

September 2012

NIEHS Spotlight



[NIEHS launches five-year Strategic Plan](#)

With an Aug. 1 editorial in *Environmental Health Perspectives*, NIEHS/NTP Director Linda Birnbaum, Ph.D., officially launched the Institute's 2012-2017 Strategic Plan.



[Guttmacher shares vision for future of NICHD](#)

The director of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development outlined the institute's strategic vision.



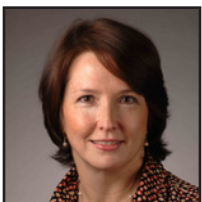
[PEPH webinar highlights the power of science in promoting public health](#)

During the Aug. 8 webinar, speakers addressed the use of community-driven research to enhance environmental public health and justice.



[Environmental epidemiology group honors Eskenazi and Lanphear](#)

NIEHS grantees Brenda Eskenazi, Ph.D., and Bruce Lanphear, M.D., took top honors at the International Society of Environmental Epidemiology meeting.



[Austin selected for advanced leadership program](#)

NIEHS Associate Director for Management Joellen Austin will be a part of the winter session of the highly competitive Leadership for a Democratic Society program.

Science Notebook



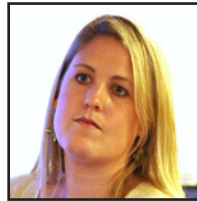
[Fellows shine for research excellence](#)

Fellows fared very well in this year's NIH Fellows Award for Research Excellence competition, receiving 19 of the 220 highly coveted awards.



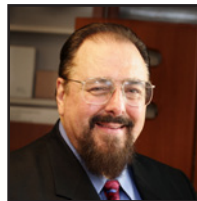
[Possible mechanism between maternal smoking and childhood illness found](#)

A new study published by NIEHS scientists and their collaborators may have discovered the answer by analyzing infant gene expression patterns.



[High school science teacher wraps up a summer of exploration at NIEHS](#)

For high school science teacher Kelly Estes, her externship was an eye-opening, curriculum-enriching experience that culminated in an informal seminar Aug. 9.



[NIEHS workshop inspires new papers on autoimmunity](#)

Four new papers published this summer in the *Journal of Autoimmunity* are the latest result of a 2010 NIEHS-sponsored workshop.



[Fenton examines effects of exposure to endocrine disrupting chemicals](#)

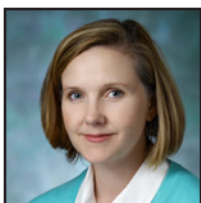
A capacity audience gathered Aug. 7 to hear Suzanne Fenton, Ph.D., discuss "Mammary gland as a sensitive target tissue for endocrine disruption."

NIEHS Spotlight



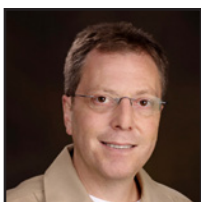
[Collins to lead trainee career development at NIEHS](#)

In late July, NIEHS named Tammy Collins, Ph.D., to direct the Office of Fellows Career Development (OFCD).



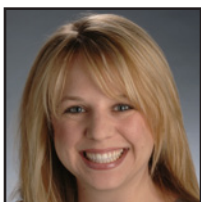
[Grantee honored for research on allergic asthma](#)

An international body of scientists has named NIEHS grantee Elizabeth Matsui, M.D., this year's top young investigator in the field of allergy and immunology.



[Miller promotes prevention by design at nano meeting](#)

At NIEHS, nanotechnology safety is a top priority, said NIEHS Senior Medical Advisor Aubrey Miller, M.D., at the Safe Nano Design Workshop Aug. 14-16.



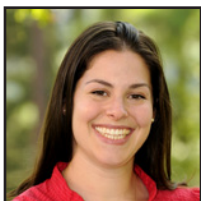
[ONES awardee honored by alma mater](#)

Outstanding New Environmental Scientist award winner Lauren Aleksunes, Pharm.D., Ph.D., is being honored by the University of Connecticut.



[WETP training program means jobs for veterans](#)

A new NIEHS-funded program in New Jersey is building on a proven model of hazardous materials training to help veterans reenter the civilian workforce.



[Swerdlow named assistant professor at Thiel College](#)

Sarah Swerdlow, Ph.D., will teach genetics and microbiology courses, along with senior seminars and other classes, at the liberal arts college in Greenville, Pa.

Science Notebook



[Neurobiology fellows win competitive travel awards](#)

Travel awards are making it possible for two NIEHS Developmental Neurobiology Group trainees to attend a major international conference.



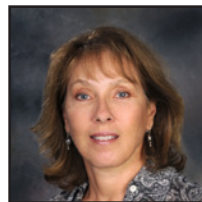
[Infants exposed to specific molds have higher asthma risk](#)

Cincinnati-based researchers report new evidence that exposure to three types of mold during infancy may have a direct link to asthma development during childhood.



[Former NIEHS trainee identifies potential risk factor for autism subgroup](#)

Children born to mothers who smoked during pregnancy had about a 25 percent increased risk for high-functioning autism, according to a new NIEHS-funded study.



[Researchers report lessons learned from Katrina](#)

Three new papers published online Aug. 15 provide insight into how researchers can work with communities to reduce children's asthma rates.



[Study finds a possible biomarker of occupational exposure in firefighters](#)

A new NIEHS-funded study suggests there is a link between exposures to polycyclic aromatic hydrocarbons and an epigenetic mark of promoter methylation.



[NICEATM publishes biennial report](#)

The 2010–2011 ICCVAM biennial report describes progress in advancing new and improved safety assessment methods.

NIEHS Spotlight



[NIEHS, ATSDR forge closer ties with Atlanta meeting](#)

The meeting Aug. 7-8 provided a forum for researchers from both groups to strengthen ties and find new opportunities for collaboration.



[Ideas and independence highlight NIEHS summer internship poster session](#)

Two months of hard work, dedicated research, and extensive laboratory training came to a close for most interns July 26 with the program's concluding poster session.



[NIEHS Commissioned Corps officers win awards](#)

During ceremonies in late July, two U.S. Public Health Service Commissioned Corps officers stationed at NIEHS received awards for outstanding service.

Inside the Institute



[NIEHS volunteers return to summer science camp in Durham](#)

The innovative Science and Everyday Experience (SEE) summer camp held its seventh annual session June 30 at the Durham (N.C.) Alumnae Delta House.

Science Notebook



[Federal agencies accept ICCVAM-recommended testing methods](#)

The testing methods use human cells to screen substances for their potential to interact with the estrogen receptor.



[This month in EHP](#)

This month's feature stories in EHP tackle the issues of labeling genetically engineered crops and regulation of trace radioactive contaminants.



[Upcoming international workshop on endocrine active chemicals](#)

NIEHS is one of several sponsors of a workshop Sept. 11-13 in Berlin on "Low Dose Effects and Non-monotonic Dose Responses for Endocrine Active Chemicals."

Extramural Research

[Extramural papers of the month](#)

- Whole genome sequencing reveals genetic basis for diversity and evolution
- Wearable sensor monitors personal exposure to VOCs
- Biomarker predicts years of service for firefighters
- Long-term air pollution exposure linked with heart problems

Intramural Research

[Intramural papers of the month](#)

- Clock gene expression regulated by ROR gamma
- Fertility drugs and young-onset breast cancer
- Study estimates the frequency of an autoimmunity biomarker in U.S.
- Revolutionizing the detection of free radical DNA in cells

Calendar of Upcoming Events

- **Sept. 4**, in Rodbell A, 10:00-11:00 a.m. — Keystone Science Lecture Seminar Series presentation on “The Many Facets of Gene/Environment Interactions of the Paraoxonases,” by Clement Furlong, Ph.D.
- **Sept. 5-6**, in Rodbell Auditorium, 8:30 a.m.-5:00 p.m. —Scientific Advisory Committee on Alternative Toxicological Methods meeting
- **Sept. 7**, in Rodbell A, 11:00 a.m.-12:00 p.m. — Laboratory of Reproductive and Developmental Toxicology Lecture Series seminar with Wen Xie, M.D., Ph.D., addressing “The Endobiotic Function of Xenobiotic Receptors and Enzymes in Metabolic Disease”
- **Sept. 11**, in Rodbell Auditorium, 8:30 a.m.-5:00 p.m. — National Advisory Environmental Health Sciences Council meeting
- **Sept. 11-13, offsite event**, at Charite Medical University Berlin — International workshop on “Low Dose Effects and Non-monotonic Dose Responses for Endocrine Active Chemicals: Science to Practice,” [registration](#) required
- **Sept. 13**, in Rodbell Auditorium, 11:00 a.m.-12:00 p.m. — Office of the Scientific Director presentation by Monica Justice, Ph.D., topic TBA
- **Sept. 18**, in Rodbell Auditorium, 1:00-2:00 p.m. — Office of the Director seminar featuring Arlene Blum, Ph.D., addressing “Flame Retardants and Public Health: How Science Can Inform Policy”
- **Sept. 27**, in Rodbell Auditorium, 8:00 a.m.-5:00 p.m. — NIEHS Genomics Day
- View More Events: [NIEHS Public Calendar](#)

NIEHS Spotlight

NIEHS launches five-year Strategic Plan

By Eddy Ball

With an Aug. 1 editorial in *Environmental Health Perspectives* (EHP), NIEHS/NTP Director Linda Birnbaum, Ph.D., officially launched the Institute's [2012-2017 Strategic Plan](#).

