UC San Diego Leads Team To Build Geographic Information System To Assess Toxic Hazards From Hurricane Katrina

October 5, 2005

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Researchers at the University of California, San Diego have been awarded $760,000 from the National Institute of Environmental Health Sciences (NIEHS) to build a Geographic Information System (GIS). This system will link to the NIEHS Hurricane Katrina Information Website, providing workers in the field and researchers with up-to-date information regarding toxicant exposure and human health.

The supplemental grant was awarded by the NIEHS to the UCSD Superfund Basic Research Program (SBRP), directed by Robert Tukey, Ph.D., professor of pharmacology, chemistry and biochemistry in the UCSD School of Medicine. The SBRP was first funded with $15 million in 2000, and received a five-year, $17.2 million renewal of this grant from NIEHS in April of this year.

"We are proud to be one of the academic partners around the country working with NIEHS," said UCSD Chancellor Marye Anne Fox. "The situation in the Gulf has affected thousands of people, and we have a responsibility to apply our research capabilities towards helping to understand the long-term impact on human health of the recent devastation."

In the aftermath of Katrina, the need for a user-friendly web-based portal, including an on-line, interactive GIS system coupled with high-resolution visualization tools immediately became clear.

"Within days of the hurricane hitting New Orleans and the Gulf Coast, we realized that a one-stop shop for data, knowledge and tools would be valuable to research scientists who needed data for analyzing immediate and long-term impacts of environmental stressors on human health," said Tukey, Under direction from Dr. David Schwartz, Director of the NIEHS and Dr. William Suk, Director of the Superfund Basic Research Program at NIEHS, Tukey called together a team of GIS experts including Mark Ellisman, Ph.D., Professor of Neurosciences and Bioengineering and Director of the National Center for Microscopy and Imaging Research as well as the Superfund Imaging Core; Eric Frost, Ph.D., from UCSD's California Institute for Telecommunications and Information Technology and San Diego State University's Visualization Center, a world-class operation assembling large-scale images of the planet; and Marie Lynn Miranda, Ph.D., Director of the Children's Environmental Health Initiative, Nicholas School of the Environment and Earth Science at Duke University.

The team participated in several Katrina disaster conference calls organized by the NIEHS in which they elaborated on a vision to provide guidance and support in developing the agency's Web-based portal. Goals had been set by the NIEHS to assess human exposure to toxicants in the immediate aftermath of the storm; evaluate the potential for future exposure and determine how to best reduce or eliminate it; and establish programs to monitor human and environmental health impacts over time.

To meet these goals, the UCSD team realized the need to enable secure, collaborative data sharing. Using leading-edge information technologies developed at the National Center for Microscopy and Imaging Research, Web portals could be constructed with advanced capabilities for collaborative data analysis (collectively referred to as Telescience.) These Telescience tools would provide a rapid mechanism by which to coordinate the various

computational resources and integrate them with the data and visuals already being put together at the NIEHS Web site

Within two weeks of the hurricane, the team had begun assembling the technical framework to help NIEHS realize its goal of serving as a national resource to track environmental hazards and focus various medical and environmental responses in areas of greatest need. Subsequently, UCSD sought funding from NIEHS for implementation of the hardware, software and personnel necessary to continue building the technical infrastructure of the GIS.

Led by researchers at UCSD, the GIS builds upon collaborations among interdisciplinary teams of scientists at UCSD, Duke and San Diego State University. As the storm approached, Frost and John Graham, Senior Research Scientist at SDSU, began acquiring satellite images making it possible to generate, with high-resolution aerial photographs, pre-and post-disaster images of those areas impacted in Louisiana, Mississippi and Alabama. The GIS will contain these aerial maps along with layers of data - including the locations of refineries, oil pipelines and industrial facilities, toxic release inventory data - as well as maps and satellite images of schools, neighborhoods and medical facilities. The information will then be overlaid with demographic information on local populations.

"We will bring on line 40 terrabytes of storage capability. To put this in context, all the texts in the Library of Congress would equal about 20 terabytes of information," said Tukey. "For instance, we can pinpoint what parts of the city have potential contamination from lead-based paint based on the age of homes. Or we can map the location of schools, and determine if they are in proximity of pesticide plants, and identify the contaminant risk for those children."

The team's approach builds upon experience garnered by the SBRP Outreach Core over the past five years. Under the direction of Keith Pezzoli, Ph.D. of UCSD's Urban Studies and Planning Program, the Outreach Core has developed and maintained a functional GIS, gathering data on environmental issues in the San Diego/Tijuana region.

Consolidating the data and ongoing evaluation of biohazards in the broad area impacted by Hurricanes Katrina as well as Rita over a five-state area will involve hundreds of experts from around the country. NIEHS will gather input from SBPR scientists nationwide, the Center for Disease Control, the Environmental Protection Agency, the Red Cross, and other government agencies, first responders, public health officials, industry and community-based groups.

"With a disaster of this magnitude, people need many things, including easy access to science-based information, so they can make informed decisions to reduce their risk of harm from contaminants," said NIEHS Director Dr. David Schwartz. Schwartz anticipates that "the website will serve as a national resource to track environmental hazards and focus medical and environmental responses where they are needed most."

The NIEHS Hurricane Katrina Information Website is accessible at http://www-apps.niehs.nih.gov/katrina/ For more information about the Superfund research projects, see the UCSD Superfund Basic Research Program website http://superfund.ucsd.edu/.

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