

There are some things you learn best in calm, and some in storm.

Willa Cather

*The Song of the Lark* (1915)

FOOD SAFETY

# Allergen Labeling Takes Effect

Since 1994 food manufacturers have been required to list all the ingredients on their products' labels. A new law now takes this obligation a step further, requiring manufacturers to notify consumers in "plain language" of certain allergens contained in their products. This is good news for the estimated 11 million Americans who have food allergies. But some question whether the new labels might be too much of a good thing.

The Food Allergen Labeling and Consumer Protection Act of 2004, or FALCPA, applies to foods labeled on or after 1 January 2006. It mandates that the nutritional labels on food packages plainly identify any of eight specified food allergen sources—milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans—that are present in the product. Together, these eight food categories account for about 90% of all food allergies. The law stipulates that the warning label be placed near the ingredient list.

Stephen L. Taylor, who heads the Food Processing Center at the University of Nebraska–Lincoln, lauds the "plain language" requirement as an overdue development. "In the past, you've seen terms like 'casein' and 'whey,'" he says. "Consumers often had to learn the hard way that those terms are synonymous with 'milk.'"

But while the new law makes the presence of certain allergens in food products more understandable, Taylor also contends that the act is too strict in requiring that allergens be listed if they are present in the faintest traces. For example, he says, the law requires

the listing of not only ingredients but also processing aids that may include allergens, such as soybean lecithin, which is used by baking companies as a stick-release agent for pans.

"My view is that in this particular application the exposure to soybean allergens is extremely low, but with the new labeling requirements you're going to be advising all soy-allergic individuals not to eat the vast majority of bakery products," Taylor says. "And I don't think that's particularly in their best interests."

The law makes clear that decisions about allergen labeling for food products will be an ongoing process. It requires that the Secretary of Health and Human Services provide a report to Congress in February 2006 that's to include information about unintentional contamination of foods with allergens stemming from equipment that is used for multiple food processes. In addition, the U.S. Food and Drug

Administration has created the Threshold Working Group to examine approaches that could be used to establish thresholds below which manufacturers would not be required to list food allergens.

Anne Muñoz-Furlong, founder and chief executive officer of the Food Allergy & Anaphylaxis Network (FAAN), a non-profit educational organization, considers the law an important step. "With food allergies, there's no cure," she explains. "[Allergic] individuals depend on other people, whether in a restaurant or the food industry, to provide accurate information so they can make the right choices."

According to figures from FAAN, each year some 30,000 Americans require emergency room treatment for allergic reactions to food, and 150 to 200 people die from such reactions. Furthermore, the number of people with food allergies is increasing around the world.

Of particular concern to many food allergists is the sharp increase of food allergies in children. According to A. Wesley Burks, a professor of pediatrics at Duke University Medical Center, peanut allergies have doubled over the last decade among children under the age of five.

Nobody really knows why allergies are on the rise. One theory holds that improved hygiene leaves the human immune system with less to do, Muñoz-Furlong says, so it identifies a particular food as dangerous and responds by attacking it.

Muñoz-Furlong believes that the next step in the development of allergen labeling should be to create binding guidelines for what is currently the voluntary use of "precautionary labeling," which warns of the possibility that an allergen might be present as the result of shared production processes. As for the longer-term issue of how to establish threshold levels, Muñoz-Furlong says that most of the parents of food-allergic children she's talked to believe the answer is simple: "They want zero. They don't want to risk that their child might be in that small percentage of the population that's below the threshold." —Richard Dahl



Values are based on a 2,000  
Your daily values may be higher  
depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:  
Fat 9 • Carbohydrate 4 • Protein 4

**INGREDIENTS:**  
Chocolate, sugar, cocoa butter  
vanilla - a natural flavor.  
May contain traces of peanuts  
soybean, nuts and milk.

**Plain talk about allergens.** New labeling requirements should make it easier for allergic consumers to tell if a food is safe for them to eat. Next up? Some suggest codifying the now-voluntary use of precautionary labeling (large photo).

Top to bottom: Daniel Gibbey/Stockphoto; Matt Ray/EHP

## CHILDREN'S HEALTH

## Breastfeeding: Nature's MRE

Low breastfeeding rates and inadequate emergency planning left many infants dehydrated and hungry in the wake of Hurricane Katrina. Health and educational organizations responded rapidly with breastfeeding information and assistance. Through direct contact with mothers and emergency responders, the groups strove to implement long-standing international guidelines for feeding infants in emergencies.



**Comfort food.** Breastfeeding, as in this refugee camp in Thailand's Mae Hong Son Province, is best for infants in emergency situations.

Breastfeeding provides optimal nutrition, protection against infection, and a safe, reliable food source for babies—attributes that are critical in emergencies. International health organizations including the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) promote breastfeeding as the best way to feed infants in a crisis. Although formula is an adequate substitute when a child does not receive breast milk, it must be available with a supply of clean water and containers, and instructions for feed preparation must also be available. Yet potable water, formula itself, and even mixing containers may be impossible to acquire in an emergency.