In the [editorial](#), Birnbaum made a point of emphasizing the collective ownership of the plan, and the input of hundreds of stakeholders, from scientists to public health advocates, that shaped its fresh vision and focused goals. As NIEHS prepares to celebrate its 50th anniversary in 2016, Birnbaum explained, the Institute has evolved to meet the new challenges of the environmental health sciences, building upon the accomplishments of the past.

“The NIEHS has come a long way in making environmental health research responsive to the needs and concerns of the American people — to make environmental health part of the public health debate,” Birnbaum wrote. “This continues to be a source of motivation and purpose for NIEHS staff and our research partners.”

The strategic plan process was officially launched March 1, 2011 in a meeting at NIEHS with Deputy Director Rick Woychik, Ph.D., and Sheila Newton, Ph.D., director of the Office of Policy, Planning, and Evaluation, discussing online resources for contributing ideas for the plan. These included an interactive website called Visionary Ideas, where people could post their big-picture ideas about the strategic plan and vote to agree, disagree, or comment on ideas posted by others.

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NIEHS/NTP Director Linda Birnbaum (Photo courtesy of Steve McCaw)




Guttmacher shares vision for future of NICHD


By Brant Hamel

Alan Guttmacher, M.D., director of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), visited NIEHS Aug. 7 to discuss “NICHD’s Vision for the Future of Research,” during a talk hosted by NIEHS/NTP Director Linda Birnbaum, Ph.D.

The talk highlighted major scientific areas across the breadth of the NICHD mission, with a focus on the most promising opportunities for advancement in the next decade. Guttmacher also pointed out ways increased collaboration could help to advance major research interests shared by NICHD and NIEHS.



Linked video:
[Watch as Guttmacher describes innovation and future of biomedical research and medicine \(01:58\)](#)
(Launches in new window)

Download Media Player:  Flash [↗](#)

Highlighting common themes for NICHD and NIEHS

“Like you,” Guttmacher told his audience, “we are not disease focused.” Because of that latitude, both institutes have interests that range across the field of biomedical research and embrace the practice of interdisciplinary collaboration.

As Guttmacher introduced the eight content areas of NICHD research, he pointed to the most important nexus between his institute and NIEHS. “As we looked carefully at our goals,” he said, “environment emerged as a common thread across these themes.” The NICHD would like to better understand how the environment interacts with the genome to influence basic processes, such as development and natural variability, as well as support more applied work on how nutrition and environmental factors affect plasticity and rehabilitation.

Throughout his presentation, Guttmacher underscored similarities between NIEHS and NICHD, which were both launched in the turbulent, but forward-looking 1960s. NICHD is celebrating its 50th anniversary this year, just four years before NIEHS will mark its half century as an institute. Both filled important needs at NIH, which had virtually no pediatric research underway prior to NICHD, and little in the way of environmental health science activity before the creation of NIEHS.

Like NIEHS, NICHD has a very broad mission statement, spanning virtually the entire lifetime of humans, from events at preconception that may influence health after conception through old age, to



Guttmacher explained that researchers still don't completely understand pregnancy. “We don't understand what normal pregnancy looks like,” he said, “[and] treatments have gotten ahead of our understanding of infertility biology.” (Photo courtesy of Steve McCaw)



Birnbaum and Guttmacher were able to combine humor with seriousness during the free-ranging question and answer segment of the presentation. (Photo courtesy of Steve McCaw)

medical rehabilitation, which may be one of the final interventions in an individual's life. Also in common with NIEHS, which just this month launched its five-year [strategic plan](#), NICHD has also just completed its own forward-looking visioning process.

Advancing the NICHD mission at 50

NICHD's [scientific vision](#) is grouped into multiple themes, with the potential for major scientific advancement in the next 10 years, Guttmacher explained. In the fields of reproduction, molecular genetics, genomics, and epidemiology, NICHD could make important contributions toward defining the heritable and non-heritable components of infertility and subfecundity.

As at NIEHS, a high priority in NICHD research is better understanding the early origins of health and disease, and how events during pregnancy and even preconception may affect development and adult health. Towards that goal, Guttmacher noted that the placenta was vastly underutilized as a record of intrauterine gene-environment interactions. He also said that there is a huge pool of pregnant women who could provide a multitude of informative data, if applications to easily capture their experiences became available.

Another major theme for NICHD is technology — both in terms of how it affects health and how it could be used to further biomedical research. One of the visions for the theme of behavior and cognition is to understand how the use of new technologies is influencing child and adolescent behavior.

Guttmacher also touched on the conduct of science and how it might change in the next ten years. Noting that many breakthroughs occur at the borders of disciplines, he encouraged policies to support interdisciplinary research, such as multidisciplinary incubators, shared sabbatical time for groups working across disciplines, and better ways to evaluate tenure for people who work on large interdisciplinary projects.

Stressing the need for development of broad diverse biorepositories, and tools to increase data sharing and analysis from studies so that data could be correlated across different disciplines, Guttmacher pointed to the responsibility for integrating and disseminating data. “Data does not belong to the PI [lead researcher],” he said. “It belongs to the public.”

(Brant Hamel, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Molecular Endocrinology Group of the Laboratory of Signal Transduction.)

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NIEHS scientists appreciated Guttmacher's description of their shared interests and values, and they enjoyed his comic relief. Shown, left to right, are Claudia Thompson, Ph.D., Kim Gray, Ph.D., Patricia Jensen, Ph.D., and Jerry Heindel, Ph.D. (Photo courtesy of Steve McCaw)



Also on hand for the presentation was NICHD grantee Barbara Entwisle, Ph.D., vice chancellor for research at the University of North Carolina at Chapel Hill, who had questions about the National Children's Study (NCS). Entwisle is the director of the North Carolina components of the NCS. (Photo courtesy of Steve McCaw)

PEPH webinar highlights the power of science in promoting public health

By Eddy Ball

At first glance, chemist Arlene Blum, Ph.D., and civil rights leader Omega Wilson would seem to have little in common. Blum is the executive director of the [Green Science Policy Institute](#) and is a visiting scholar at the University of California, Berkeley, studying fire retardant chemicals, while [Omega Wilson](#) and his West End Revitalization Association (WERA) colleagues, epidemiologists [Sacoby Wilson, Ph.D.](#), and [Christopher Heaney, Ph.D.](#), are concerned about the health and quality of life impact of environmental injustice on residents of an underserved and marginalized minority community in Mebane, N.C.

Where they intersect, however, is in the use of community-driven research to enhance environmental public health, a keystone concept in the NIEHS Partnerships for Environmental Public Health (PEPH) program. Although separated by nearly 3,000 miles, Blum and the WERA activists came together in cyberspace for a webinar Aug. 8 on “Science-based Decision Making.” The program was sponsored by PEPH and moderated by NIEHS Worker Education and Training Program manager Sharon Beard.

Grounding public health discourse in science and reason

Blum’s message about fire retardant chemicals was clear from the beginning of her talk. She said there is compelling evidence the chemicals are potentially harmful for humans, including decreased fertility, hormone disruption, lowered intelligence quotient, and hyperactivity, and there is little evidence to support industry claims of their effectiveness in significantly reducing flammability.

