

## ANALYSIS

to combat biological warfare agents is a "high priority within the Department of Defense," says Stephen Morse, a program manager at DARPA and a specialist in emerging infectious diseases.

"The field is poised for a revolution, and we are looking for high impact research projects." The program represents a "unique opportunity for researchers in the United States," adds Shaun Jones, director of the unconventional pathogens countermeasures research program at DARPA.

Morse, Jones and several other representatives of the seven-member biological warfare defense research group at DARPA outlined this expanding program during the American Society for Microbiology meeting, held in Miami Beach, FL, May 4-8. They unabashedly use the term "DARPAesque" to define the high degree of technical risk they deem a vital component of research aimed at reaching those goals. DARPA is supporting research that other federal agencies would probably not fund because it is too "audacious" or belongs to the "lunatic fringe," they say.

"We want a magic bullet that will work broadly against pathogens," Jones says. "We're looking at common target mechanisms . . . to create fundamental new therapeutics." He points to research directed by Ronald Taylor at the University of Virginia (Charlottesville, VA) in which "heteropolymer-decorated" red blood cells effectively remove simulated viral pathogens from blood as an example of a "DARPAesque" project.

In this spirit, Jones and other DARPA officials are encouraging biotechnology companies to join in these ventures, promising minimal red tape and a chance to share in the \$36.7 million budget for the agency's biological warfare, defense-related, research program during fiscal year (FY) 1998 (\$42.1 million in FY 1999). "We're interested in teaming up someone with great ideas with commercial partners," Morse says. "We want to end up with useful products, not prototypes in a museum."

DARPA awards to researchers at companies and universities have ranged from \$200,000 to about \$2 million. The entire DARPA-supported program is being (and will be) done extramurally, and none of it involves classified projects.

Jeffrey L. Fox



Larry Lynn, director of DARPA.

## US military takes up phytoremediation

The US Environmental Protection Agency (EPA; Washington, DC) and the US Department of Defense (DoD; Arlington, VA) have joined forces to develop plant-based approaches for cleaning up soils and water at hazardous waste sites, and the EPA is now seeking industry partners to help develop and support this technology.

In May, DoD and EPA officials gathered at the US Naval Air Station Joint Reserve Base Fort Worth (Fort Worth, TX) to show off plantings of cottonwood and other trees on a site containing ground water contaminated with trichloroethylene (TCE). The trees, ranging from saplings to maturer specimens with 4-inch diameter trunks, efficiently take up ground water and can decontaminate the TCE-containing plume. "We want to stop the plume dead in its tracks," says the EPA's Philip Sayre.

But researchers on the project have yet to determine just how the cottonwood trees act on the TCE dissolved in the shallow aquifer beneath them. They expect some combination of passive uptake, entrapment, and transpiration, along with active metabolic degradation by tree enzymes and possibly also by microorganisms associated with the tree root systems. Besides tracking the fate of TCE, investigators will also assess the cost effectiveness of this approach for decontaminating ground water. Numerous holes have been drilled to extract water samples, and expensive analysis equipment has been bought. "We have a 29-well array, and we're putting a lot of money into instrumentation and chemical analysis [of TCE]," says Greg Harvey of Wright-Patterson Air Force Base (Wright-Patterson, OH), who is part of the

Air Force team working on the TCE project.

Preliminary evidence suggests that after the end of the first growing season, some tree roots have already penetrated to the capillary fringe of the aquifer, Harvey says. This could mean that deep and expensive planting techniques such as auguring may not be necessary. DoD will spend \$600,000 under its Environmental Security Technology Certification Program, the Air Force another \$400,000, and EPA about \$600,000 to see this project through completion.

The EPA is sponsoring similar phytoremediation-based Superfund Innovative Technology Evaluation (SITE) projects in at least four US locations, reflecting a recent shift from a "technology-driven focus to a more integrated approach driven by the needs of the waste remediation community," according to Walter Kovalick, director of the Technology Innovation Office, which was set up by the Office of Solid Waste and Emergency Response to apply technology to the remediation of contaminated waste sites, soil and groundwater. The SITE program is now emphasizing "low-cost technologies, partnerships, and resource leveraging."

Together with other federal agencies, such as the US Geological Survey (Reston, VA) and with industry, the EPA is also supporting phytoremediation efforts through its Remediation Technology Development Forum. The forum operates by establishing "self-managed action teams," in which representatives from universities and industry pursue joint field work and are funded jointly by the EPA and industry.

Jeffrey L. Fox

## Hemispherx: 300 patents, 20 staff

Last month, Hemispherx BioPharma (Philadelphia, PA) announced that it had received its 300th patent worldwide on its nucleic acid-based drugs. Hemispherx now holds one of the largest patent portfolios in the entire biopharmaceutical industry. Its 300 patents include 178 in Europe, 51 in the Pacific Rim, and 21 in the United States. Another 124 are pending worldwide. "If there is a patent office anywhere in the world, we go to it," says William Carter, CEO at Hemispherx. "We have 26 patents in

Japan alone. That's unheard of."

Why so many patents for a company with only 20 employees and single core technology? Carter, also Hemispherx's founder, believes that an extensive patent portfolio is the best way to raise capital, attract corporate partnerships, and compete in a global marketplace.

Indeed, Hemispherx has been able to raise over US\$112 million, "a very significant amount of money" says Carter. For investors, "the size and scope of our portfolio mitigates the risk," he says. The money spent on patents pays for itself.

Many of Hemispherx's compounds activate the body's normal immune defenses against viral diseases and cancer. Some of the latest technology to be patented is for treating

Ken Chahine is an attorney at Madison & Metcalf, Salt Lake City, UT ([chahine@mmlaw.com](mailto:chahine@mmlaw.com)).