The WHO and UNICEF have long had guidelines that strongly favor breastfeeding in crises. Current guidelines stem in part from the March 1999 Kosovo crisis in which war forced thousands of Kosovar Albanians into refugee camps. Andrew Seal, a lecturer in international nutrition at the London-based Institute of Child Health and coauthor of a 1999 report based on the Kosovo experience, says, "I think the guidelines are quite good, but it's like any other specific technical sector—it depends on having

people within the organization who have the interest and awareness to champion that particular cause when there are one thousand and one other things to be thinking about."

Breastfeeding should begin at birth, but a full milk supply can be established even several days after birth. If a nonbreastfed infant is less than six months old, a mother may be able to relactate; beyond that, it is sometimes possible to induce lactation for a partial milk supply. Health organizations dispute the common beliefs that stress "dries up" a mother's milk and that malnourished mothers cannot produce milk, but emphasize that optimal breastfeeding requires a supportive environment.

Guidelines issued by the American Academy of Pediatrics in 2005 emphasize that children younger than six months old require no other food or fluids beyond breast milk and recommend that breastfeeding continue after solid foods are introduced for at least the first year of life or longer if mother and child wish to continue. The WHO and UNICEF recommend breastfeeding for at least two years.

One significant problem in the Gulf Coast crisis was a lack of breastfeeding knowledge in the affected population. "We sent . . . board-certified lactation consultants into the shelters to start working directly with the mothers who wanted our help," says Katy Lebbing, herself an international board-certified lactation consultant with La Leche League International, an organization that supports and promotes breastfeeding. But few women were already breastfeeding. "Not only did we have to help people with breastfeeding, but we also had to educate people about breastfeeding," she says.

Getting breastfeeding support and information to people in crisis is problematic, though. Says Seal, "We need integrated interventions that acknowledge the reality of a mother's established feeding decisions."

Indeed, one reality is that breastfeeding rates are extremely low in many areas, including Louisiana and Mississippi, which have some of the lowest breastfeeding rates in the nation, according to the Centers for Disease Control and Prevention. Nevertheless, Lebbing hopes that breastfeeding promotion efforts after Katrina planted a seed. "Natural disasters and other types of disasters happen," she says. "The best choice is to breastfeed because you don't have to worry about your baby's milk supply." —Julia R. Barrett

## Liver Library

Johnson & Johnson's pharmaceutical research and development division has contributed a library of expression profiles for 100 paradigm compounds, primarily hepatotoxicants, to the Chemical Effects in Biological Systems (CEBS) knowledge base based at the National Center for Toxicogenomics, a part of the NIEHS. CEBS users can select arrays corresponding to one or more compounds from the library and use knowledge base tools to identify genes with significantly changed transcript levels. Lists of altered genes can then be annotated with current annotation provided by CEBS or projected onto biological pathways from groups like BioCarta, KEGG, and the Gene Ontology Consortium. CEBS is accessed at <http://cebs.niehs.nih.gov/>.

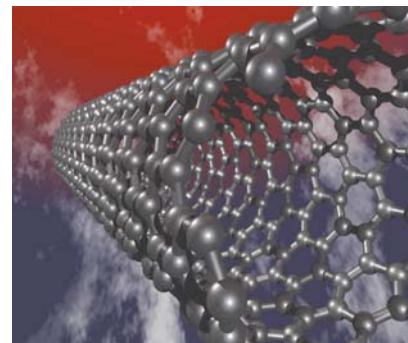


## Action for Indoor Air

At its 4 September 2005 congress, the International Academy of Indoor Air Sciences called on the governments, institutions, and corporations of the world to invest more in reducing indoor air pollution. According to the academy, indoor air pollution in developing countries can exceed international health-based guidelines by 20 times or more, and the use of coal contaminated with arsenic and fluorine is poisoning millions in China. The World Health Organization estimates that indoor solid fuel burning causes about 1.6 million premature deaths annually, mainly among women and children. These problems are easily solved, however. Low-cost interventions including education, improved cooking devices and fuels, better stove placement and ventilation, and a focus on reducing children's exposures have been shown to successfully reduce the health effects of indoor air pollution.

## Nanodatabase Unveiled

The International Council on Nanotechnology and Rice University's Center for Biological and Environmental Nanotechnology unveiled the world's first database of scientific findings on nanotechnology on 19 August 2005. Available at <http://icon.rice.edu/research.cfm>, the database was created by Rice University researchers, the chemical industry, and the Department of Energy, and will be updated and enhanced over the next year. The database is searchable by author, year, keyword, type of particle, and type of experiment. Currently the database houses only abstracts and summaries of papers from peer-reviewed scientific journals, but policy reports and commentaries on key papers in the field will be added in the future.