Referring to California Technical Bulletin (TB) 117, which mandated the use of the chemicals in foam beginning in 1975, she said, “It’s not such a great standard.” TB 117 requires the foam inside furniture to withstand a 12-second exposure to a small open flame. However in a real-life fire, fabric ignites first, exposing the interior foam to a much larger flame.



*Blum described herself as optimistic, saying, “We can have healthier homes and a healthier world.” She collaborated with NIEHS grantee Heather Stapleton, Ph.D., on a study that was chosen as 2011 paper of the year by the journal *Environmental Science and Technology*. (Photo courtesy of the University of Richmond)*



Former NIEHS grantee Omega Wilson is one of many environmental justice advocates who want health impact assessment to be a requirement for all new projects that could endanger the optimal health of affected communities. (Photo by Isaac Sandlin, courtesy of the Carrboro [N.C.] Citizen)

Mounting evidence of their threat to health led to the ban or voluntary removal of several of the chemicals but, because they persist in homes and in the environment, especially in older furniture, humans are routinely exposed in their homes and workplaces.

Supported by an increasing number of studies from researchers worldwide, the evidence-based research of Blum and others, including NIEHS Director Linda Birnbaum, Ph.D., and several NIEHS grantees, has been used to inform policymakers and has had an effect on regulations and attitudes. Blum pointed to the suspension in 2010 of efforts by the state of California to implement TB 604, which would have set flammability standards for bedding, and this June's executive order by California Governor Jerry Brown, calling for revision of the state's regulations requiring furniture and other consumer products to be treated with fire retardant chemicals.

Creating a community-tailored partnership with contextual experts

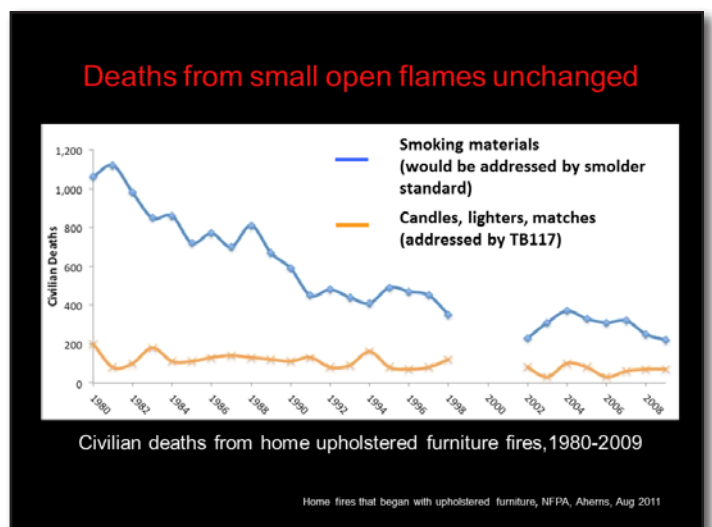
Omega Wilson is a leading figure in the environmental justice movement who has called for interagency actions to reduce or eliminate environmental contaminants and health care disparities, to enforce health statutes, and to generate new preventive efforts, including expanded enforcement of Title VI of the Civil Rights Act, which protects people from discrimination based on race, color, or national origin in programs or activities that receive federal financial assistance. Upending the top-down model of academic research, he designed WERA's community-owned and -managed research (COMR) model, in collaboration with Sacoby Wilson and Heaney, two researchers he first met when they were interns with WERA.

Omega Wilson explained that implementing COMR involved a redefinition of research methodology and ethics, as well as developing new communication strategies. "We had to develop a language that was common to community and researchers," he said. As the relationship between researchers and community evolved into a partnership, the economic foundation of research also shifted. Unlike traditional research, with publication as the goal, the COMR model values most highly research that can be translated into public health and associated infrastructure improvements in the community, and positions the community as the funded entity.

In this model, community members, who know the people and their needs, work with researchers to gather the data they need to get results. The speakers focused on water quality in Mebane's West End, where private water systems and septic tanks were the rule. Researchers gathered data about levels of fecal coliform in drinking and surface water, educated government agencies, and took advantage of pro bono legal help to make sure the community's needs were considered. The result was an expansion of metropolitan water and sewer lines into the West End.



Blum argued that science can help to blunt the fear, fueled by millions of dollars of industry lobbying, that inspired TB 117 and other proposals to require fire retardants in products sold in California and, ultimately, throughout the U.S. (Courtesy of Arlene Blum)



One of Blum's points involved determining just how effective TB 117-mandated flame retardant chemicals have actually been in reducing fire deaths. (Courtesy of Arlene Blum)

PEPH – Webinar: Science-Based Decision Making

Major Points

- A. WERA Background
- B. Environmental Justice Legal Framework
- C. Need for Solutions: Legal Compliance Science
- D. Community/University Research Partnerships
- E. Co-Benefits and Successes
- F. COMR: National Policy Inclusion
- G. COMR Vision: Training of other community-based organizations
- H. Sustaining COMR Vision: Major Funding.

PEPH – Webinar: Science-Based Decision Making

In 1994, African American residents in Mebane, NC started a “Right to Basic Amenities Movement” against:

Physical Barriers: 119-bypass/interstate, dead-end and unpaved streets, and housing construction on a landfill

Artificial Boundaries: Industrial park zoning, land use planning exclusion, red-lining under Extraterritorial Jurisdiction (ETJ) statutes

Institutional Limitations: Economic disparities, racial discrimination (“old south” values in the New South)

Non-compliance: Civil rights, Environmental Justice, and federal regulations

The WERA speakers structured their presentation around eight major points. (Courtesy Christopher Heaney and Sacoby Wilson)

A central premise in Omega Wilson’s argument involves the intersection of discrimination, environmental justice, and health risk, which spelled PAIN for the West End community. (Courtesy Omega Wilson)

Promoting science-based decision-making

Research by Blum and other experts on the potentially harmful health effects of exposure to fire retardant chemicals is changing regulations and public attitudes on the use of chemicals to reduce the flammability of consumer products. Despite those successes, issues remain unresolved.

Among them is how to dispose of products permeated with fire retardant chemicals. “Some research really is needed to find out the best way to do it,” Blum said. As she and others have also observed, replacement chemicals should be adequately tested to ensure that they are safe, to avoid the danger of trading one set of health risks for another.

Omega Wilson’s passionate calls for justice, in league with the scientific rigor of researchers Sacoby Wilson and Heaney, are improving health and quality of life for West End residents, and pressuring governments to enforce public health regulations and civil rights legislation. They are also disseminating their successful model of community-academic partnership to groups in other communities experiencing the effects of environmental injustice, such as the Rogers-Eubanks Neighborhood Association near Chapel Hill, N.C.

Even as the battle lines shift, however, the larger struggle continues. “One of the central principles [of justice and equality] is equity in power distribution and resources,” Heaney said. Wilson argued that there is a need for formal guidelines to help people get equal protection against environmental injustice under Title VI.

Citations:

Heaney C, Wilson S, Wilson O, Cooper J, Bumpass N, Snipes M. 2011. Use of community-owned and -managed research to assess the vulnerability of water and sewer services in marginalized and underserved environmental justice communities. *J Environ Health* 74(1):8-17.

Stapleton HM, Klosterhaus S, Keller A, Ferguson PL, van Bergen S, Cooper E, Webster TF, Blum A. 2011. Identification of flame retardants in polyurethane foam collected from baby products. *Environ Sci Technol* 45(12):5323-5331.

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Environmental epidemiology group honors Eskenazi and Lanphear

By Eddy Ball

NIEHS grantees Brenda Eskenazi, Ph.D., and Bruce Lanphear, M.D., took top honors at the [24th Annual Conference of the International Society for Environmental Epidemiology \(ISEE\)](#) Aug. 26-30 in Columbia, S.C.

During an awards plenary Aug. 29, members honored Lanphear with the [ISEE Research Integrity Award](#) and Eskenazi with the [ISEE John Goldsmith Award for Outstanding Contributions to Environmental Epidemiology](#), the highest awards that ISEE gives to scientists in the field of environmental epidemiology. Eskenazi and Lanphear gave talks on their research as a part of the ceremony.

Eskenazi and Lanphear have worked for many years at the intersection of public health and environmental justice — Lanphear with inner city children exposed to lead in the environment, and Eskenazi with families exposed at work and at home to endocrine disrupting chemicals used in pesticides and flame retardants.

