Scientists ID Bacterial Genes That Improve Plant Growth

**Findings could lead to new strategies for sustainable agriculture and biofuel production**

You might think that bacteria that “invade” trees are there to cause certain destruction. But, like the helpful bacteria that live within our guts, some microbes help plants thrive. To find out what makes these microbe-plant interactions “tick,” scientists at BNL decoded the genome of a plant-dwelling microbe they had previously shown could increase plant growth by 40 percent.

Their studies, published in the May 2010 issue of *PLoS Genetics*, identified a wide range of genes that help explain this symbiotic success story. The work could move the approach of using bacteria as growth-promoting agents one step closer to implementation for improved agriculture and biofuel production.

“To fuel and feed the planet for the future, we need new approaches,” said lead author Safiyh Taghavi of the Biology Department. “Biofuels derived from plants are an attractive alternative energy source, but many biofuel feedstock crops are in direct competition with food crops for agricultural resources such as land, water, and fertilizers. Our research is looking for ways to improve the growth of biofuel feedstock plants on land that cannot be economically used for food production. What we learn might also be put to use to increase the productivity of food crops,” she added.

The BNL team of Taghavi, Daniel van der Lelie, Adam Hofman, Yian-Zhao Buzz, Lee Newman, and Sébastien Moncy, all of BNL, Michael Walla, University of North Carolina; and Jacy Vangronsveld, University of Hasselt, Belgium, has been studying a species of bacteria isolated from the roots of poplar trees.

“Poplar is a model species for biofuel production, in part because of its ability to grow on marginal soils unsuitable for food crops,” said van der Lelie, who leads the research program. Previous studies by the van der Lelie-Taghavi group have shown that the bacterium

**See Plant Growth on page 2**
In Memoriam

François Hydén, who became an instrumentation clerk in the Technical Services Division on October 25, 1973, died on March 30, 2010. She was 86.

Clintond Coone, who joined the Lab on March 14, 1966, as a Cupertino project at the Administration Divi- sion, died on December 22, 1988, died on February 20, 2010. He was 66.

Hollis Fields, who joined BNL on April 21, 1947, with the life number of 605, as a design draftsman in the Architectural Planning & Plant Maintenance Division, died on August 15, 2010. He retired from Plant Engineering as a senior project engineer on February 28, 1986.

Robert Jasaitis, who worked for the BNL Alternating Gradient Synchrotron De- partment as a contract labor from February 15 to December 29, 1978, and joined the staff as a technician IV on January 2, 1979, died on February 25, 2010. He had retired as a technical assistant on September 30, 1988.

Thomson Mullany, who joined the BNL Alternating Gradient Synchrotron Operator Project as a draftsman B on July 2, 1953, and retired from the Materials Division in 1983, died on May 5, 2010, at the age of 88.

George Vengeal, who joined the BNL Plant Maintenance Division as a custodian on May 11, 1964, and retired from the Plant Engineering Service in 1982, died on August 26, 1982, as a sewage treatment plant operator A Group Leader, died on May 4, 2010.

Arrivals & Departures — Arrivals —

Michael Arons...CEGAP
Charles Black...CM-1
James Disser.....NSNS
Margie Goodsell...Diversity
Shweta Sarad...NSLS II

Felicia Hartlough...HR/OM
Xinguong Hong...NSLS

Changes in BNL Rad Protection Program

All staff who have RAD CERT and Contamination training must complete the same new training course by June 28

In June 2007, 1OCFR 835, Occupational Radiation Protection Rule, implemented several radiation protection requirements. To ensure that changes to the program are completely documented and understood by radiological workers, an updated training course, BNL-5955, was added to the BNL Training Website. The new course takes approximately 50 minutes to complete and can be accessed from http://training.bnl.gov/.

Staff who are required to have Radiological Worker I, II, or III training must complete the updated training course by June 28. Those who fail to do so by this date will be unable to perform work in areas controlled for radiological hazard or enter a radiation control zone until training is completed.

