Fighting bioterrorism

A Montclair State researcher is working with government agencies, pharmaceutical companies and other scientists to help the United States combat a serious threat in the war on bioterrorism.

David Rotella, the University’s Sokol Professor of Chemistry and a former research scientist in the pharmaceutical industry, was awarded a $2.5 million, five-year contract from the Defense Threat Reduction Agency (DTRA) to help develop inhibitors of the botulinum toxin, which causes botulism, a life-threatening illness characterized by paralysis and respiratory failure.

“This is one of the most, if not the most, toxic agents known to man,” says Rotella. It is also a potentially powerful bioterror weapon.

Montclair State University was awarded a $6.2 million U.S. Department of Education grant to support its Newark-Montclair Urban Teacher Residency Program. The University is one of 24 universities that received a total of $35 million in Teacher Quality Partnership Grants, which support educational partnership programs with high-need school districts to recruit, train and support more than 11,000 teachers. The grant was the largest given to a New Jersey university.

With a focus on preparing teachers in STEM disciplines – science, technology, engineering and math - and on encouraging underrepresented groups, such as women, minorities and people with disabilities to teach STEM subjects, the awards support President Obama’s goal of preparing 100,000 STEM teachers by 2021.

“Every teacher deserves the opportunity to receive the training and support necessary to prepare for the rigors of preparing all students for success in the classroom and in life,” U.S. Secretary of Education Arne Duncan said in announcing the grants. “We’re proud to announce these awards that represent another important step in strengthening teacher preparation and residency programs.”

In 2009, an earlier rendition of the Newark-Montclair Urban Teacher Residency Program received an initial $6.3 million, five-year Teacher Quality Partnership Grant.

Residents in the apprenticeship-based program receive a solid grounding in pedagogical practices along with experience applying those practices in the classroom. Those who complete the program receive the Master of Arts in Teaching degree, which has two tracks: Early Childhood teacher certification with dual certification in Teacher of Students with Disabilities; and content...
Adolescents try on many identities, and a Montclair State researcher is studying what that means when it comes to math. Jamaal Matthews, an educational foundations professor, has received a five-year, $730,000 Faculty Early Career Development (CAREER) grant from the National Science Foundation to support his research on how African American and Latino adolescents in urban schools come to see themselves as mathematicians.

“Early adolescence is when conceptions of identity and social status become more complex,” says Matthews. “This project assesses how teacher-student interactions, student responses to culture and stigma and cognitive flexibility support identity construction processes for students in math.”

By integrating social-cognitive and social-cultural approaches to understanding math identity formation, Matthews will explore issues behind learning and participation in math in sixth- and ninth-grade African American and Latino students recruited from Newark public schools. Research will focus on how interaction with teachers contributes to students’ math identities, as well as on how these identities change.

Matthews will train 12 undergraduates to mentor up to 48 sixth-graders per academic year. The prestigious CAREER award funds the research initiatives of faculty who are at the beginning of their academic careers.

“This is important work in ensuring that all students have the support they need to thrive in school,” says College of Education and Human Services Dean Francine Peterman. “This research represents the College’s commitment to creating a healthier, more educated and socially just world.”

The idea for the project, titled, “How Urban Adolescents Come to Think of Themselves as Mathematicians,” grew out of Matthews’ early career experiences as a middle school math teacher in the Bronx, New York. “It lets me really test ideas I’ve been playing around with for a while but haven’t had the resources to research on my own,” he says.

Rotella will work with the U.S. Army Institute for Chemical Defense, the U.S. Department of Energy’s Brookhaven National Laboratory, the University of Massachusetts at Dartmouth, the Naval Research Laboratory and pharmaceutical companies Ossianix and Hawaii Biotech to eventually disarm the threat of the botulinum toxin.

“The aim of the project is to identify a molecule or molecules that would provide either treatment for exposure to botulinum toxin, or provide prophylactic protection prior to exposure,” explains Rotella.

As Botox, botulinum toxin is injected in minute amounts into specific areas for localized cosmetic effects. “But if you were exposed to this by food consumption or inhalation, a larger amount of the toxin would be more broadly distributed within you, which would lead to adverse, potentially fatal, results,” says Rotella.

Because the toxin is easily produced and easily distributed, it is a major bioterrorism concern. Following exposure, time becomes the enemy, as the physical effects begin shortly thereafter. To counter this, an effective drug or antitoxin would need to be readily available for rapid administration in the event of a widespread exposure to the toxin. Developing a drug that could be administered prior to exposure and would provide protection from the toxin is also a possibility, Rotella says.