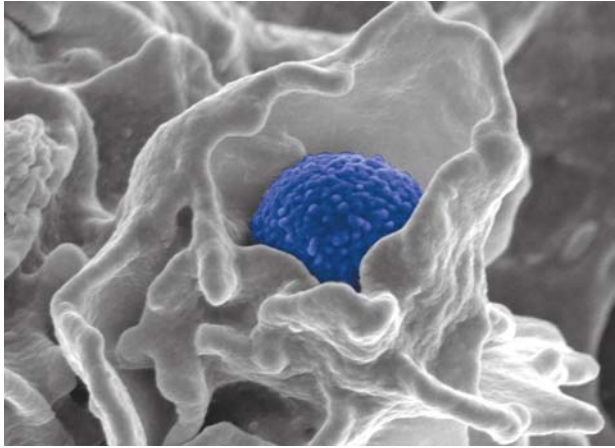
## INFECTIOUS DISEASE

## Meaner MRSA

Most methicillin-resistant *Staphylococcus aureus* (MRSA) infections are contracted in hospitals and other health care facilities. Antibiotic use, patients' weakened immune systems, close contact among people, and open wounds all make hospitals prime breeding grounds for these bugs. But community-acquired MRSA strains, which attack healthy individuals with seemingly normal immune systems, are becoming more prevalent. A recent comparison of representative strains of hospital- and community-acquired MRSA now suggests that the latter are more virulent and that they excel at escaping destruction by white blood cells.

Infectious disease experts suspected that community-acquired strains can overcome a healthy immune system because they operate differently than those acquired from hospital or health care settings. Microbiologist Frank DeLeo of the National Institute of Allergy and Infectious Diseases' Rocky Mountain Laboratories led a multi-institutional team of researchers in comparing the two types. In studies described in the 15 September 2005 issue of *The Journal of Immunology*, they evaluated the potency of three community-acquired MRSA strains (MW2, LAC, and MnCop) and two hospital-acquired strains (MRSA252 and COL).

Healthy adult mice were injected with each strain. All the mice infected with community-acquired strains became ill, and several died.



**One bad bug.** Community-acquired methicillin-resistant *S. aureus* (in blue) overcomes the immune system by destroying neutrophils, thus breaching the body's first line of defense.

None of the mice infected with the hospital-acquired strains died, and only one mouse became ill. Then the MRSA strains were mixed with human neutrophils (white blood cells), the body's first line of defense against bacterial invasion, which kill bacteria by producing hydrogen peroxide and other toxic oxygen metabolites. After half an hour, the community-acquired strains survived neutrophil destruction better than the hospital-acquired ones. After six hours, the community-acquired strains had begun rupturing the neutrophils and were actually growing.

Next the researchers used microarrays to uncover genes that differed during interaction with neutrophils. Not surprisingly, genes that encode virulence factors, toxin production, and stress responses were induced in all the MRSA strains. However, about two dozen genes that encode surface or secreted proteins of unknown function were upregulated only in the community-acquired strains. Gene knockout experiments are under way to identify whether these genes contribute to neutrophil killing. The researchers are also exploring how the community-acquired strains withstand neutrophils' toxic compounds.

The findings suggest that community- and hospital-acquired MRSA strains differ broadly in their biology and genetics. Will this new information help physicians on the front lines who are fighting MRSA infections? "[The findings] do not have immediate therapeutic implications, but maybe down the line therapies will be developed based on such findings," says Henry Chambers, an infectious disease physician at the University of California, San Francisco, School of Medicine. —Carol Potera

## INNOVATIVE TECHNOLOGIES

## X-Rays Get in Synch

Synchrotrons may have been designed with high-energy physics in mind, but now biologists are starting to see the light too. Jeffrey Gillow, a researcher at Brookhaven National Laboratory, has been making use of the X-ray microscope at the National Synchrotron Light Source (NSLS) in New York to see extremely fine details of bacteria biochemistry in a technique known as X-ray spectromicroscopy.

Gillow's team, funded by the Department of Energy Office of Science, uses "soft" X-rays (up to 800 electronvolts, a relatively small amount of energy) to study the chemical structure of organic compounds. "It's great because you get more than just a detailed picture," says Gillow. "You also get chemical information about your sample."

Gillow uses the synchrotron to precisely tune the energy of the X-rays, knocking carbon electrons out of their orbitals. The resulting disturbance changes the bonds of

molecules, and the researchers can read the spectra to see which elements were bonded to which.

The precise nature of the X-ray microscope allows Gillow to see exacting chemical detail within bacteria. Recently, his team used the 30-nanometer resolution of the NSLS X-ray microscope to observe an immature spore develop within a *Clostridium* sp. bacterium, something far too minute and hidden within its host for any conventional electron microscope. These findings were published in the June 2005 issue of the *Journal of Electron Spectroscopy and Related Phenomena*.

Another strength of X-ray spectromicroscopy is that samples require only minimal preparation. Says Gillow, "There is no staining necessary. Basically you just put the sample on the window and away you go." Without staining or heat fixing, the bacterium maintains its naturally occurring biochemical composition.

However, X-ray spectromicroscopy does require that experiments be conducted in close proximity to a synchrotron. And

even though there are currently 40 of these very expensive machines in the world, only a few have the capabilities to conduct this type of research. Further, no live specimens can be studied due to the extraordinary amount of radiation they receive.

