

Bioterrorism detector adaptation

Instrument to detect tuberculosis

An instrument originally designed for detecting the malicious release of biological pathogens has potential for use in the public health sector to rapidly screen people for tuberculosis.

In experiments over the past year, a LLNL research team has used its system to detect a tuberculosis surrogate, even when it is coated with sputum and mucus-like substances.

They also were able to differentiate between two similar bacteria, distinguishing between a non-virulent strain of tuberculosis and a closely related bacterium, *Mycobacterium smegmatis*.

Their research, using a system called Single-Particle Aerosol Mass Spectrometry, or SPAMS, was described in the July 15 edition of *Analytical Chemistry*, a semi-monthly journal published by the American Chemical Society.

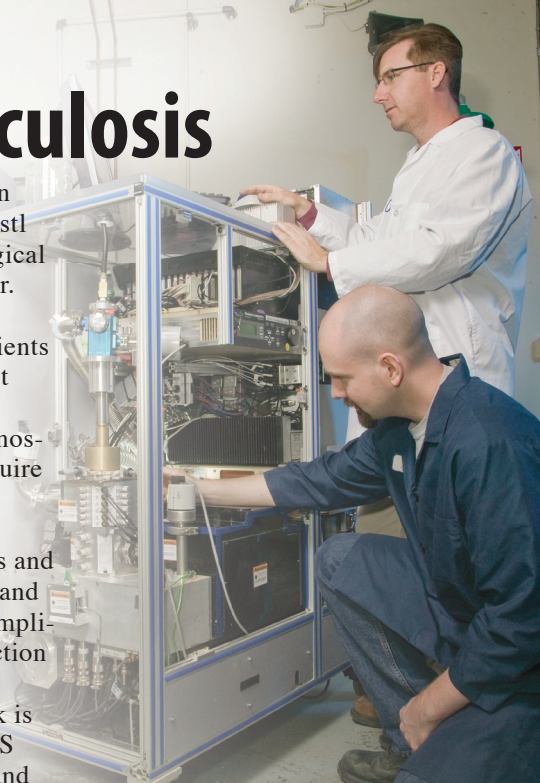
“Without reagents, we can rapidly detect a non-virulent strain of tuberculosis that is coated in sputum-like mate-

rials and we can distinguish between two similar mycobacteria,” said Kristl Adams, a LLNL postdoctoral biological physicist and the paper’s lead author.

There is no current method for screening potential tuberculosis patients within minutes, said LLNL physicist and co-author Matthias Frank, who added that the “gold standard” diagnostic tool of culturing samples can require days to weeks.

Other methods of diagnosing the disease, which each have advantages and disadvantages, are bacteria staining and counting in a sputum smear, DNA amplification using polymerase chain reaction and chest X-rays.

While emphasizing that their work is only a first step toward using SPAMS for tuberculosis diagnostics, Frank and Adams said they believe SPAMS potentially could detect the disease within five minutes using concentrated samples.



Physicist Paul Steele (kneeling) and chemist Keith Coffee make adjustments to the LLNL detection system known as Single-Particle Aerosol Mass Spectrometry, or SPAMS.

Site 300 environmental cleanup plan approved

The sitewide Record of Decision (ROD) for environmental cleanup at Site 300 has been signed by the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA), U.S. Environmental Protection Agency (EPA), State of California Department of Toxic Substances Control, and the Central Valley Regional Water Quality Control Board. Site 300 is the Laboratory’s experimental test facility, located in the foothills southwest of Tracy.

“The sitewide Record of Decision identifies the final cleanup actions and cleanup standards for Site 300,” said NNSA Livermore Site Office Manager Camille Yuan-Soo Hoo. “The selected remedies pro-

tect human health and the environment, comply with federal and state requirements that are applicable to the remediation actions, are cost-effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.”

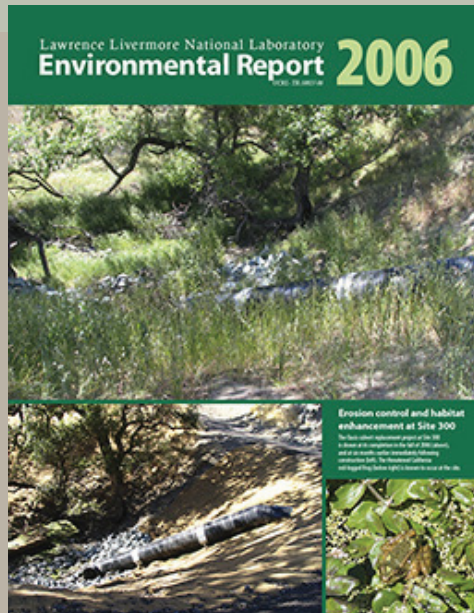
DOE began conducting environmental restoration activities at Site 300 in 1982 to address contamination primarily resulting from past waste handling practices. The EPA placed Site 300 on the National Priorities List (Superfund) in 1990. All cleanup activities since then have been conducted under regulations administered by the EPA and the State of California.