Rotella’s team, which includes a post-doctoral scientist, is working to synthesize new molecules – or inhibitors – that are potential drug candidates.

“These molecules have properties that might inhibit the enzyme botulinum A protease that we hope to improve, so that at least one compound could eventually be tested in clinical trials,” he says. The FDA requires such trials before approving new treatments for use in humans.
Exploring the High Line

A two-year award from the National Science Foundation gives Julian Brash, an anthropology professor, the opportunity to study the functions of urban, post-industrial public space by focusing on Manhattan’s High Line, a “rail to trails” park that is both celebrated and criticized for its repurposing of an abandoned elevated railroad track.

“There has yet to be a study that really places the park, its users and its uses under an analytical microscope,” Brash says. “Cities like New York are increasingly unequal and dominated by the power of wealth. I want to understand how ‘public’ the High Line really is.”

By exploring who uses the High Line and how they use it, Brash hopes to determine if the park is predominantly a tourist space or a community space.

“Once we understand this, we can make nuanced, empirically based judgments as to whether or not it is a ‘good’ model of a democratic urban public space that is accessible to all, for cultural, social and political interaction,” he explains. Brash will also consider how longtime neighborhood residents and businesses, as well as newcomers and tourists who are attracted by the park and the redevelopment it has sparked, regard the park.

“So far, Brash has been busy with preliminary research and logistical planning for the data gathering effort that will begin in 2015. He will hire three student research assistants to help with fieldwork and the collection of historical and secondary-source data.

“I’m excited to be able to have students engage in this work,” he says.

Building adolescent character

What builds character? Family and child studies professors Jennifer Urban and Miriam Linver are studying the question with a grant from the John Templeton Foundation to specifically evaluate a character development program for teens in Scotland.

Students in Scotland’s Inspire>Aspire program reflect on universal virtues and values – such as generosity, future-mindedness, joy, purpose, curiosity and humility – identified by the late investor and philanthropist, Sir John Templeton, in his book, The Essential Worldwide Laws of Life.

Inspire>Aspire program participants, who are ages 12 to 14, develop posters based on research and writings about inspirational figures, quotations and their own future aspirations.

“Character education programs like this promote positive development in youth,” notes Urban. “Teens tend to gain an increased sense of purpose by engaging in a process that helps them establish personal goals.”

While last year roughly 55,000 youths participated in the program across Scotland, there has yet to be a systematic evaluation of the...
Genetic secrets in corn

Corn or maize — America’s number one crop — is of special interest to Chunguang (Charles) Du, a biology and molecular biology professor and the recipient of a three-year National Science Foundation Plant Genome Research Program-funded sub-award from Rutgers University.

Building on the results of a previously funded NSF project, Du and his team aim to produce a sequence-indexed reverse genetics resource for maize that will let researchers fully exploit the maize genome sequence, which could eventually lead to better corn crops for farmers.

When a single gene is disrupted, the resulting mutant line gives scientists a fresh understanding of its function, according to Du, the co-principal investigator on the project. “The resource we are creating will consist of 15,000 gene knock-out mutants,” he says. “Researchers can take our gene knock-out mutants to study particular gene functions.”

The project will integrate his bioinformatics sequence analysis with the high-throughput genetic sequencing done at the Rutgers lab, which allows scientists to quickly conduct millions of tests, Du says.

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“Our study will ultimately help corn breeders.”
—Chunguang Du

The new award will allow the program to continue to fulfill its mission.

“We hope to maintain the high standard of excellence of the residency and improve upon the model so that we can sustain it within the teacher education program at the University,” says Jennifer Robinson, executive director of the Center of Pedagogy at Montclair State and one of the project’s principal investigators.

Secondary and special education professors Monica Taylor and Emily Klein are researching the residency’s impact on its graduates, mentor teachers and partner schools.

“Our residents are change agents, who work alongside their mentor teachers to design innovative and effective curricula, launch new initiatives and conduct professional development,” Taylor says.

Notes Robinson: “Seventy percent of the residents are from racially and ethnically diverse groups, a reflection of the populations of the students in our classrooms today.” To date, 100 percent of the residents have been hired after completing the program.

Supporting STEM teachers continued from page 1

area certification in Mathematics or Science. Residents receive tuition, fees and a living stipend and, in return, are required to teach in Newark Public Schools for three years.

“The residency builds on our history of partnerships with Newark Public Schools and community agencies that serve children and families,” notes College of Education and Human Services Dean Francine Peterman. “By learning alongside educators with skill and passion, our graduates are well prepared for the realities of today’s classrooms and for ensuring their students’ success.”