“These scientists are an important part of the fabric of NIEHS,” said Gwen Collman, Ph.D., director of the NIEHS Division of Extramural Research and Training. “We have made a major, decades-long investment in their work, and it’s wonderful to see the value of their contributions to the field recognized by an organization of the stature of ISEE.”

On the front lines of environmental public health

[Eskenazi](#) is a professor in the University of California, Berkeley (UCB) School of Public Health Division of Epidemiology. She is chair of the UCB Maternal and Child Health Program, director of the Children’s Center for Environmental Health, and lead researcher in the [Center for the Health Assessment of Mothers and Children of Salinas \(CHAMACOS\)](#) longitudinal birth cohort study examining chemicals and other factors in the environment, and children’s health.

Eskenazi was a pioneer in environmental health research when she entered the field in the late 1970s. In the 30 years of research that followed, she has studied a host of environment exposures, including cigarette smoke, caffeine, and chemotherapy to pesticides and flame retardants. She and her group have looked for effects on the human brain, child development, and reproductive health. Translating their research, she and her colleagues have worked to advance children’s health in agricultural, residential, and daycare settings throughout California.



In March 2010, Eskenazi gave a presentation in the NIEHS Distinguished Lecture series ([see story](#)), speaking on “Organophosphate Pesticide Exposure and the Development of Children Living in an Agricultural Community: Results of the CHAMACOS Study” to a capacity audience. (Photo courtesy of Steve McCaw)



NIEHS has called upon Lanphear’s expertise a number of times. Most recently, he was a member of the independent expert panel review for the Draft NTP Monograph on Health Effects of Low-level Lead ([see story](#)) in November 2011, and a keynote speaker at the Data Sharing Strategies for Environmental Health Science Research Workshop ([see story](#)) in March 2012. (Photo courtesy of University of Cincinnati)

“Brenda’s research marries molecular analysis with epidemiology, and she takes her work a step further by translating the findings into interventions to help protect the health of children and their families,” said Collman, describing her longtime colleague.

Following more than a decade with the Cincinnati Children’s Environmental Health Center at Cincinnati Children’s Hospital Medical Center, [Lanphear](#) moved to Vancouver, British Columbia, to focus on the intersection between epidemiology and public health policy. He was appointed in 2008 as a professor at Simon Fraser University, where he continues his research examining fetal and early childhood exposures to widespread environmental neurotoxins including lead, pesticides, mercury, alcohol, PCBs, and environmental tobacco smoke. He also serves as a [senior scientist](#) at the Child and Family Research Institute of the British Columbia Children’s Hospital in Vancouver.

An outspoken crusader for children’s health, Lanphear has testified before state and federal committees, and served as a spokesperson for advocacy groups. In the course of pursuing his goal of a safer environment, he has been criticized by opponents and had his data subpoenaed in attempts to discredit his findings. “There have been times when essentially everybody would like to put me in the closet and lock the door,” Lanphear lamented in a 2011 [interview](#).

“Bruce is both an outstanding scientist and an outspoken advocate, whose work has been very influential in efforts to limit children’s exposure to lead,” Collman said. “He has taken significant personal and professional risks to protect the integrity and confidentiality of his research.”

ISEE is an international organization with members from more than 55 countries and regional chapters, as well as local groups in Latin America, the Caribbean, the Mediterranean, Central and Eastern Europe, the Caucasus, South Asia, and East Asia.

Topics addressed by ISEE members include environmental exposures, health outcomes, methodology, environment-gene interactions, and ethics and law.

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An international forum dedicated to discovering ways to protect children from environmental hazards

Meeting Aug. 28 at the ISEE annual conference were members of the multidisciplinary [International Society for Children’s Health and the Environment \(ISCHE\)](#), which was founded in 2010 with an international membership that includes founders Lanphear and Eskenazi. As the organization grows, it meets annually as part of ISEE, and this year, it also sponsored a preconference ISEE Workshop on Assessment of Neurobehavioral Effects of Environmental Exposures on Children moderated by [Lynn Goldman, M.D.](#), and [Mark Miller, M.D.](#)

Following the ISCHE meeting, Eskenazi and Lanphear faced off in a debate that was scheduled prior to the announcement of their awards titled “Controversies in Children’s Health and the Environment: Should Organophosphate Insecticide Use Be Restricted and Organic Diets Promoted?”

Austin selected for advanced leadership program

By Eddy Ball

NIEHS Associate Director for Management Joellen Austin will be a part of the winter session of the highly competitive Leadership for a Democratic Society (LDS) program. Austin was notified in August of her acceptance into the four-week training session Jan. 6-Feb. 1, 2013 in Charlottesville, Va.

LDS is part of the Federal Executive Institute (FEI), which is sponsored by the U.S. Office of Personnel Management. The program uses the U.S. Constitution as the principal guide in helping federal executives, with exceptional credentials, to understand the diverse goals of the government and the citizens they serve. FEI fosters executives who excel in a 21st century world, while remaining connected to the constitutional principles forged in the 18th century.

When she learned of Austin's LDS program acceptance, NIEHS/NTP Director Linda Birnbaum, Ph.D., said, "This is a big honor for Joellen." Birnbaum also reflected on her own experience in the LDS program, saying, "I took the training 12 years ago and it was a life-changing experience and a tremendous learning opportunity."

Since 1968, FEI has been known for the personal attention it gives to every executive who attends its programs. The FEI approach builds a learning community where federal executives and faculty are both teachers and participants. The LDS program promises to help participants advance their leadership abilities in several ways, including:

- Gaining a broader understanding of the Constitution and how it continues to guide today's government.
- Understanding the policy framework in which executives must lead, and the interplay among major stakeholders at national and global levels.
- Developing keen insights into leadership strengths and areas for improvement.
- Devising a plan to enhance an organization's performance.
- Increasing networks for enhanced problem-solving support.
- Appreciating more fully the importance of federal service and the diverse talents of federal executives.

The participants receive five hours of post-program executive coaching after they return to their day-to-day organizational challenges.

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Austin joined NIEHS in 2011, after serving four years at the National Institute of Neurological Disorders and Stroke, where she had been associate director for management and executive officer. (Photo courtesy of Joellen Austin)

Collins to lead trainee career development at NIEHS

By Jeffrey Stumpf

In late July, NIEHS named Tammy Collins, Ph.D., to direct the [Office of Fellows' Career Development \(OFCD\)](#). As the former [NIEHS Trainees Assembly \(NTA\)](#) chairperson, Collins worked closely with co-chair Darshini Trivedi, Ph.D., in addition to many hardworking colleagues throughout the Institute, including those on the NTA Steering Committee, the NTA General Assembly, and the Assembly of Laboratory Staff (AoLS), to provide many of the much-needed services in the absence of a full-time OFCD director, following the departure of Diane Klotz, Ph.D., last June.

OFCD provides trainees with important seminars, courses, and workshops critical to developing skills necessary for their future career success. In addition, OFCD assists trainees with preparing job application materials and offers practice job interviews. Collins plans to continue the supportive role of the office, while expanding its reach to more postdocs through effective communication and an open-door policy.

Deputy Scientific Director William Schrader, Ph.D., is the NIEHS Training Director, and appreciates the value of resources offered by OFCD. "For over ten years, trainees have benefitted from an office that is specifically charged to aid them in aspects of their professional needs outside of the scientific support that their mentors provide," Schrader observed. "In today's complex workforce environment, our trainees can expect to select among nontraditional career paths, and to deal with highly competitive team science and business in ways that their forebears have never experienced."

Catching up for lost time

With support and guidance from many, including Schrader, Debbie Wilson, the NIEHS Summer Internship Program (SIP) Coordinator, and Lori Conlan, Ph.D., director of Postdoctoral Services for the NIH Office of Intramural Training and Education (OITE), NTA and AoLS members have continued very important programs that support postdoctoral career development during the time without an OFCD director. Now in her current position, Collins states that there are several immediate goals that the OFCD office plans to fulfill:

- Finalize the upcoming workshop and training schedule.
- Centralize the resources involving searching for and applying for jobs.
- Manage a career progress tracking system that helps trainees focus on long-term goals.