Regardless, X-ray spectromicroscopy offers environmental scientists chemical detail and unaltered observations like never before, which is key to understanding the complex biochemical reactions that bacteria undergo in the environment. For example, groups interested in bioremediation can now see on a molecular scale how bacteria alter the chemistry of metals and radionuclides and remove them from soils and waters.

A better understanding of subcellular microorganism chemistry, specifically sporulation, might also help authorities neutralize bioterrorism threats before they become a problem. "Finding ways to interrupt sporulation could stop bioterrorism attacks," says Gillow. "But I doubt you will ever see a synchrotron at an airport scanning your luggage." —Graeme Stemp-Morlock

ehpnet

## CDC: Environmental Concerns After Hurricane Katrina NIEHS: Natural Disaster Response

Since Hurricane Katrina struck the U.S. Gulf Coast on 29 August 2005, Americans have sought reliable information on how to safely reenter flood-damaged environments. The U.S. Department of Health and Human Services (DHHS) has been at the forefront of the effort to assist those affected by this disaster. Two DHHS agencies, the Centers for Disease Control and Prevention (CDC) and the NIEHS, have developed websites offering information on dealing with post-hurricane conditions.

The CDC page, located at <http://www.bt.cdc.gov/disasters/hurricanes/environmental.asp>, gives visitors access to information from both the CDC and the U.S. Environmental Protection Agency (EPA). The site contains a 38-page report, released on September 17, summarizing an environmental health needs



and habitability assessment of the city of New Orleans conducted by these two agencies. The report provides conclusions about the habitability of the city as well as recommendations on how best to go about allowing citizens to repopulate the city. There is also a health consultation on the Murphy Oil Company spill, which released 25,110 barrels of mixed crude oil into the area around Meraux and Chalmette, Louisiana.

The site also includes several documents to guide residents as they resume life along the Gulf Coast. There is basic information on cleaning up mold, disinfecting wells, protecting oneself from debris smoke, avoiding carbon monoxide, dealing with animal and insect hazards, and managing chemicals released during flooding. The mold cleanup section also links to other information sources, some of which are available in Spanish and Vietnamese (many Vietnamese have settled along the Gulf Coast since the 1950s). For response and cleanup workers there are links to federal guidelines and recommendations on personal protective equipment, cleaning HVAC systems, and handling and burning hurricane debris.

The NIEHS Natural Disaster Response page is located at <http://www.apps.niehs.nih.gov/katrina/>. The page features geographic information system (GIS) maps that the NIEHS and its academic partners created that identify chemical plants, refineries, Superfund sites, and other potential sources of contamination. It also contains satellite images of the areas affected by the hurricanes. In the future, the section will feature a functional set of GIS layers that will let visitors customize their own maps. These images can help decision makers and others in identifying sources and routes of contaminants, analyzing the potential for future exposures, assessing human exposures in the immediate aftermath of the hurricanes, and predicting long-term health impacts linked with these exposures.

The Questions and Answers page brings together resources from several federal agencies to answer frequently asked questions about mold, sewage, and seafood consumption. This page also contains information on the NIH Katrina Call Center, available at 1-866-887-2842, which provides round-the-clock medical consultation by telephone to anyone affected by Hurricane Katrina.

The NIEHS Program Resources section of the page has links to four programs that the NIEHS had in place long before the disaster struck, which are now being called into action. One of these, the Worker Education and Training Program, offers a PowerPoint presentation for cleanup workers titled *Protecting Yourself While Helping Others*, developed jointly by the NIEHS and other federal agencies to guide those responding to the storms of 2005. This presentation is also available in Spanish and Vietnamese. Visitors can also find safety posters for responders, guidelines for the protection and training of mold cleanup workers, and other checklists, safety plans, and materials.

As a service to NIH- and NIEHS-funded researchers at flooded universities, this site provides links to information for grantees affected by Hurricane Katrina, including notices from the *NIH Guide*. —Erin E. Dooley

## Arsenic in U.S. Rice

Researchers from Scotland's University of Aberdeen reported in the 1 August 2005 issue of *Environmental Science & Technology* that U.S.-grown rice contains an average of 1.4 to 5.0 times

more arsenic than rice from Europe, India, or Bangladesh. Most U.S. rice is grown in fields that once grew cotton, which depends on arsenic-based chemicals to kill boll weevils and remove its leaves before harvesting.

Because of the form that arsenic takes in plants, the rice may not pose a threat; arsenic found in drinking water is estimated to be five times more toxic. However, one of the few epidemiological studies on eating a subsistence diet of arsenic-contaminated rice has linked it with an increase in bladder cancer.

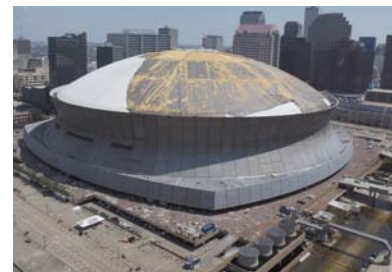


## Managing Chemicals Together

Representatives of the world's governments, intergovernmental groups, and other stakeholders met in Vienna in September 2005 to finalize the Strategic Approach to International Chemicals Management (SAICM). SAICM is a framework for global policy on chemical hazards and will ensure that by 2020 chemicals are manufactured and used in ways that minimize impacts on the environment and human health—a goal outlined at the 2002 World Summit on Sustainable Development. SAICM also promotes capacity building, technology transfer, and improved chemicals management, allowing better implementation of international treaties on chemicals such as the Basel Convention on the Transboundary Movement of Hazardous and Other Wastes. Three core documents from the Vienna meeting are expected to be adopted at a February 2006 conference in Dubai.