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Predicting climate change

Over the course of millions of years, the edges of the Antarctic ice sheet have advanced and retreated numerous times. While melting ice from the most recent retreat 19,000 to 9,000 years ago raised sea levels by more than 26 feet, much less is known about prior retreats.

Stefanie Brachfeld, earth and environmental studies professor and department chairperson, has received a three-year grant from the National Science Foundation's Antarctic Earth Sciences Program to go back even further in time – 240,000 years - to understand how Antarctic ice retreats and which parts of the ice sheet are most likely to retreat. By pinpointing when and where the ice destabilized in the past, she and her team will be able to predict how Antarctic ice will behave in a warming climate.

Brachfeld’s project collaborators, Trevor Williams, the lead principal investigator at Columbia University’s Lamont Doherty Earth Observatory (LDEO), Sidney Hemming from LDEO and Kathy Licht at Indiana University-Purdue University Indianapolis, will travel to Antarctica’s Weddell Sea embayment in November to collect samples from glacial moraines, ridges of debris that form on the edges of glaciers as they move and erode the underlying bedrock.

Her collaborators at the Alfred Wegener Institute in Germany will give the researchers access to Weddell Sea sediment cores that contain ice rafted debris layers called IRD. The IRD layers consist of sediment grains eroded by ice sheets, trapped in floating icebergs and released to the ocean when the iceberg melted.

“These layers are indicators of past episodes of iceberg generation and ice sheet retreat,” Brachfeld explains. The project provides funding for a graduate assistant and undergraduate student to use light and electron microscopy to conduct laboratory analyses of the IRD.

“Those time intervals can be used as an analogue of what we can expect over the next several centuries as temperatures continue to warm.”
–Stefanie Brachfeld

“We’ll need the full three years to analyze everything,” Brachfeld says. “Our specialty at Montclair State is the use of iron oxide minerals as forensic tracers. If we know the local geology of Antarctica, which we will determine from the moraines, we can then trace the iron oxide mineral grains back to their source and identify which part of the ice sheet destabilized and generated the icebergs.”

Much of the ice covering western Antarctica may well have melted at 130,000 and 240,000 years ago, explains Brachfeld.

“Those time intervals can be used as an analogue of what we can expect over the next several centuries as temperatures continue to warm,” she says.
Spotlight: Centers and Programs

Improving communities through schools

Montclair State University’s Service-Learning and Community Engagement program has received a $2.5 million U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration grant to work with two community schools in Orange, New Jersey, to provide an array of resources to students and families, including after-school programs, mentoring, parent workshops, job training and health services.

As a University-assisted community school project, the goal is to engage the resources (students, faculty, staff and alumni) of the entire University into the life and work of the community schools in order to support student and family success. The University will also partner with numerous social service agencies to prepare children at the low performing Rosa Parks Central Community School and Oakwood Community School to learn as well as to assist families and strengthen the community, says Bryan Murdock, director of Service-Learning and Community Engagement.

“The grant award is a game changer and greatly increases the likelihood that the promise of community schools will become a reality for the children, families and their school communities,” Murdock says.

New uses for social media

Family and Child Studies professors Robert Reid and Pauline Garcia-Reid have received a one-year U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration grant to use social media to help prevent substance abuse and HIV/AIDS among African American and Hispanic young adults and the LGBTQ community in Paterson, New Jersey. The grant builds on a decade of prevention work undertaken by the Reids and Montclair State in Paterson through Project C.O.P.E.

“We hope to leverage our previous work with our current anti-drug coalition efforts to target substance abuse and HIV prevention messages to at-risk populations,” explains Reid. Volunteer peer mentors and coaches will engage the target population through C.O.P.E.’s website and social media, including Facebook, Twitter, Instagram, YouTube, Pinterest and Tumblr in a way that the target audience feels safe getting and using sensitive information.

“If successful, we hope our work will serve as a model prevention platform for the state and federal levels,” says Reid.

A voice for autism

The University’s Center for Autism and Early Childhood Mental Health has received an additional $1.2 million award from the New Jersey Governor’s Council for Medical Research and Treatment of Autism to support its work coordinating statewide research and treatment efforts for the New Jersey Autism Center of Excellence (NJACE).

The enhancement follows the initial $1.5 million grant received in 2012 to establish the NJACE Coordinating Center in response to a growing epidemic of autism statewide. It now oversees a total of 16 clinical research program sites and pilot projects, says Gerard Costa, director of the Center for Autism and Early Childhood Mental Health.

Costa’s vision for the Coordinating Center is for it to become the “voice” for autism in New Jersey.