Special Award Winners at 2010 NSLS CEN Users’ Meeting

Two special awards were given at the National Synchrotron Light Source (NSLS)/Center for Functional Nanomaterials (CFN) Users’ Meet- ing held at BNL on May 10-13, 2010. The NSLS User’s Committee Community Service Award to NSLS employees Mike Caruso and Rick Greene. Julian Baumert Ph.D. Thesis Award to Jonathan Rameau, a postdoctoral researcher in BNL’s Condensed Matter Physics and Materials Science Department.

The UEC Community Service Award is given for outstanding service, innovation, and dedica- tion to users of the NSLS.

Mike Caruso, a mechanical technician for the NSLS X-ray Beamlines, was joined BNL in 1981 to work in the ultra-high vacuum group on the NSLS project. In 1983, after ISABELLE was terminated, he transferred to the Alternating Gradient Synchrotron. He joined the NSLS x-ray vacuum group in 1984, servicing the X-ray, VUV, and X-ray, VUV Undulator. In 1996 he works with the Mechanica- l technicians group, providing vacuum support, making leak testing, making repairs, and installing upgrades. He also assists with the NSLS VUV beamlines, so earned an associate degree in science in 1980 from Suffolk Community College, and a bachelor’s degree in physics in 1984 from the National Radio Institute of Electronics.

Caruso was recognized for his great skill in vacuum systems as well as his unfailingly sunny nature. “Mike is very helpful, always smiling and ready to help,” said one user in support of this nomination. “He is most consistently cheerful and optimistic outlook I’ve ever seen.”

Rick Greene: Greene is a mecha- nical technician for the NSLS x-ray beamlines. After graduating from a special ROCES aircraft me- chanic program and working in the field for four years, he joined BNL in 1978 — the year group was broken for the NSLS x-ray beamlines. He was recognized for his ability to work in challenging environments.

Scientists ID Genetic Gene That Improve Plant Growth

Elsedrothor (sp. 638) increases poplar growth by as much as 40 percent.

In the current study — through genome sequencing at the Joint Genome Institute, manual genomic annotation in col- laboration with biologist Monchy, and meta- bolic analyses performed at the University of South Carolina in collaboration with plant scientist Newman — the scientists identified an extended set of genes that help Elsedrothor (sp. 638) establish itself in this niche. Remark- able interactions were also revealed between the microbe and its host that help the plants survive and thrive.

Among the bacterial genes identified are ones that can help protocole to help the microbe survive and cope with other species for resources in the soil, take up nutrients that are spread by wind or through water, adhere to, and colonize poplar root tissues. The microbes also have genes that provide metabolites for plants that may help confer drought resistance and the ability to coexist with toxic metals, genes that produce antimicrobial agents that protect plants from fungal and bacterial infections, and genes that produce plant-growth-enhancing substances that plants cannot produce on their own.

One of the most remarkable things about this association, which we confirmed with our metabolic assays, is that the pro- teins that promote poplar growth by producing phytohormones depends directly on the presence of plant-synthesized sugars, such as sucrose, in the growth medium. Also, one metabolite (meso-2,3 butanediol) is known to elicit the induction of systemic tolerance to drought and induced systemic resistance against plant diseases,” Taghavi said. The plant makes sugar that helps the bacteria grow and makes phytohormones and other compounds that help the plants grow better and healthier.

"Interestingly, the genes that allow the bacteria to metabolize sucrose and the genes that produce the phytohormones are located on a genomic island, suggesting they may have been acquired together via natural hori- zontal gene transfer,” Taghavi said.

The scientists plan to continue their work by studying how these various genes are expressed during different stages of bacterial development and plant growth. By knowing the "phytohormones" and other secondary metabolites that play a role in colonization and plant-growth promotion.

“These basic findings can eventually be translated into comprehensive strategies to exploit an effective symbiosis between bacteria and plants to improve establishment and biomass production. This approach can be applied to improve plant productivity for sustainable agriculture, bioenergy feedstock production on marginal lands, or to fight desertification of arid areas,” van der Lelie said.

This research was funded by the DOE Office of Science. The Joint Genome Institute unites the expertise of five national laboratories — Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge, and Pacific Northwest — with the Hudson Alpha Insti- tute for Biotechnology to advance genomics in support of the DOE missions related to clean energy generation and environmental characterization and cleanup. JGI is operated for DOE by the University of California.