## Green Plan for Rebuilding NOLA

In the October 2005 issue of *Environmental Building News (EBN)*, executive editor Alex Wilson outlines a 10-point plan for rebuilding New Orleans. The plan, developed with *EBN's* editorial board and other sustainable planning and design experts, calls first for the formation of a Sustainable New Orleans planning task force. Coast and floodplain restoration is cited as the first priority. The plan also calls for salvaging and warehousing building materials, rebuilding a stronger levee system that is integrated into a perimeter park, mandating green building of both housing and commercial structures, creating more sustainable Gulf Coast fisheries, cleaning up the new brownfields using the greenest means, and partnering with industry to clean up factories in the region.



## NIEHS Responds to Katrina

NIEHS director David Schwartz knows firsthand what the country's worst natural disaster looks like. Within days of Hurricane Katrina's winds and waves, he led an advance medical team of 50 physicians, nurses, and health care workers from the NIH, the NIEHS, and Duke University Medical Center to Mississippi to respond to the disaster. There he found "nothing short of what one would expect in a war zone," as he wrote on the NIEHS website when he returned two weeks later. The extent of destruction was "overwhelming, with cars upturned, tractor trailers scattered like matchsticks, homes completely leveled, buildings destroyed."

Schwartz was just one of many NIEHS specialists who were, and in some cases still are, part of the largest disaster response mobilization in U.S. history. The institute's response to Katrina involved quick, extensive planning and organization within the NIEHS and across a span of sister agencies, such as the NIH, the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC), the Department of Defense, the Food and Drug Administration, the U.S. Department of Agriculture (USDA), and the Department of Homeland Security and Federal Emergency Management Agency (FEMA).

"Katrina was an environmental health catastrophe, and [Hurricane Rita a month later] just added to the damage," says Allen Dearry, the NIEHS associate director for research coordination, planning, and translation, who has acted as the institute's response coordinator. "The institute's expertise is connecting environmental

exposure to human health, and there are bigger questions as the result of this natural disaster than we have encountered before."

### Immediate Response on Many Fronts

The NIEHS went into action shortly after Katrina hit. On August 31, the day after the New Orleans levees broke, Joseph "Chip" Hughes and the team he directs at the NIEHS Worker Education and Training Program (WETP) developed a PowerPoint safety awareness training primer for first responders and posted it on the NIEHS website. The group had produced 11 versions of the primer by October 27, updated as the scope of the disaster unfolded to include information on such health threats as trench foot, waterborne diseases, and mold. The primer—available in English, Spanish, and Vietnamese (since there are many Vietnamese in the Gulf Coast region)—has been downloaded at least 1,600 times, and more than 35,000 printed copies have been distributed. The WETP team has also delivered hands-on hazards training to federal employees and federally employed contractors in the field in Mississippi, Louisiana, Alabama, and Texas.

Just as human health was at risk, so was that of the animals left stranded by the hurricane. Starting September 7, William Stokes, director of the National Toxicology Program (NTP) Interagency Center for the Evaluation of Alternative Toxicological Methods, who also serves as the chief veterinary officer of the U.S. Public Health Service, headed the federal effort to assist with the rescue and shelter of those animals. Stokes led an initial team of 10 veterinarians and a public health nurse whose number quickly doubled to meet the overwhelming needs of two emergency animal shelters, one located on the Louisiana State University Baton Rouge campus, and one at a livestock exposition center in Gonzales.

The shelters' residents included carriage horses from New Orleans, a pet alligator, an eight-foot-long python, pot-bellied pigs, birds, turtles, and a variety of other pets. A total of 35 Public Health Service veterinarians and countless volunteers examined and treated more than 5,000 creatures, inserted identifying microchips, took photographs, and moved many of the

animals out to other shelters to await their owners.

"In addition to keeping all of these animals healthy, our goal was to ensure that as many as possible were returned to their owners in order to avoid further stress from the pet loss on top of all their other losses," says Stokes. He adds that in the future, he hopes evacuation policies will allow for animals to accompany their owners.



**Saving man's best friends.** Bill Stokes and a team of vets and volunteers helped stranded pets.

### Meeting of the Minds

As the extent of the disaster unfolded, the NIEHS continued to send out experts to assist other federal agencies. Mary Wolfe, director of the NTP Office of Liaison and Scientific Review, was sent to CDC headquarters in Atlanta for five days in mid-September to help assimilate field data from teams along the Gulf Coast who were assessing emerging health threats. Sam Arbes, an epidemiologist in the NIEHS Laboratory of Respiratory Biology who studies the health effects of mold, went to Baton Rouge with a CDC team to prepare a document that helped local and state officials assess environmental damage and public health issues as they planned for re-entry of residents and restoration. The document addressed public health issues associated with drinking water, sewage disposal, roads and transportation, toxic exposures, housing, and schools, among other things.