Significant progress has been made in the remediation of the site. Cleanup remedies have been implemented in many areas resulting in a reduction of groundwater contamination, removal of contaminated soil, and elimination of risk to on-site workers in many locations. The implemented cleanup remedies will continue to operate and be monitored in the future under the NNSA Long-Term Stewardship Program.

The ROD for Site 300 can be viewed on the Laboratory’s Environmental Community Relations website (<https://www-envirinfo.llnl.gov/>) and at the Tracy and Livermore public libraries.

Annual report finds no adverse impacts to environment

Environmental monitoring of operations at Lawrence Livermore National Laboratory in 2006 indicates no adverse impact to public health or the environment from Lab operations. The findings are presented



The LLNL Environmental Report for 2006 is available on the Web.

in the *Lawrence Livermore National Laboratory Environmental Report 2006*.

The report demonstrates LLNL's continuing commitment to providing responsible stewardship of the environmental resources in its care and the integration of environmental stewardship into strategic planning and decision making through the Lab's Environmental Management System.

The report assesses the impact of LLNL operations on the environment, summarizes regulatory compliance and records results of environmental monitoring for the main Laboratory site and for Site 300, the Laboratory's experimental test facility near Tracy. Environmental samples were taken from air, water, vegetation, wine, soil and wastewater on site and in surrounding communities.

In addition to environmental monitoring, the report documents the substantial actions the Laboratory has taken to comply with federal, state and local environmental laws, including

New Environmental Website

The Laboratory has made changes to its Environmental Community Relations website. The new website provides information on the Lab's environmental activities, including environmental protection and restoration and regulatory and permitting processes, along with other additional features. The new website can viewed at <https://www-envirinfo.llnl.gov/>.

the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, and National Environmental Policy Act, among others.

The complete *Lawrence Livermore National Laboratory Environmental Report 2006* may be accessed on the Web at <http://www.llnl.gov/saer/>. It also is available in the environmental repositories of the Livermore and Tracy public libraries.

Rare plant flourishes at Site 300

Once thought to be extinct for about 40 years, a rare plant has been anything but scarce this spring — at least in one location, Site 300.

The diamond-petaled California poppy was believed to have become extinct until it was rediscovered in 1992 in the Carrizo Plain in San Luis Obispo County by a botanist from Cal Poly, San Luis Obispo. Five years later, in 1997, botanical surveys, conducted to obtain background information for the 2005 Sitewide Environmental Impact Statement for continued operation of LLNL, led to the discovery of the second population of this species at Site 300.

In succeeding years, in 2002 and 2004, two small additional populations were discovered, also at Site 300, a 7,000-acre rolling grasslands area, southwest of Tracy.

These are the only locations in the world — LLNL's Site 300 and San Luis Obispo County's Carrizo Plain — where the diamond-petaled California



The diamond-petaled California poppy

poppy currently is known to grow. It has not been seen on the Carrizo Plain between 1995 and 2007.

Typically, the cumulative population of this plant at Site 300 includes less than 1,000 plants each year, according to ecologist Lisa Paterson, of LLNL's Environmental Protection Department. Paterson and her colleagues estimate that this spring the three remote populations at Site 300 contain between 8,000 and 10,000 diamond-petaled California poppies.

"This has been a great year for the poppy," Paterson said. "There have been close to 10 times as many plants this spring as in each of the previous 10 years of monitoring."

Paterson believes that Northern California's steady, even rainfall during this last year is the most likely explanation for the explosion of diamond-petaled California poppies, although she adds that she and others aren't certain that's the reason.

Since 1993, LLNL has had a program at Site 300 to monitor rare plant populations and study the ecological causes of rarity in these species.

"Once we have a better understanding of why these plants are rare, we hope to use this information to better manage and protect these extremely rare species," Paterson said.

A short-lived annual plant, the diamond-petaled California poppy started blooming this year at Site 300 in late March and continued blooming through the spring.

Tracy teacher brings world of science to classroom

When you peek inside Dean Reese's science classroom at Tracy High School, you may find it difficult to spot the teacher among the students. Casually dressed and interacting eagerly with the students, Reese blends in with his scholars.

Reese graduated from the University of Massachusetts at Amherst and heard about the Tracy position through a job fair in Braintree, Mass. He has been teaching physics and conceptual physics at Tracy High for six years. His goal is to teach science to students in a way that "will answer questions they may never have been able to understand before."