In addition to the NIEHS OFCD website that she will maintain, Collins plans to make use of social media to increase the connection between NIEHS trainees and alumni. (Photo courtesy of Steve McCaw)



Schrader feels that NIEHS is fortunate to have an OFCD director who has research experience, especially at NIEHS. "Collins will hit the ground running with a good understanding of the needs and challenges faced by our trainees," Schrader noted. (Photo courtesy of Steve McCaw)

- Establish effective communication with trainees, particularly new ones who may be unaware of OFCD’s role.
- Prepare for the upcoming 2013 NIH Summer Internship Program application process.
- Coordinate fellows’ activities with the Office of Science Education and Diversity, including the new Scholars Connect project.

Even with an already long list of priorities to be addressed by workshops and symposia, Collins plans to search for unmet needs in training by using a more personal approach. “I think it is important to meet with trainees from various groups to survey the landscape of career development needs throughout the Institute,” Collins said. “We need to determine where there are gaps that need to be filled.”

Collins already has identified an unmet need in the support of international fellows. In addition to providing workshops to help improve communication for trainees whose primary language is not English, Collins said she wants to establish an arrangement to ease the overall transition to working in the U.S. Collins may organize a system where international fellows are paired up with willing American fellows, to help them adjust to U.S. culture.

(Jeffrey Stumpf, Ph.D., is a research fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)

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Transitioning from trainee to advisor

Trained as a chemist and biochemist, Collins earned an undergraduate degree from Appalachian State University and a Ph.D. from Duke University. After a brief stint of postdoctoral work at Duke, Collins joined the NIEHS Laboratory of Molecular Genetics (LMG) [Mitochondrial DNA Replication Group](#), where she has researched the role of human topoisomerase IIIalpha in mitochondrial DNA replication and disease.

In addition to research, Collins progressively acquired more leadership responsibilities, by serving in various roles, from a co-chairperson in the LMG trainee action committee to being a member and chair of the NTA. Experience in decision-making helped her realize her passion for impacting policy that assists in the training of young scientists. Schrader notes that her dedication to helping trainees achieve their goals will improve mentorship at NIEHS.

“I am confident that Dr. Collins will also bring a sense of renewed enthusiasm to test out new training modalities — enthusiasm that I believe will serve all of NIEHS well as we move forward,” he said.

Grantee honored for research on allergic asthma

By Eddy Ball

NIEHS grantee Elizabeth Matsui, M.D., has been named this year’s top young investigator in the field of allergy and immunology. [Matsui](#) is an associate professor of pediatrics at Johns Hopkins Children’s Center (JHCC), specializing in allergy and immunology, and holds a joint appointment in the department of epidemiology at the Johns Hopkins Bloomberg School of Public Health.

Chosen by an international body of scientists on behalf of the [Phadia Allergy Research Forum \(PhARF\)](#), Matsui also received a \$50,000 cash award, sponsored by blood test manufacturer Thermo Fisher Scientific Inc., during the [European Academy of Allergy and Clinical Immunology Congress 2012](#) held in Geneva.

Exceptional contributions to advancing the field of allergy

The award recognizes exceptional young scientists who have advanced the field of allergy through creative and independent research. Matsui was specifically honored for her work on pediatric asthma and her research on the role of mouse allergens as an important driver of asthma flare-ups, particularly among urban patients.

In bestowing the award, committee members commended Matsui's combined expertise in epidemiology and clinical and basic science, which has led to novel insights into the mechanisms of inflammatory airway disease, and helped allergists better evaluate and manage urban patients with asthma.

“This award couldn't have gone to a more deserving investigator,” said [Robert Wood, M.D.](#), in a [JHCC press release](#). Wood is the director of allergy and immunology at JHCC, as well as a mentor and collaborator of Matsui's. “Dr. Matsui's investigative curiosity and her clinical acumen, combined with her epidemiologic and scientific expertise, have greatly influenced the field of pediatric allergy and fueled a new understanding of modifiable risk factors for allergic asthma.”



*PhARF Award winner Elizabeth Matsui
(Photo courtesy of Elizabeth Matsui)*

Matsui received her undergraduate and medical degrees from Vanderbilt University and went on to complete her pediatric residency at the University of California, San Francisco (UCSF). After her residency, Matsui spent several years practicing general pediatrics in Seattle and Baltimore.

During this time, she developed an interest in asthma and allergies, and subsequently began subspecialty training in pediatric allergy and immunology at Johns Hopkins. After completing her fellowship there, Matsui joined the faculty in the [Division of Pediatric Allergy and Immunology](#) and has built a research program focused on the impact of allergen exposure on allergic disease.

Matsui is part of the research team at the NIEHS-funded [Children's Environmental Health and Disease Prevention Research Center](#) program and was also involved in the Disease Investigation Through Specialized Clinically Oriented Ventures In Environmental Research (DISCOVER) program there from 2006 to 2011. She is currently the lead researcher on two NIEHS grants, [Oxidative Stress and Inflammation in a Human PM \[Particulate Matter\] Nasal Challenge](#) and [Core-Data Management](#), which funds the Data Management and Analysis Core for the Johns Hopkins Center for Childhood Asthma in the Urban Environment.

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Miller promotes prevention by design at nano meeting

By Cindy Loose

At NIEHS, nanotechnology safety is a top priority, said NIEHS Senior Medical Advisor [Aubrey Miller, M.D.](#), at the [Safe Nano Design Workshop](#) Aug. 14-16. Miller addressed top scientists in industry, government and academia who gathered this month for the meeting at the College of Nanoscale Science and Engineering of the University at Albany, State University of New York, which co-sponsored the workshop with the National Institute for Occupational Safety and Health.

The three-day conference focused on prevention through design — a phrase which embodies the effort to avoid potential hazards in nanoscale products and devices, by anticipating them in advance. NIEHS is in the forefront of that effort, both by conducting studies of widely used classes of nanomaterials and by collaborating with numerous entities, Miller explained. Collaborations, he added, help guide research in the most productive, nonduplicative way and ensures wide dissemination of available information.

Unlimited potential, but are some nanomaterials potentially harmful?

Already, nanomaterials are being used in a wide variety of consumer and industrial products, from cosmetics and medicines, to airplane wings and advanced optics. Global demand for nanomaterials is expected to reach \$3.1 trillion in just three years.

While the promise is unlimited, there is limited information about the unique electrical, magnetic, and physical properties that emerge when substances are engineered to nanoscale. According to Miller, one nanometer is about 100,000 times smaller than the diameter of a human hair.

“The aim of prevention by design in nanotechnology is similar to that of green chemistry — to address problems up front, before damage is done to the environment and human health,” said Miller.

“The difference is that we are starting prevention work early in an emerging field. By doing so, we can avoid the mistakes of an older industry that unleashed toxic chemicals into the environment before we understood the implications of new discoveries.”

NIEHS initiatives to promote nano safety

Current research programs within NIEHS emphasize understanding potential hazards from inhaled nanomaterials, Miller told the group. NIEHS scientists are studying the relationship between the physical and chemical properties of specific classes of nanomaterials and the biological reactions they may cause. Other internal studies will be focused on developing nanotechnology-based sensors that can monitor exposure to nanomaterials in the workplace and among the general public. NIEHS scientists also plan to extend their research into exposures through routes other than inhalation.



“Understanding, in advance, the potential hazards of the entire life cycle of a nanomaterial, from creation to the landfill, just makes sense,” said Miller. “Even so, it’s a very exciting and innovative approach.”
(Photo courtesy of Steve McCaw)

The NIEHS role in a government-wide nano initiative

Miller noted that in addition to conducting research within NIEHS and funding scientists around the country as part of its One Nano initiative, NIEHS is also involved in a number of collaborative efforts with its partners.

NIEHS collaborates with 25 different federal agencies, through efforts organized by the National Nanotechnology Initiative. NIEHS also plays an important role in the development of health research strategies for the government, through collaboration with the Nanotechnology Environmental and Health Implications working group.

Disseminating information about what is known is also a hallmark of the work being done. To that end, NIEHS was involved in the development of the Nanomaterial Registry launched this summer — a resource that allows any scientist to find the latest information and studies available about nanomaterials.

Scientists funded through the NIEHS Division of Extramural Research and Training (DERT) also are focused on understanding the potential health implications of various classes of nanomaterials and on guiding the use of safe materials in nano-enabled products in the marketplace.

One DERT initiative created centers with a three-fold mission — to conduct *in vitro* and *in vivo* whole animal studies, and to model risk assessment tools based on both types of studies. Additionally, each center will collect and share data on a common set of engineered nanomaterials (ENMs) — silver nanoparticles, cerium dioxide or ceria, and multiwalled carbon nanotubes. The centers will then use the shared data on these ENMs to apply different risk assessment modeling systems. By integrating results from these studies, the centers will be able to provide detailed, comprehensive hazard ranking and risk assessment information to regulators and the public.