NIEHS-funded environmental health sciences centers also swung into action. Immediately after the hurricane, Schwartz asked the center directors to work collaboratively to define the research questions that would surround the effects of the hurricane and the recovery of the population. Five working groups within the centers



**At the ready.** NIEHS staff came soon after Katrina hit to help at a 500-bed field hospital in a Meridian, Mississippi, hangar.

program addressed issues of worker surveillance and health, water quality and microbes, water quality and chemical contamination, mold and respiratory consequences, and outreach and education for the affected populations. The groups have since provided Schwartz with a critical assessment of the research questions that could be addressed.

Some action has begun. Staff from the centers' Community Outreach and Education Programs have banded together to create educational and outreach materials about the hazards that the populace may find in their homes [see "COEPs Contribute to Hurricane Relief," next article]. Centers will also be conducting pre- and postdeployment blood sampling and analysis of New York City firefighters deployed to help the relief efforts in New Orleans. And key experts from the centers have been invited by groups such as the American Red Cross to consult on environmental problems in the region that arose from the storms. They have done some sampling of water, molds, and sediment in the region.

Back home, institute staff developed an NIEHS Natural Disaster Response website to disseminate information to workers and residents about conditions in the Gulf Coast [see the EHPnet article, p. A27 this issue]. Deary acted as a liaison with call centers set up by the NIH and the CDC, providing information on human and environmental health issues to pass along to callers. The call centers ini-

tially took calls just from health care providers, state and local environmental and health agencies, clinics, and other providers, but were soon opened to calls from the public as well.

### Long-Term Study of Environmental Health Risks

Some of the NIEHS disaster response efforts are unique programs that will help identify the environmental hazards produced by Katrina as well as provide long-term insights into the link between environmental toxicants and health outcomes. For example, the NIEHS website features a geographic information system (GIS) database that is designed to help expedite cleanup efforts, but which can be continually developed and updated as a tool to track environmental health.

Led by William Suk, director of both the NIEHS Center for Risk and Integrated Sciences and the Superfund Basic Research Program, the GIS overlays maps and high-resolution aerial photography of Texas, Louisiana, and Mississippi with a wealth of demographic, hydrographic, infrastructure, and industrial/agricultural data from publicly available sources. With the assistance of NIEHS academic partners at Duke University and the University of California, San Diego, supercomputing center, the interactive maps pinpoint the location of Superfund sites (four in New Orleans alone), scores of Toxics Release Inventory-reporting sites (those that release toxic contaminants), and the hundreds of oil and gas

rigs, gas stations, chemical industries, refineries, and crude petroleum and natural gas operations in the Gulf Coast region.

Information now being collected on water and air sampling in the area will be added as a way to model the movement of contaminants and identify sources of human exposure. For example, one-quarter of the areas sampled by the EPA in New Orleans by late September showed benzene levels that were more than twice the NTP intermediate safety level. And there were hundreds of reported oil and toxicant spills—including gas that may have seeped from an estimated 350,000 swamped cars—as well as drowned industrial and toxic waste dumps. Suk and his team of institute scientists and academic partners are working 14 to 20 hours a day to pull in data from federal agencies such as the EPA, the CDC, and OSHA in order to create what he calls a "national model that can track environmental health, both for the short-term use of responders and cleanup crews and long-term assessment of health consequences." The model is available on the NIEHS Natural Disaster Response website.

Among the resources they are tapping are the Centers for Oceans and Human Health, supported jointly by the NIEHS and the National Science Foundation. The four centers have been sampling and analyzing floodwaters from New Orleans, and received \$150,000 in National Science Foundation "rapid response" funding to collaboratively investigate the health of Lake Pontchartrain, into which 100 billion liters of New Orleans floodwater has been pumped. Researchers at these centers will sample and document the presence, abundance, and fate of waterborne pathogens such as *Escherichia coli* and *Vibrio vulnificus* (which produces a cholera-like infection and is already responsible for deaths in the area) as well as heavy metals and other toxicants in the pollution plume entering Lake Pontchartrain and beyond. They will also monitor the development of harmful algal blooms that could result from matter pumped into the lake. The information will then be linked to the GIS database.

Frederick Tyson, who administers the Centers for Oceans and Human Health program, says, "We have galvanized the talents we have to give us important answers to a public health crisis that is happening right now and that will impact public health in that region." Suk adds that Katrina has offered "an experiment that no one wanted but which we now have in place to study real problems that will allow us to gain a better understanding of environmental health risks." —Renée Twombly



**Rebuilding safely.** The NIEHS WETP has developed a primer to guide construction and cleanup workers in rebuilding the Gulf Coast in a safe manner.

## BEYOND THE BENCH

## COEPs Contribute to Hurricane Relief

The conditions in Louisiana and Mississippi following Hurricanes Katrina and Rita reminded us all of our commonality in the human experience and moved many to help. Among those moved to help were the staff at the Community Outreach and Education Programs (COEPs) of NIEHS Centers across the country. Responding to communities in need is one of the primary functions of the COEPs, so providing outreach to those areas on the Gulf Coast impacted by the hurricanes seemed a natural step to take.