“What we’re learning is changing our understanding of autism and will ultimately enhance our respect and appreciation of this remarkably neurodiverse community,” he says.
Innovation exchange in the Americas

In September, Montclair State hosted a delegation of students and faculty from Universidad Mayor in Santiago, Chile, as part of a new study and research exchange program created by a U.S. Department of State innovation grant for President Obama’s “100,000 Strong in the Americas Initiative.”

Montclair State is one of nine universities to receive grants from the U.S. Department of State initiative that is funded by the Santander Universities division of Santander Bank, N.A., and promotes study-abroad exchanges in the Americas.

According to Carlos Molina, the grant project director and a Montclair State biology and molecular biology professor, Universidad Mayor’s strong biotechnology program makes it an ideal partner for this exchange in part because Chile is a biotechnology leader in South America.

The universities have developed a collaborative biotechnology course for this year’s six Universidad Mayor and seven Montclair State student participants.

During their visit to the University, the Chilean group attended mini-courses in biotechnology research methods, as well as workshops and seminars, and visited pharmaceutical companies.

The visit launched collaborative research projects between students from both schools. Research results will be presented when Montclair State students and faculty mentors travel to Chile in January 2015.

“The biggest benefit to all the students is the fact that this first meeting was an important step in establishing international collaborations,” says Molina. “The Chilean students are already talking about coming to the U.S. for graduate school. One of them is interested in joining my lab as a doctoral student. Some of our students have told me they already see the possibility of studying in South America.”

“The results exceeded all expectations, particularly in the way students and faculty interacted and learned from each other,” says Marina Cunningham, executive director of international affairs at Montclair State’s Global Education Center.

Molina hopes to receive additional funding from the National Science Foundation to develop a robust scientific collaboration with Universidad Mayor.

Building adolescent character continued from page 3

program. “We’ll be applying the Systems Evaluation Protocol that I developed with NSF funding to this project,” explains Urban, who is also the director of the Montclair State Developmental Systems Science and Evaluation Research Lab.

“Our fantastic team of graduate students, undergraduates and staff is helping us conduct surveys and interview about 150 to 200 boys and girls from five different Scottish schools, both before the program starts and after it ends,” says Urban.

“We’ll also talk to 35 teachers to learn how they are integrating the program into their curriculums.”

Urban plans to seek funding for a subsequent, larger-scale project that will provide additional, in-depth insights.

“Our project has new implications for character education,” she says. “This research helps us see how we can help young people ultimately work towards a more just and civil society.”
Researchers dig into ancient Rome

Montclair State researchers are preparing for a sixth summer at the University’s archaeological dig at the Villa of the Antonines in Genzano di Roma, Italy. Students and faculty have previously uncovered long-buried secrets of life during the Roman Empire there, including residential quarters and an amphitheater that may have been used by ruler Commodus as a gladiator practice arena.

For the past five summers, Montclair State undergraduate and graduate students have excavated the site of the ancient villa complex, accompanied by students from other universities such as Brown, Fordham, the University of Minnesota, Johns Hopkins and SUNY Albany, who have joined Montclair State’s field school for a month.

“The Alban Hills, where our site is located, was one of the very first places Roman emperors built imperial villas,” says Deborah Chatr Aryamontri, who co-directs the Montclair State Center for Heritage and Archaeological Studies Field School program with Timothy Renner, a classics and general humanities professor.

Aryamontri studied at The University of Rome – La Sapienza, where she developed strong ties with the Italian archaeological community. Because of her extensive training in classical field archaeology, the Italian government granted Montclair State exclusive permission to excavate the historic villa site. The researchers believe the complex belonged to the second-century CE Antonine dynasty that included emperors Trajan, Hadrian, Antoninus Pius, Marcus Aurelius and Commodus. “We think Antoninus Pius would surely have owned this villa,” says Renner.

Commodus – perhaps best known as the inspiration for the crazed nemesis of the title character in the movie Gladiator – may have killed animals in the amphitheater unearthed by the Montclair State team. Convinced he was the reincarnation of Hercules, Commodus’ rocky rule from 180–192 CE began the decline of the Roman Empire.

“It’s very possible that gladiatorial games and exhibits were held in that amphitheater.”
– Deborah Chatr Aryamontri

Assisted by grant funding from the John J. and Rose Cali Family Foundation and private donors, University researchers learn more from the site each year and will eventually be able to place the villa within the broader context of the region’s other imperial villas.

“This villa may have been comparable to Hadrian’s in Tivoli, but it is hard to tell for certain, as some buried parts have been destroyed by modern development,” says Renner.