick-start" a professional master of science (proMS) program in food safety.

"A uniquely developed proMS program in food safety will train and educate those professionals responsible for assuring a safe food supply for our world," Mather said, "and I'm excited about the prospect of the NFSTC sponsoring such a program."

According to Mather, the NFSTC is uniquely positioned to administer this program, offering facilities and equipment to faculty from six colleges and 16 departments at MSU. Additionally, the center collaborates with a large number of faculty and staff from across MSU's campus and beyond.

"It's this powerful networking capability that allows the center to address a wide range of substantive food safety issues," Mather said. "We can offer expertise on a wide range of issues, such as pre-harvest food safety; food safety education for consumers and food professionals; early detection of pathogenic contamination in packaged food products, addressing microbial threats to human food safety, insights from ethnic groups, the food industry structure and food safety and food safety and culture."

The NFSTC is posed to use the existing infrastructure at MSU. Founded in 1855 as the United States' pioneer land grant institution, Michigan State University is a dynamic community of more than 34,000 undergraduates, 9,000 graduate/professional students and more than 3,000 faculty members. The National Food Safety and Toxicology Center is privileged to have entitlement to these vast resources.



National Food
Safety &
Toxicology Center

Interim Director
Ed Mather

NFSTC Members

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Animal Health &
Diag. Lab

Biochemistry

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Pathology

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Pathology

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Human Develop.

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Zoology



The Director's View

Ed Mather

Several months ago I participated in the well-attended International Conference on Emerging Infectious Disease in Atlanta. The conference was sponsored in large part by the Centers for Disease Control, the American Society for Microbiology, and the Association of Public Health Laboratories. Over the past several weeks, issues raised and predictions made from that meeting are coming true, and a considerable number of related concerns are on the minds of nearly all Americans. The NFSTC and its faculty are quizzed daily about emerging foodborne pathogens, zoonotic diseases--those that can be transmitted between animals and humans--and the potential global migration of these problems.

To provide background on the meeting, it was my observation that approximately one-third of the presentations and topics involved food safety issues in one form or another. Of particular interest was a poster presentation by Taylor and Woolhouse from Edinburgh that summarized and identified 1,709 infectious organisms known to be pathogenic to humans. Of these, 49 percent were reported to be zoonotic. Using the World Health Organization definition, 156 are classified as emerging diseases. Of this group, 114, or 73 percent, are zoonotic. This data substantiates much of our epidemiologic findings and provides a risk factor for disease emergence in general and food safety in particular.

The recent concern about bovine spongiform encephalopathy (BSE--mad cow disease) in Europe and its connection to vCJD (variant Creutzfeldt-Jakob disease) is of immense concern to federal and state regulatory agencies in the U. S. Elementary and high school students

are writing papers for their teachers. Scientists at all levels are searching for



answers as to its mechanism of action, pointing out the major public concern on this one disease. Regulatory officials and epidemiologists continue to search for methods to manage the risk and contain its spread around the globe.

Another zoonotic disease, tuberculosis, is on the minds of many NFSTC faculty because of its immediate presence in Michigan. Fortunately, the organism, *Mycobacterium bovis*, found in wildlife and cattle has not found its way to human subjects in the recent Michigan outbreak.

The omnipresence of zoonotic foodborne pathogens such as *Campylobacter jejuni*, *Salmonella spp.*, and *E. coli 0157:H7* continue to baffle scientists as the organisms migrate between animals and humans, sometimes through fruits and vegetables. Related are the ill-defined questions about antibiotic resistance and what proportion of the problem is contributed by antibiotic use in animals, or use in humans, or use in

both animals and humans for pathogen control.

Many faculty associated with the center are also concerned about nonfood-related emerging diseases. Foot and mouth disease, West Nile Virus and rabies are but a few that are attracting public attention.

Although research at the center maintains course at a steady pace, there is much work yet to do. Certainly, few food safety centers have the luxury and opportunity to pool such physical and intellectual resources that are available to the NFSTC, and we intend to take advantage of those resources to their fullest extent in continuing our global fight against foodborne illness.

"We can do anything we want to do if we stick to it long enough."

Helen Keller



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Inflammation: the good and the bad

Inflammation--it can be good and it can be bad. The NFSTC's Patricia Ganey studies inflammation and the chemicals that change how inflammatory cells work.

Inflammation is good and necessary when there is an infection. It brings special fighting cells, called neutrophils, that help destroy the source of an infection, usually bacteria. Inflammation is bad when it is excessive, causing arthritis for example, or for some reason damages tissue.

Ganey found that neutrophils changed when they were exposed to chemicals, such as polychlorinated biphenyls (PCBs), which are found in fish and some pesticides.

The changed neutrophils would release toxic substances into the affected area, and this excessive response would not only kill the bacteria, but could also damage the surrounding tissue. Her work helps to identify the pathways that allow the PCBs to alter the neutrophil's response to infection.

"We've been very interested in what goes on within the cell that leads to this change in function that actually causes other cells to die," said Ganey. "It's common among cell types that if you hit them with some kind of chemical, a signal is generated inside the cell to cause it to do something else. That change can be positive or negative. We're studying why and how these changes happen."

Ganey is also working on how inflammation changes the response of the body to toxic chemicals. For example, in inflammatory bowel disease, there are mild and acute phases. During these mild inflammatory reactions, people may be more susceptible to toxic effects of other insults, such as drugs and chemicals from foods or in the environment.

To learn about this, Ganey's team creates a mild inflammation in an animal model, then exposes it to a certain chemical. She has already discovered that the animals with the inflammation respond with a greater degree of toxicity: more cells die, and they are a lot sicker than those without the inflammation. This suggests that somehow the inflammatory process limits the ability of these cells to defend against other insults.

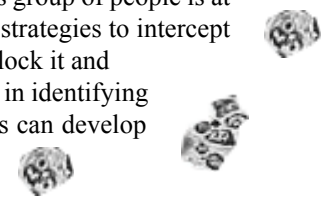
Ganey's research focuses on how that happens, and what it is about the inflammatory process that makes these tissues unable to defend or repair themselves.



"People are exposed routinely to small amounts of endotoxins, substances that cause an inflammatory response, which are usually removed from circulation by the liver. Lifestyle and disease, as well as consumption of contaminated foods, can increase the amount of endotoxins to which we are exposed, and under these circumstances, an inflammatory response may develop."

Sometimes, an exposure to chemicals can start an inflammatory response all by itself. Because there is no infection to attack, this inappropriate response can lead to tissue injury.

"How do they (the chemicals) do that? Why is that happening? If you know that, then you can say, 'OK, this protein is really important, and this group of people is at risk for this.' We can then design strategies to intercept this protein, or use something to block it and preserve the tissue. I'm interested in identifying the targets so that pharmacologists can develop drugs to prevent this response."



Foodborne illness--what can you do if you think you're sick?

The United States offers one of the safest food supplies in the world, and everyone in the food system--including you--can do their part to help ensure the safety of food. Informed consumers can help extend the precautions taken by industry and government by becoming educated on how to buy, prepare and store food safely. However, none of the control measures can completely remove 100 percent of the microorganisms in food. If you think you are sick from foodborne bacteria:

- Consult your physician.
- Any instance of diarrhea, vomiting, abdominal pain, or headache lasting longer than two days should be reported to your physician.
- Most foodborne microorganisms take approximately one to three days to cause symptoms. However, some can cause symptoms rapidly and some can take a week or more to cause symptoms. When you call or visit your doctor, be prepared to recount all the foods you have consumed during the past week or longer.