“When our director volunteered our COEP [to lead efforts], we remarked that if COEPs had never existed, they would have had to be invented on August 28,” says Pamela Diamond, director of the NIEHS Center COEP at University of Texas Medical Branch (UTMB) in Galveston. Adds Robin Fuchs-Young, director of the COEP of the Center for Research on Environmental Disease at the University of Texas, M.D. Anderson Cancer Center (UTMDACC), “All of us saw what was happening on television and felt compelled on a human level to help in whatever way we could.”

### A Helping Hand

Says Diamond, “Most of the community outreach directors and staff across the country knew one another and trusted one another, and we could quickly organize a response. It was quite a pickup operation—cell phone calls, e-mails in the middle of the night. During our own evacuation due to Hurricane Rita, we sat on [Fuchs-Young’s] back porch, planning supply deliveries, editing public service announcements [PSAs], and identifying scientists in distant states to provide reliable information and data for flyers.”

Two teams from the UTMB COEP were dispatched in early October with different objectives. One team, led by Diamond, connected with shelters in rural LaFourche Parish and delivered humanitarian supplies including first aid equipment, diapers, and drinking water. The other team covered a wider range including Calcasieu, Jefferson, Orleans, Terrebonne, and LaFourche Parishes, as well as Baton Rouge and New Iberia and Port Arthur, Texas, to contact community-based environmental organizations whose operations had been disrupted by the hurricanes. These groups were asked how the events had disrupted their normal functions, what environmental damage they observed, what they saw as the greatest environmental threats facing residents on re-entering impacted areas, and how they could

unite their skills and networks with scientific and clinical expertise. These interviews were compiled in a DVD format and are being sent to the directors of each COEP and interested personnel at the national level.

The UTMB COEP is also collaborating with the Louisiana Environmental Action Network in funding the preparation and delivery of re-entry hazard protection kits for residents involved in recovery operations. These kits focus on mold and toxic residue hazards and—along with information prepared by the NIEHS, the Centers for Disease Control and Prevention, and the Federal Emergency Management Agency—aim to mitigate citizen exposures.

### Education for the Re-entry Process

The COEPs also recognize that the devastated areas will need resources to help them deal with the long-term environmental aftermath of the hurricanes. Soon after Katrina hit, reports indicated high levels of arsenic and lead in the floodwaters and severe mold contamination. The programs joined forces to provide long-term outreach, and divided into areas of strongest expertise to develop fact sheets offering clear, useful information for citizens in the affected areas.

“The strong desire to return families to their homes and to rebuild neighborhoods needs to be balanced with care to do things right,” says Ruth Woods, program administrator of the Center for Child Environmental Health Risks Research and the Pacific Northwest Center for Human Health and Ocean Studies, both at the University of Washington (UW). “Environmental cleanup needs to be a high priority so that people are not made ill from [environmental exposures].”

The COEPs from UW, the Kresge Center for Environmental Health at Harvard University (in conjunction with Columbia University), the University of Iowa Environmental Health Sciences Research Center

(EHSRC), and the Wayne State University Environmental Health Sciences Center in Molecular and Cellular Toxicology with Human Applications have developed fact sheets addressing various elements of returning home safely. Topics include lead and arsenic contamination from floodwaters, mold hazards, and safe cleanup procedures.

Some of the fact sheet material is based on Katrina-specific studies. Peter Thorne, director of the University of Iowa COEP, says members of his group have collected air and surface samples from water-damaged homes in New Orleans. One study showed that the mean airborne endotoxin concentration was 200-fold higher than in nonflooded homes, and levels of airborne mold spores were so high that N95 respirators—devices with a filter efficiency of 95%—are inadequate protection. Thorne says the fact sheets his working group created describe mold hazards and instruct residents on precautions necessary for safe re-entry and cleanup.

To date, the COEPs have distributed more than 67,000 flyers to local leaders in the storm-damaged area. “We are hoping that other . . . COEPs have information on the same or other topics that can be developed into flyers,” says Lisa Pietrantoni, project coordinator for the Wayne State COEP.

What was particularly gratifying about the flyer effort was how clearly the flyers were needed. “I often encountered someone in a shelter who told me they had mold re-entry flyers,” says Diamond. “When we looked at them, they were the flyers that had been created at UW or Wayne State, . . . copied by shelter workers, and passed down the line.”

The COEPs are also using PSAs to get safety information out to residents. The program at the University of New Mexico Center for Environmental Health Sciences produced six PSAs on topics such as safe cleanup methods, water safety, and toxics, and is working with American Forum, a



**Pitching in.** Center staff stepped in at several points, including taking water samples (left, at the 17th Street Canal) and helping area victims sign up for assistance and humanitarian aid (above, at the LaRose community shelter).

nonprofit media company, to disseminate them to over 3,000 radio, television, and print media outlets in the Gulf Coast area. The UTMDACC COEP is developing PSAs for especially susceptible groups of people, including immunocompromised patients. Still more PSAs may be developed to target specific regional issues and incorporate data that emerge from environmental health studies being conducted. Spanish-language PSAs might also target workers doing the repairs and rebuilding.