Kendra Snyder

BNL has filed a provisional patent application related to this work. For more information about these licensing, contact BNL Licensing Specialist Christine, brook@bnl.gov, (631) 344-7134.

TIAA-CREF One-on-One Retirement Counseling

A TIAA-CREF consultant will visit BNL on Wednesday, July 7, Wednesday, July 21, and Thursday, July 29, to answer employees’ questions regarding financial matters. The consultant will help you find the right allocation mix, learn about TIAA-CREF retirement income flexibility, and compare income levels with cash-based drawal options. For an appointment, call 1-800-712-6957 or go online at www.tiaa-cref.org and select “set up a meeting.”
Performing a study involving native Long Island bees are: (from left) BNL’s Natural Resources Manager Tim Green and three students, Lauren Moiniery, Lauren Henshaw, and Lauren Hemmen, who are participating in the PRE Student Service Teacher (MCIntyre, Hemmen) and Community College Institute (Delia) programs administered by the Lab’s Office of Educational Programs.

Native Bee Study to Add Local Data To More General U.S. Bee Die-Off Study
By Tim Green, Natural Resources Manager
For the past few days, BNlers could have noticed a series of colorful plastic bowls (fluorescent yellow, fluorescent blue, and white) arranged in a large X on the lawn north of Berk Hall, just west of the parking lot, and at the Brookhaven Center, just east of the parking lot. These bowls contained soapy water and some weights to help them from blowing over. Their purpose was to capture a representative sampling of native bees for a student research project. This work will help the Lab establish a baseline and determine if the apparent bee die-off affecting some areas of the U.S. is having an impact on Long Island bee populations.

Brookhaven manages its lands and landscapes in a sustainable manner, using little or no fertilizer and no herbicides. This practice results in our lands’ having an abundance of flowering plants that are attractive to wildlife, including native and non-native bees. In an effort to develop an inventory of bees on the Lab site, we identified two “area locations” for this study. We’ll also set up additional sampling sites out in “the woods.”

The students doing the work will be preparing a poster describing the study results. That poster — along with dozens of other student projects — will be available for viewing at the Annual Symposium and Poster Presentations on August 12 and 13 at Berk Hall.

BERA Events, Trips
The Brookhaven Employee Recreation Association (BERA) is happy to welcome all members (everyone is everywhere with a BNL badge) — to join in club activities, take trips, etc. At the BERA Store in Berk Hall, open weekdays, 9 a.m.-3 p.m., you can buy a ticket (non-refundable) for trips or for concerts, etc. A variety of trips are being planned. See below for more information (see page 4). For more information, go to http://www.bnl.gov/bera/recreation/events.asp or stop by the BERA Store, which also sells cards, tee-shirts, items with the BNL logo, and more.

Some of the events you may want to participate in are listed below:


• Tues., 7/6 (Lab Holiday) - Six Flags, MA, $35/dep BNLI, 7 a.m., dep. Park, 5 p.m.

• Sat., 7/10 - Promises, 2 p.m. Broadway Theatre. $116/dep BNLI 9 a.m., dep. NYC after the show.

• Sat., 7/17 - Brooklyn Bridge Walking Tour, $30/dep BNLI, 3:30 p.m. Broadway Theatre. $30/dep BNLI, 2 p.m. Broadway Theatre. $116/pp

NEWLY GENUINE CLOTHES — All sizes, styles, colors! For charity, books to be donated to 70 families living in a low income community. BNL, 25-45 New York Ave. 3:30-4:30 PM

For Rent

MASTIC — 1 bdrm, full bath, den, close to BNL, rent incl utilities, 2nd floor, $1,300/month. MGR X 3499, 219-7241.

MEDFORD — 2 bdrm, grd level apt, quiet location, 1/2 mile from BNL, $850/mo. joe x 2055, 291-7674.

S. PATCHOGUE — v/lg 3 bdrm ranch, 1 car det gar w/elec, $260,000 neg. 241-4166.

SHIRLEY — 2 bdrm furn apt, grd level, close to BNL, rent incl water/heat/elec, $925/mo. j/kennedyx 3161 or kratto@bnl.gov.

