Beating bioterrorists

Experimental program part of new early warning system to combat bioterrorism

By Judith Graham and Ronald Kotulak
KRT CAMPUS

Government analysts have begun scanning the United States daily for the first signs of a bioterror attack by monitoring enormous databases that include over-the-counter drug sales and common ailments reported in hospital emergency rooms.

The experimental high-tech program is part of a new effort to develop early warning systems for imminent public health crises and is analogous to those that scan the skies for a missile attack.

Although supporters of the effort, including top Bush administration officials, believe stepped-up surveillance is crucial, critics say the concept is largely untested and likely to impose new burdens on an already overstretched public health system.

BioSense, run by the Centers for Disease Control and Prevention, quietly began operating late last year. It is designed to pick up signals of potential health emergencies as close to the onset as possible.

Instead of relying on confirmed medical diagnoses, the program focuses on symptoms such as fever, rash, diarrhea or nausea, searching for unusual patterns or clusters.

Eventually, the system will scan a wide variety of information sources for signs of possible disease outbreaks, from school absenteeism rates to sharp spikes in doctors' visits.

The program joins BioWatch, a network of air sensors in 31 cities that are sniffing for toxic substances, and a new CDC program to electronically track illness outbreaks across the country.

Meanwhile, scientists are in a race to supplement large, stationary monitors with the first generation of handheld sensors that can quickly identify anthrax and other bacteria or viruses that might be used in a bioterror attack.

Researchers in Chicago and England are working to make such devices available in one to two years. They will be a hybrid of electronics and biology, housing electronic chips studded with antibodies to microorganisms that cause disease.

Uniting these developments is a push to use cutting-edge technology to more rapidly identify and respond to threats to public health, whether from bioterrorism or emerging infectious diseases such as SARS, said Dr. John Loonsk, associate director for informatics at the CDC.

Visionaries talk of a national "public health information network," a vast invisible web of real-time health data, like weather data. But whether this is feasible has yet to be determined.

Thousands of clinics, hospitals, doctors' offices, pharmacies, labs, public agencies and responders would have to be hooked up to the network, a task the CDC readily acknowledges is monumental.

The proposed 2005 federal budget allocates $130 million to BioSense and calls for doubling the size of BioWatch.

Chicago is monitoring ambulance dispatches, complaints recorded in hospital emergency rooms and symptoms patients display at physicians' offices across the city, said Dr. Pamela Diaz, director of emergency preparedness for the Chicago Health Department.

For all the appeal of high-tech solutions, alert doctors who pick up the phone when they see something unusual may be even more valuable, she suggested.

Less controversial is the National Electronic Disease Surveillance System, another high-tech CDC initiative. More than a dozen states are participating, including Illinois, which rolled out the first part of its electronic disease system last month.

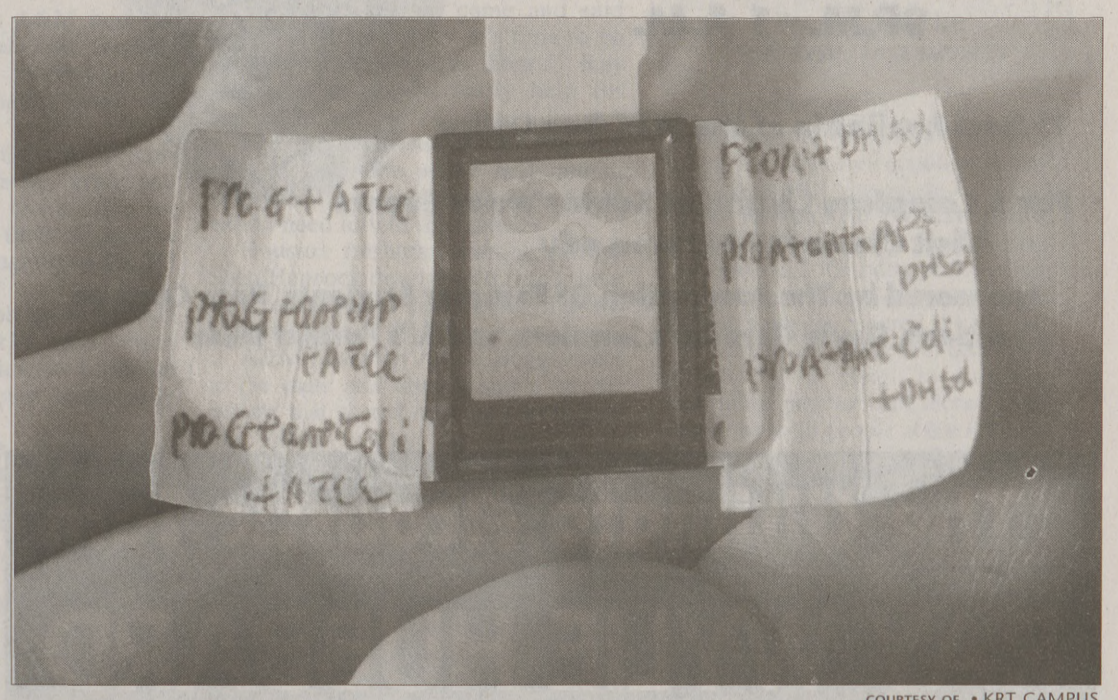
Illinois' system focuses on diagnosed health conditions that are reported to local and state public health agencies, from measles and mumps to meningitis and AIDS.

It works by replacing paper forms that medical providers routinely send to public health departments with electronic forms transmitted over secure Internet connections.

Sophisticated analytical tools are built in, making it possible to examine disease trends by county, city or ZIP code.

Meanwhile, scientists are working on handheld devices that can be used to check for specific viruses or bacteria that could be spread through bioterrorism. The key to the new devices is the use of antibodies, proteins in the body that hunt down and identify specific bacteria or poisons.

"Because these use the same recognition systems as living sensors, we can tell in real time whether there has been an attack," said Carl Mayers of the Defense, Science and Technology Laboratory in Salisbury, England. He reported his findings recently at the meeting of the Society for General Microbiology in Bath, England.



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Jenna Zhang, a chemistry graduate student at Illinois Institute of Technology, holds a computer chip that she helped adapt to detect single-cell bacteria.

Initially intended to defend against biological warfare agents, the devices are expected to also find wide application in identifying germs that make people sick.

"Many more people around the world die of undiagnosed and untreated diseases than die of terrorist attacks," said chemist William Penrose, a member of the Illinois Institute of Technology team developing a handheld detector. "Tuberculosis, for example, is the leading cause of death around the world, next to malaria. An inexpensive, handheld scanner that could be used to seek out tuberculosis patients in remote locations could be used to identify infected people early, in time to start drug treatment or, at the very least, to prevent the disease from spreading."

The new handheld instruments will probably cost less than $2,000, both Penrose and Mayers said.

"This portable device can instantly detect a variety of dangerous agents in the field through an instrument no larger than a typical hand-held computer," said IIT chemist Joseph Stetter, leader of the research team.

The IIT device uses a postage stamp-sized electronic chip. Antibodies against a variety of different germs are studded on the surface. Germs and toxic chemicals stick to specific antibodies and are quickly identified.

Antibodies — grown in animals or bacteria — are placed on small gold plates and exposed to samples suspected of containing harmful agents. A laser beam flashes over the plate. Any germs caught by the antibodies reflect the laser light in a specific pattern, quickly revealing their identity.