### More to Be Accomplished

At the NIEHS Core Centers Annual Meeting held this fall at the Vanderbilt University Center in Molecular Toxicology, COEP staff discussed their outreach efforts and looked ahead to some next steps, such as community forums, town hall sessions, and continued data collection. They concluded that there is still much environmental health aid these towns and cities will need.

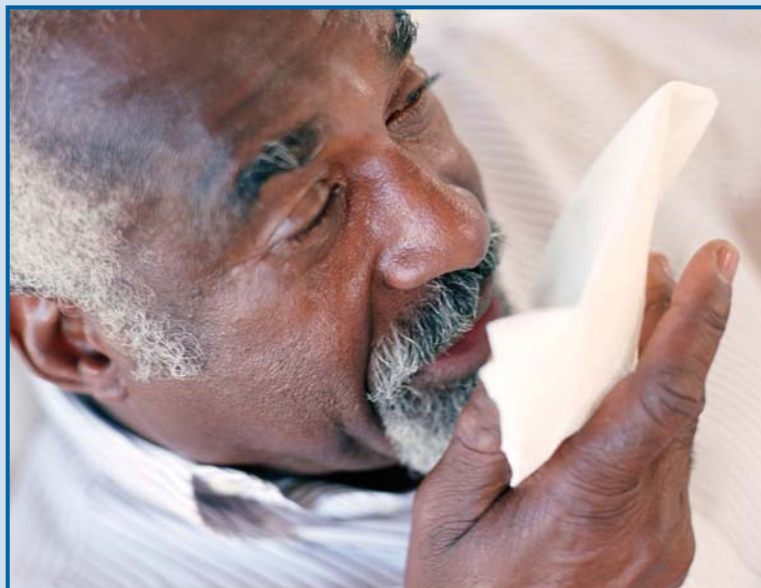
One potential partnership that could help the COEPs offer some long-term solutions is the Katrina Environmental Research and Restoration Network (KERRN), a vision conceived by John McLachlan, director of the Center for Bioenvironmental Research at Tulane and Xavier Universities in New Orleans. According to McLachlan, KERRN is “a network of researchers sharing data and ideas, crossing disciplinary, geographical, and institutional boundaries, providing models to respond to and recover from major environmental disasters.” The network, funded by a grant from the National Science Foundation, could be a great help for the residents in the affected area. As Fuchs-Young notes, “Folks in the Gulf Coast want science and data. They want to know what’s going to happen to their water supply and wetlands, and what will be the effect of flooded toxic waste dumps on their lives and livelihoods.”

The communities located throughout the Gulf Coast have a long road ahead of them. There is no question in the minds of most that they can and should rebuild; many have lived in this area for generations, and don’t want to change their way of life. But environmental health experts caution that much care must be taken because of the health threat that contaminants like mold can pose. States Thorne, “There remains extensive remediation work [in the Gulf Coast area] that will expose residents and contractors to mold hazards. The potential for allergy, asthma, and lung infections is high due to the enormous concentrations encountered. It is critically important that residents of Louisiana and Mississippi are protected from these exposures.” –Tanya Tillett

## Headliners

NIEHS-Supported Research

## Immune Response



### Lead Disrupts T Cell Function

Farrer DG, Hueber SM, McCabe MJ Jr. 2005. Lead enhances CD4<sup>+</sup> T cell proliferation indirectly by targeting antigen presenting cells and modulating antigen-specific interactions. *Toxicol Appl Pharmacol* 207:125–137.

Although lead has been banned from use in products like house paint, gasoline, and water pipe solder in the United States, it is still present in older housing, and is used in products in other countries. Besides its widely studied neurotoxicity, lead is also a well-known immunotoxicant, though little is known about its mechanism of action. Now NIEHS grantee Michael McCabe and colleagues at the University of Rochester have discovered how lead may work to disturb T cell function in the body.

Previous studies have suggested that lead’s immunotoxic effects may occur at exposures even lower than those required for neurotoxicity to occur; thus, suboptimal immune function may affect people who do not even realize they have been exposed to lead. Older adults and lactating, pregnant, and postmenopausal women are at greater risk for lead exposure as lead stored in the bones is released back into the blood and soft tissues. Children are also at heightened risk for lead exposure because they engage in more hand-to-mouth activity and absorb a larger proportion of ingested lead across the intestinal epithelium than do adults.

The Rochester researchers used flow cytometry to analyze T cell division in cell cultures derived from lead-treated mice. T cells help regulate the body’s immune system by attacking bacteria, viruses, foreign tissue, and tumor cells. At day 4 of treatment, the frequency of proliferating T cells was much greater in treated than in nontreated cultures. Lead appeared to target a type of cell known as antigen presenting cells, and its effect was based on specific peptide-major histocompatibility complex conjugate. The results suggest that lead may pose even more long-term health threats than originally thought. –Tanya Tillett