Moving Sale


DONATIONS OF DOG/CAT FOOD — For pets of military families. Collection tins are in the Bldg. 134, 400, 510 (245-2204), 250, 254, 256, 270 (given to local food pantries). Call Betty Elder, Ext. 3562, or Jim Maron, Ext. 6222.

Additional therapy, both physical and occupational will be offered to employees and their families. The Lab’s Health Promotion Program Coordinator, Michael Thor, is hosting a relaxation session at noon on Wednesday, June 30, in the Medical Department Large Conference Room, Bldg. 490. You must preregister at healthlink@bnl.gov or Ext. 6122. For more information, contact Betty Elder, Ext. 3562, or Jim Maron, Ext. 6222.

If you’re interested in participating or volunteering, contact Betty Elder, Ext. 3562, or Jim Maron, Ext. 6222.

Prepare to Run/Walk at Jones Beach on 8/3 And Participate in Readiness Session, 6/30
Many BNLI runners and walkers will participate in the Marcum & Kligerman Workspace Challenge again on Tuesday, August 3, at 7 p.m. at Jones Beach. If you’re interested in participating or volunteering, contact Betty Elder, Ext. 3562, or Jim Maron, Ext. 6222.

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Safety Day Puzzle: Answers

While some of these answers were easy, some were moderately difficult. The great success of this event made the homepage “searchBNL” (top four hits) for people interested in puzzle-solving.

D9120610

BOYD’S BEDROOM — gray foam-top platform bed w/linen mattress, dresser, desk top monitor 24” LCD, 72” HDTV, WATER & DRYER — gd workng cond, white. Ext. 6250, 828-6509.

CRIB FOR SALE — All 5 in-convertible wooden cribs, with mattress, fitted sheets, ask/$350. Syed, Ext. 2451, 828-4770.

CUTLERY SET — wooden box w/2 sets, cutlery set in box, ask/$400. Mark, Ext. 5864.

DIVING SET – 1 table w/4 folding chairs, 5 cushioned chairs, 2 cushioned cushions, ask/$490. Lynn, Ext. 2710, 828-3770.

DECK, LADIES — 9 ft x 9 ft on wheels, built-in desk/shelf/dresser drawers, gd cond, ask/$1,500. Bob, Ext. 7183, 828-1127.

FILING CABINET — Metal/Beige color, 4 ft x 2 ft x 3 ft, 3 drawers, ask/$275. Proctor, Ext. 375-1327.


LIFT CHAIR – Pride, 2 positions, burgundy, ask/$500. Syed, Ext. 2723.

LOW PROFILE 2 PC LIVING ROOM SUITE — b/c wood, couch, love seat, used, ask/$100. Gene, Ext. 7934, 828-3642.

MISCELLANEOUS PET SUPPLIES — cat food, dog food, fish food, cat litter, ask/$15. Mark, Ext. 3100, 828-4132.


TOYS — Hasbro, 4 ft long, antique German, ask/$75. Rose, Ext. 6217, 828-6350.


Know the answers? Call 2576 to submit.

1. The Lab’s placement program is to select the best qualified candidates for an available position. Candidates are considered in the following order: (1) present benefits-eligible employees within the department and/or appropriate bargaining unit, with preference for those within the immediate work group; (2) present benefits-eligible employees outside the laboratory; and (3) outside applicants. In keeping with the Affirmative Action Plan, selections are made without regard to race, color, religion, national origin, sex, or veteran status. The overall selection process, however, is competitive; positions will open once a work day where more information is available. For more information, call the Employee Recruitment Office, Ext. 2882.

2. To apply for a position, go to the Employment Manager, Ext. 2882. Immediately upon publication. For more information, contact the Employment Manager, Ext. 2882.

3. Except when operational needs require it, positions are filled in the following order: (1) present benefits-eligible employees within the immediate work group; (2) present benefits-eligible employees outside the laboratory; and (3) outside applicants. In keeping with the Affirmative Action Plan, selections are made without regard to race, color, religion, national origin, sex, or veteran status. The overall selection process, however, is competitive; positions will open once a work day where more information is available. For more information, call the Employee Recruitment Office, Ext. 2882.

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