Miller also described the work of the National Toxicology Program (NTP), headquartered at NIEHS. NTP has been conducting toxicity studies of a variety of different types of nanomaterials, including carbon fullerenes, silver-based nanoparticles, and 24 commercially available multiwalled carbon nanotubes.

Ongoing studies are focused on nano-sized ceria, which is being used as a diesel fuel additive. Studies that compare the reactions of both healthy and asthmatic cells are planned.

(Cindy Loose is a contract writer with the NIEHS office in Bethesda, Md.)

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ONES awardee honored by alma mater

By Eddy Ball

Outstanding New Environmental Scientist (ONES) awardee Lauren Aleksunes, Pharm.D., Ph.D., is being honored by the University of Connecticut (UConn).

The UConn Alumni Association selected Aleksunes as the 2012 recipient of the [Graduate of the Last Decade \(G.O.L.D.\) Award](#) for her achievements since becoming in 2007 the UConn School of Pharmacy's first graduate of its dual Pharm.D./Ph.D. program. The award honors those alumni who have been out of school for ten years or less and who have made significant contributions to their professions, their communities, or in philanthropy.

[Aleksunes](#) is an assistant professor in the Ernest Mario School of Pharmacy Department of Pharmacology and Toxicology at Rutgers, The State University of New Jersey. She joined the Rutgers faculty in 2009, following an NIEHS-supported postdoctoral fellowship at the University of Kansas Medical Center. During this training, she was awarded a Pathway to Independence Award from NIH. She also enjoyed support during her doctoral program with a Howard Hughes Medical Institute predoctoral fellowship ([see story](#)).



Aleksunes will pursue her research with an NIEHS grant supporting studies on the disposition of environmental chemicals during pregnancy. (Photo courtesy of Rutgers University)

Since her graduation, Aleksunes has been awarded several federal and local research grants, including ones from NIEHS and the National Institute of Diabetes and Digestive and Kidney Diseases. In 2011, she received her ONES award from NIEHS. This award provides five years of support for her research into how chemicals from the environment are transferred between mothers and babies during pregnancy.

“Her work will allow researchers to predict which patients are at a greater risk for adverse effects of chemical exposure during pregnancy,” said Robert McCarthy, Ph.D., dean of the UConn School of Pharmacy, in a university [press release](#).

Aleksunes will be honored at the Alumni Association Awards Celebration Oct. 12 on the UConn Storrs Campus, and the following day at the UConn Homecoming Game at Rentschler Field in East Hartford, Conn.

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WETP training program means jobs for veterans

By Eddy Ball

A new [NIEHS-funded program](#) in New Jersey is building on a proven model of hazardous materials training to help veterans reenter the civilian workforce and assist graduates with their job search upon completion of the five-week training program.

In an Aug. 9 [press release](#), the University of Medicine and Dentistry of New Jersey (UMDNJ) announced the launch of the [NJ Jobs4Vets](#) training program by the New Jersey/New York Hazardous Materials Worker Training Center at the UMDNJ–[School of Public Health \(SPH\)](#). Recruitment for the first training session, which begins in November, is now underway. The program expects to enroll 25 military and National Guard veterans in courses provided by UMDNJ and the New York City District Council of Carpenters.

“There is a need for veterans to be trained in an area that has potential jobs that are critical for the state,” center director [Audrey Gotsch, Dr.P.H.](#), said in the program announcement. Gotsch is a professor of health education and behavioral science and founding dean of UMDNJ-SPH, a position she held from 1999 to 2010.

“It is unacceptable that so many of our veterans struggle to find jobs when they return home from service,” observed Senator Frank R. Lautenberg, D-N.J., an Army veteran who has worked to expand veteran employment programs nationwide and was quoted in the press release.



SCHOOL OF
PUBLIC HEALTH

University of Medicine & Dentistry of New Jersey



Gotsch is also the director of an NIEHS-funded Minority Workers Training Program and Brownfields Minority Workers Training Program. (Photo courtesy of Audrey Gotsch)

Matching veterans with critical jobs

UMDNJ courses will include an introduction to the program, as well as training in hazardous waste site, asbestos worker, lead abatement, construction safety, and disaster site protocols. The New York City District Council of Carpenters will provide the 40-hour construction skills course at its New York City site, teaching hands-on skills in carpentry and other trades.

Participants will be prepared to apply for asbestos and lead abatement licenses through the state of New Jersey at the conclusion of the five-week training program.

Gotsch said of program participants, “Military service has instilled these veterans with skills, discipline and a work ethic that make them especially strong candidates for these important jobs. We encourage businesses to contact those who have completed the program to recruit them for employment.”



Beard, standing, is shown in a photo earlier this year of U.S. Department of Health and Human Services Good Neighbor Award winners. Seated are WETP Director Chip Hughes, right, and NIEHS Program Analyst Liam O’Fallon. (Photo courtesy of Steve McCaw)

Men and women who have served in the U.S. military, the National Guard, or Military Reserve and are interested in this training program can call 866-VETS-NJ4 (866-838-7654) toll-free for more information. Twenty-five stipends will be provided to veterans who qualify for this program, covering all costs for the five-week training program as well, as the application fees to apply for N.J. state licenses in asbestos and lead abatement.

The program is funded by an [NIEHS grant](#) administered by NIEHS Worker Education and Training Program manager Sharon Beard. Beard is program manager for the highly successful WETP [Minority Worker Training Program \(MWTP\)](#), which has trained more than 10,000 workers with a placement rate of more than 70 percent. The new program incorporates elements from MWTP and a range of other high-impact WETP programs. This NJ Jobs4Vets program mirrors the MWTP by preparing individuals with much needed environmental remediation instruction, as well as specific health and safety job training to make them more marketable to employers.

In addition to UMDNJ, New Jersey/New York Hazardous Materials Worker Training Center program participants include the Hunter College School of Health Sciences, New Jersey State Police, New York Committee for Occupational Safety and Health, New York City District Council of Carpenters, Universidad Metropolitana, and University at Buffalo.

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Swerdlow named assistant professor at Thiel College

By Jeffrey Stumpf

Postdoctoral fellow Sarah Swerdlow, Ph.D., is taking her training in bacterial genetics at NIEHS to Thiel College in her new position as assistant professor. Swerdlow will teach genetics and microbiology courses, along with senior seminars and other classes, at the liberal arts college in Greenville, Penn.

As a member of the NIEHS [Mechanisms of Mutation Group](#), Swerdlow spent the last two years identifying *E. coli* mutants that increase mutation rates by altering the balance of nucleotides within the cell. Swerdlow hopes to start a microbial genetics class that will give the students real experience in research, while teaching them basic microbiology techniques.

“Searching for these mutants involves every microbial genetics technique,” Swerdlow explained. “It will give them a great laboratory experience.”

While her primary role will be in teaching undergraduates, Swerdlow notes that managing long lab classes and mentoring senior research will satisfy her need to actively be involved in primary research.

“I’ll be at a bench, just not always doing basic research,” Swerdlow laughed. “But I will be mentoring senior research projects and helping the students come up with projects that are more along the lines of basic research.”

The journey’s end

Reflecting on her decision to teach college biology, Swerdlow remembered an influential meeting with an undergraduate advisor. Her innocent question about how to become a professor progressed into a detailed plan for obtaining experience and earning qualifications that would take years to complete. Unquestionably, Swerdlow stuck to the plan.

After completing her bachelor’s degree from Clarion University of Pennsylvania and her Ph.D. in the pathology department at Case Western Reserve University, Swerdlow’s journey sent her away to get two very distinct types of experience — as a teaching instructor at a branch campus of Bowling Green State University and later as a postdoctoral researcher at NIEHS.

Lead researcher Roel Schaaper, Ph.D., mentored her project at NIEHS and was pleased that the experience prepared her for the research aspects of teaching at Thiel. “Sarah loves teaching and interacting with students, and I have little doubt that she will be successful in her teaching career,” Schaaper predicted. “She will also have the opportunity to do some genetics research with her students.”

