The Mercury News
MercuryNews.com

Business
Posted on Tue, Dec. 07, 2004

Chip planned to protect water from terror attack

By Glennda Chui
Mercury News

Two companies agreed Monday to spend millions of dollars developing a tiny device to stand guard over water systems, detecting germs or toxins from terrorist attacks.

It's based on a lab-on-a-chip invented at Sandia National Laboratory in Livermore. The chip of glass, about the size of a nickel, is etched with channels no wider than a human hair through which water samples flow for analysis.

The lab was developed as a way for police, firefighters and other emergency workers to quickly identify germs or chemicals at the scene of a terrorist attack. Even with its 10,000-volt power supply attached, it fits in one hand and weighs less than three pounds.

Now the challenge will be to adapt the lab to the rough-and-tumble world of water systems, where it would sit in reservoirs or pipes for a month at a time, sipping the water and reporting the results to a central control room.

An agreement signed Monday between Sandia and two companies, CH2M Hill of Colorado and Tenix Investments of Australia, calls for a prototype to be developed and tested within six months. Field tests will take place at Contra Costa Water District facilities.

The two companies will provide tens of millions of dollars over the next decade for research aimed at turning the device into a viable product. The exact amount of funding is proprietary, said Matthew Simmons, manager of technology commercialization at Tenix.

In return, they'll have exclusive rights to license any resulting product for six to 12 months after the agreement ends. The federal government keeps the rights to any patents.

Tenix, which is Australia's largest defense and technology contractor, will also contribute expertise on integrating systems. CH2M Hill, an engineering and

construction firm, brings decades of experience with water and sewage systems to the deal.

``The water infrastructure in many places in this country is very open, highly vulnerable,'' said Peter Davies, director of Sandia's Geoscience and Environment Center.

There are more than 55,000 public water agencies in the United States that draw water from 300,000 wells and 10,000 surface water supplies, said Bruce A. Macler, an expert in microbial risks for the Environmental Protection Agency in San Francisco.

They also operate thousands of miles of pipelines and hundreds of thousands of storage tanks.

``These are all places someone could attack if they so pleased,'' Macler said. ``To try to protect this kind of infrastructure is extremely daunting.''

Adding to the problem, many water systems are small and strapped for cash, he said. There is no law requiring them to install sensors for detecting contamination.

So any device would have to be cheap, accurate and reliable -- and good for more than detecting terrorist acts, Macler said. It would have to allow a water system to run more efficiently, reduce costs and make more money.

And there are many technical problems to overcome, he said -- such as the tendency of any equipment that is deployed in water to gunk up, over time, with microbial material or salts.

In addition, the water in each system is unique, with its own mix of background chemicals and microbes that must be distinguished from harmful contaminants.

Researchers said they would be testing the new system, from the start, on samples of water drawn from about 20 large water systems throughout the state.

``It's not just the terrorist attack that we're all worried about,'' said Yolanda Fintschenko, manager of microfluidics at Sandia. ``There are day-to-day threats we face, nationally and around the world, from naturally occurring pathogens,'' such as the cryptosporidium parasite that sickened 403,000 people and sent 4,400 to the hospital in Milwaukee in 1993.

The first phase of the project will focus on detecting poisons, such as ricin and the toxin responsible for botulism, Fintschenko said.

Then it will move on to detection of viruses, bacteria and parasites, she said. Eventually, the device could store the unique chemical signatures of hundreds of thousands of potential contaminants, allowing it to identify anything from pesticides to smallpox bacteria within minutes.

Labs on a chip, known as microfluidics, have been under development for a decade, with companies such as Caliper Life Sciences selling systems for use in pharmaceutical and genome-related research.

But Tenix's Simmons said this is the first attempt to develop unattended sensors for water systems.

``The intent really is that this is step one of a multi-step process,'' he said. ``We'll be improving on this technology for a decade or two.''

Contact Glennda Chui at gchui@mercurynews.com or (408) 920-5453.