"I want the students to leave my classroom with a new perception of the world — viewing physics as a science that can be seen in their daily lives, not a mystery.

"Until it's been revealed and someone shows them, they will never know."

After becoming interested in the Laboratory's education programs through fellow Tracy High science teacher Kirk Brown, Reese completed LLNL's Teacher Research Academy, a program that is a joint collaboration of LLNL and the University of California, Davis.

The program offers a rigorous, four-step approach to introduce teachers to cutting-edge science. Each step, or level, builds upon the knowledge and skills developed in the previous step. The fourth and final level is a capstone six-week internship in a research laboratory at LLNL.

The academy provides teachers with access to the scientific community and shows them how to bring the real world of scientific research into the classroom. It also offers flexibility and can be tailored to the needs of individual teachers offering a scientific theme that interests them at level(s) at which they'll participate.

"I got to be a student again," Reese said about the program. "It was nice to experience ideas. It prepared me for new challenges." And, he had several challenges ahead.

Partnering with scientist Gene Berry last year, Reese presented a Science on Saturday lecture about LLNL's research on the hydrogen-powered automobile to a packed house at the Grand Theatre in Tracy. "It was exciting," he said. "It's science that's going on locally, and a hot topic."



Tracy teacher Dean Reese oversees his student, Vatsal Jhalani, in acquiring a mustard leaf sample to be analyzed.

Recently, Reese was accepted into the U.S. Department of Energy's Academies Creating Teacher Scientists (DOE ACTS) at LLNL, a three-year program for middle- and high-school teachers to involve them in hands-on learning activities in one of three fields: biotechnology and genetic engineering, fusion and astrophysics and energy technologies and the environment. Through this program, he is developing skills and knowledge that will prepare him to be a member of a research team.

Through the Teachers Research Academy, the internship and collaboration on the science lectures, Reese has established strong ties to LLNL. He has had the chance to work alongside Lab scientists that he calls "amazing." And, as a bonus, he brings back real science to his classroom.

"Teaching science is a way for me to open doors for students. I have a responsibility to prepare young generations to solve the problems we are facing today and encourage them to be proactive in how they live, realizing that in our world there are consequences to our actions," said Reese.

Tracy Teller Scholarship Winners

The 2008 Edward Teller Scholarship Awards are presented at the close of the school year by the Laboratory to Livermore and Tracy graduating high school seniors who have excelled in science. This year's Tracy recipients are Peter Wardell of West High School and Meera Punjiya of Tracy High School. The students each received a \$1,500 scholarship from the Laboratory toward their college education.

A reception in honor of Peter and Meera and their families was hosted by Congressman Jerry McNerney in June at Tracy City Hall. Congressman McNerney, along with Tracy Mayor Brent Ives, Superintendent of Schools James Franco, LLNL representatives, and the students' teachers, Kirk

Brown of Tracy High School and Randy Moehnke of West High School, congratulated the students and presented them with their awards.

Meera will attend Harvey Mudd College in Southern California, where she will study science. She participated all four years as a member of Tracy High School's Science Olympiad team and helped with Science Night, an evening event for local elementary school students. She also took part in National DNA Day, where she partnered with LLNL scientists to teach area fifth grade students about DNA.

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Tracy Teller Scholarship Winners

Mark Your Calendars

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Peter will attend UCLA. He has excelled in classes like Advanced Placement Physics and Chemistry Honors and graduated with honors from the Tracy Unified School District's Space and Engineering Academy. He also has participated in Project Greenlight, an energy efficient lighting program, the University of the Pacific's Engineering Day and Great America Physics Day.

The Edward Teller Scholarship Award is named in honor of the late Dr. Teller, renowned physicist and Laboratory co-founder who devoted his life to preserving freedom, pursuing new knowledge and passing along his passion for science and engineering education to students of all ages.



The 2008 Edward Teller Scholarship Award recipients Meera Punjiya of Tracy High and Peter Wardell of West High.

Science on Saturday in Tracy

LLNL's popular Science on Saturday lecture series will return to Tracy in November for two presentations at the Grand Theatre Center for the Arts.

Lectures are scheduled for Nov. 1 and 8, starting at 9:30 a.m. Admission is free; seating is on a first come, first-served basis.

The Grand Theatre is located at 715 Central Ave. in downtown Tracy. More information will soon be available at <http://education.llnl.gov/>.

Discover LLNL is a publication of the Public Affairs Office at Lawrence Livermore National Laboratory. For more information, please contact Linda Lucchetti, lucchetti1@llnl.gov, or call (925) 422-5815.

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