Although NIEHS does not directly offer classes for trainees to teach, Swerdlow sought out opportunities to teach lectures at nearby universities and to organize programs for the NIEHS summer internship program. In addition, workshops on college pedagogy, sponsored by the NIEHS Office of Fellows Career Development, were helpful in learning practical skills about being a professor, such as writing syllabi. Swerdlow mentioned that the workshop gave her a unique perspective that will help her future career.

“It allowed me to look at everything that I did wrong when I taught previously,” she joked.



In addition to her research at NIEHS, Swerdlow was active in leadership roles, including participating in the NIEHS Trainees Assembly, leading seminars for the NIH Summer Internship Program at NIEHS, and representing NIEHS at career fairs. (Photo courtesy of Steve McCaw)



While wishing Swerdlow a bon voyage and good luck, Schaaper also noted that she may be able to continue certain aspects of her NIEHS work and hopes to collaborate on future projects. (Photo courtesy of Steve McCaw)

Although these programs and experiences have prepared her for the next step in her career, Swerdlow advises others interested in teaching college classes to do what she did so many years ago.

“Go back to your undergraduate professors and ask what they did to become a professor,” she suggested.

A new beginning

Armed with a new purple laser pointer and an intense enthusiasm for teaching, Swerdlow has the monumental challenge of preparing multiple labs and lectures as well as creating a new molecular biology course. This daunting task has not curbed her enthusiasm, however.

“I’m so excited to teach, and to not only help the students learn biology, but also learn to like biology,” Swerdlow said. “I really want to help the students reach their goals and get them to where they want to go.”

(Jeffrey Stumpf, Ph.D., is a research fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)

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NIEHS, ATSDR forge closer ties with Atlanta meeting

By Rebecca Wilson

More than 170 researchers affiliated with the NIEHS Superfund Research Program (SRP) traveled to Atlanta last month to meet with scientists from the Centers for Disease Control and Prevention (CDC) Agency for Toxic Substances and Disease Registry (ATSDR). The meeting Aug. 7-8, on the CDC campus, provided a forum for researchers from both groups and the U.S. Environmental Protection Agency (EPA) to strengthen ties and find new opportunities for collaboration, data sharing, and building community partnerships.



ATSDR Director Chris Portier, Ph.D., and NIEHS Director Linda Birnbaum, Ph.D., opened the first and second day’s sessions, respectively. Birnbaum discussed the budget challenges that NIEHS and ATSDR face and shared the new NIEHS strategic plan. She outlined how collaborations between SRP and ATSDR can further the visions of both groups over the next 5 years.

Legacy contaminants and community engagement

Meeting attendees participated in a lively discussion centering on legacy contaminants in the environment and community engagement strategies. Legacy contaminants are substances whose use has been banned or severely restricted by government agencies for many years. Both topics were covered by a series



Birnbaum’s opening remarks placed the SRP-ATSDR collaboration within the context of the new NIEHS five-year strategic plan. (Photo courtesy of MDB Inc.)

of presentations from SRP scientists and followed by a panel discussion from ATSDR scientists.

Meeting organizer and SRP grantee Anna Hoover, Ph.D., said she received input from several scientists at EPA and ATSDR, who commented that they deepened their understanding of SRP research and made connections with researchers. ATSDR panelists mentioned that they appreciated the extent to which epidemiological studies are included in SRP research, as they are frequently utilized in their health assessments. They also expressed an interest in finding ways of connecting with NIEHS scientists and grantees using social media tools such as [ResearchGate](#), a network dedicated to science and research.

NIEHS and ATSDR researchers found common ground in sharing stories about their methods of building partnerships with community liaisons, to communicate health information to the public. “I thought it was a good venue to talk about future partnerships, where we can work together to provide services to impacted communities,” said Sue Casteel, an ATSDR regional representative who served on the community engagement discussion panel.

“The workshop was a great opportunity to share knowledge with participants about successful programs ... so that we can provide higher quality services to communities impacted by hazardous waste sites,” said Casteel. Meeting participants agreed that public availability sessions were great tools to address the concerns of everyone in the community, not just petitioners or those in activist groups.

Building interagency partnerships and looking forward

Over the course of the second day, NIEHS and ATSDR researchers discussed ways to design studies that would allow for maximum utility by both groups.

ATSDR researchers pointed out that they rely heavily on other people’s data, and talked about the challenges of deriving conclusions about human health and exposures from studies that are not perfectly matched to their goals. “We generally rely on the lab to provide us with human health data,” one panelist said.

The meeting wrapped up looking forward. The two groups assessed their respective priorities in the areas of dosage, exposure levels, time scales, and emerging issues. The attendees agreed that when dealing with emerging contaminants and mixtures, it can be difficult to determine how best to serve public health. However, they agreed that the scientific expertise and collaborative opportunities offered at this meeting provided them with excellent tools to meet this challenge.



The meeting featured a poster session for researchers to share their current projects. ATSDR Senior Environmental Health Scientist Olivia Harris, second from left, discussed a poster with SRP trainee Albert dela Cruz, Ph.D., of Louisiana State University, as SRP Director Bill Suk, Ph.D., second from right, talked with SRP trainee Katryn Eske of the University of Kentucky. (Photo courtesy of MDB Inc.)



Casteel, left, spoke during the panel discussion, as ATSDR Environmental Health Scientist Jack Hanley looked on. (Photo courtesy of MDB Inc.)

“This was a very engaging meeting for both the SRP and ATSDR participants,” observed SRP Program Analyst Beth Anderson. “SRP grantees went home understanding some of the challenges ATSDR faces in using the program’s research, and ATSDR attendees had a wonderful opportunity to learn firsthand about the breadth and depth of SRP research.”

(Rebecca Wilson is an environmental health information specialist for MDB Inc., a contractor for the NIEHS Superfund Research Program and Worker Education and Training Program.)

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Ideas and independence highlight NIEHS summer internship poster session

By Ian Thomas

Two months of hard work, dedicated research, and extensive laboratory training came to a close on July 26, as the 2012 [NIEHS summer interns](#) gathered in Rodbell Auditorium for the program’s poster session, where students from across the country showcased what they’ve learned during their time at the Institute.

“The purpose of this program is to have fun, learn some environmental bioscience, and get students exposed to what it’s like to do science in the real world,” said NIEHS Deputy Scientific Director [Bill Schrader, Ph.D.](#) “Once they’ve gotten acclimated to life in the lab, they go to work on an actual research project of their own, and this poster session is the culmination of all of that hard work and effort.”

Learning by doing

The core component of the NIH Summer Internship Program (SIP) at NIEHS is its commitment to giving students hands-on experience in a world-class biomedical research setting, by pairing them with members of the NIEHS intramural research team. Through this mentoring partnership, NIEHS interns learn, firsthand, what it means to conduct experiments and analyze data.

“There’s a lot of emphasis on independence in this program,” said Nick Tobey, a recent graduate of the North Carolina School of Science and Mathematics who will attend the University of North Carolina at Chapel Hill beginning this fall. “Interns or not, we’re responsible for the work that we do and we’re given the tools to do it. It really is a fantastic way to learn.”

Although their mentors are always on hand for guidance and suggestions, students’ success ultimately comes from their ability to take what they’re taught and use it to generate new ideas.



Dayal, right, heads off to her first year in college as a winner in the high school competition. Schrader, left, presented the awards at a ceremony and ice cream social following the poster session. (Photo courtesy of Michael Garske)

“My mentor edited the contents of my poster but, at the end of the day, I was responsible for writing all of it,” explained Karlie Haug, a college senior from Carleton College in Minnesota, who worked in the Laboratory of Molecular Carcinogenesis under [Trevor Archer, Ph.D.](#) “It was definitely a struggle at times, but I really feel like I learned a lot about research, as a whole, by doing it on my own.”

Head of the class

In the end, top honors were given to the highest rated high school, undergraduate, and graduate student posters, as judged by a panel of NIEHS scientists and postdocs.

“There were a lot of remarkable projects out here today, so I was surprised and thrilled to have mine picked as one of the winners,” said Bridget Mayer, a third-year veterinary student at North Carolina State University, who worked in the Comparative Medicine Branch under Terry Blankenship-Paris, D.V.M. “This entire process has been an amazing journey of discovery, and I just hope that my mentor and lab mates can use my work to benefit theirs moving forward.”

2012 SIP Poster Session Winners

- **High School** — Diana Dayal of Enloe High School in Raleigh, N.C., “Testing for Xenobiotic Disruption of Calcium Oscillations in Rat Pituitary Cells,” with lead researcher David Armstrong, Ph.D.
- **Undergraduate** — Kaushik Annam of the University of Pennsylvania, “Association between Serum Levels of Environmental Contaminants in the US Population and Antinuclear Antibodies: A Novel Application of Cox Regression,” with lead researcher Clarice Weinberg, Ph.D.
- **Graduate** — Bridget Mayer of the North Carolina State University College of Veterinary Medicine, “A Comparison of Sustained Release Tramadol and Buprenorphine as Analgesics in Rats,” with lead researcher Terry Blankenship-Paris, D.V.M.



Rising senior Annam was obviously pleased with this addition to his CV. (Photo courtesy of Michael Garske)



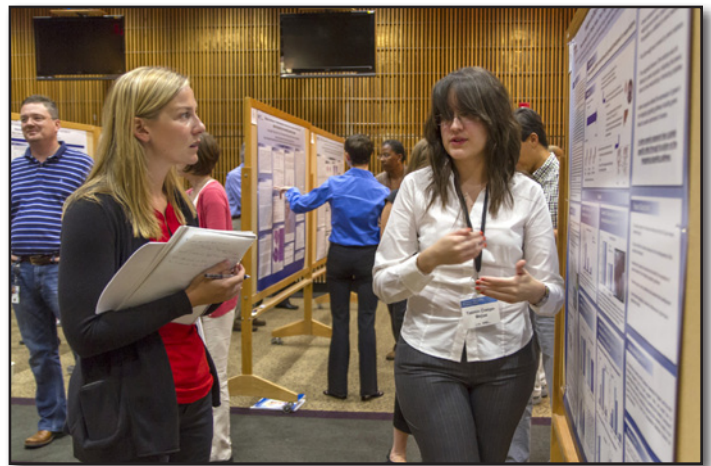
Mayer enters her final year of D.V.M. training with experience in the care of laboratory animals. (Photo courtesy of Michael Garske)



It takes a community of mentors to nurture young scientists, such as Christopher Newport University senior Alejandra Vall, third from left. Shown at her poster, left to right, are Xianhong (Linda) Yu; lead researcher Darlene Dixon, D.V.M., Ph.D.; Vall; Xiaohua Gao, M.D., Ph.D.; Maria Sifre; and Yitang Yan, Ph.D. (Photo courtesy of Michael Garske)



Scientific curiosity runs in the family of Elon University graduate Kyle Herbert, center, who joined his NIEHS mentor, lead researcher Sue Fenton, Ph.D., left, and his proud mother, NTP group leader Angela King-Herbert, D.V.M. Kyle's father, Ron Herbert, D.V.M., Ph.D., is also a group leader with NTP. (Photo courtesy of Michael Garske)



An important part of the poster competition is explaining the summer project to the NIEHS postdocs who served as judges. Intern Yasmin Crespo-Mejias, right, a rising senior at the University of Puerto Rico, described her research to judge Kymberly Gowdy, Ph.D. (Photo courtesy of Michael Garske)



Along with group leaders, postdocs play an important part in the summer experience. Mount Holyoke College rising junior Morgan Linney, left, joined postdoc mentor Rachel Goldsmith, Ph.D., center, and lead research Jonathan Freedman, Ph.D., at Linney's poster. (Photo courtesy of Michael Garske)



The summer internship involved a lot of work, but there was also time to make friends. Shown above, left to right, are interns Komal Patel and Jasmin Huang, students at the University of North Carolina at Chapel Hill, and Priyanka Venkannagari, a rising senior at Enloe High School. (Photo courtesy of Michael Garske)



As he looked forward to ice cream and a break before getting back to classes, North Carolina Central University rising junior Michael Lekwuwa, right, was ready to loosen his tie and enjoy time with fellow interns. (Photo courtesy of Michael Garske)

(Ian Thomas is a public affairs specialist with the NIEHS Office of Communications and Public Liaison and a regular contributor to the Environmental Factor.)

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NIEHS Commissioned Corps officers win awards

By Eddy Ball

During ceremonies in late July, two [U.S. Public Health Service \(PHS\) Commissioned Corps](#) officers stationed at NIEHS received awards for their outstanding service. NIEHS/NTP Director Linda Birnbaum, Ph.D., presented certificates and medals to recently promoted Captain (CAPT) Paul Jung, M.D., chief of staff at NIEHS, and Lieutenant Commander (LCDR) John McLamb, a health physicist in the NIEHS Health and Safety Branch.

“The Commissioned Corps is a unique and integral part of HHS,” said Birnbaum. “We are proud to have several PHS officers here at NIEHS.” She also praised the officers for their contributions to effective communication of the NIEHS mission and to the strengthening of interagency partnerships.

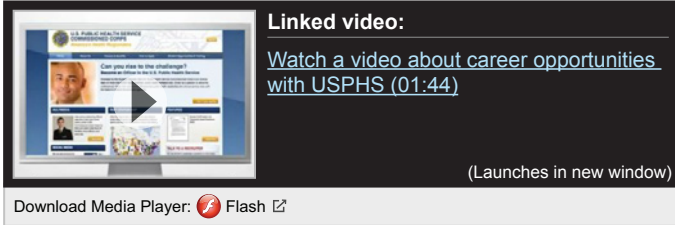
The citation for Jung’s medal read, “For exceptional performance while preparing a timely, sensitive, and comprehensive report in response to congressional inquiry under time constraints.”

The citation for McLamb’s medal read, “For significant contributions to foster cooperation between federal agencies, while developing an audit program for environmental management systems.”




CAPT Jung, right, showed off the medal and certificate presented to him by Birnbaum. (Photo courtesy of John Maruca)

The Commissioned Corps is an elite uniformed all-officer organization. The Corps is made up of more than 6,000 full-time, well-trained, highly qualified public health professionals, dedicated to delivering the nation's public health promotion and disease prevention programs, and advancing public health science.



Linked video:
[Watch a video about career opportunities with USPHS \(01:44\)](#)
(Launches in new window)

Download Media Player:  Flash [↗](#)

PHS ranks correspond to ranks in the U.S. Navy, with CAPT equivalent to a colonel and LCDR equivalent to a major in the U.S. Army.

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In a separate ceremony, LCDR McLamb, right, received his medal and certificate from Birnbaum. (Photo courtesy of John Maruca)

Science Notebook

Fellows shine for research excellence

By Nisha Cavanaugh

As a testament to the top-notch research and training at NIEHS, fellows fared very well in this year's NIH Fellows Award for Research Excellence (FARE) competition, receiving 19 of the 220 highly coveted awards for their [winning abstracts](#).

NIEHS had the third highest number of award recipients, surpassed only by the National Cancer Institute and the National Institute of Allergy and Infectious Diseases. The FARE award recognizes outstanding scientific research performed by intramural NIH fellows. The program is sponsored by the NIH Fellows Committee (FelCom) and is funded by the Scientific Directors and the Office of Research on Women's Health.

Fellows submitted abstracts earlier this year, which were ranked by study sections made up of previous FARE awardees and NIH senior scientists. Exceptional abstracts — the top 25 percent in each study section — were selected based on scientific merit, originality, experimental design, and overall quality and presentation.

NIEHS Deputy Scientific Director William Schrader, Ph.D., commented in a message to winners, “This juried review of submitted research abstracts is a highly competitive event. Your research excellence and the environment provided by your mentors are achievements in which all of the NIEHS community can take pleasure.”

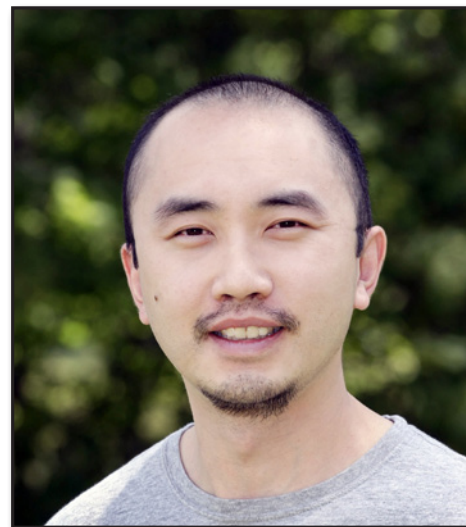
The prestigious award provides the winners with:

- A \$1,000 travel award to attend a scientific meeting of their own choosing to present their research.
- An invitation to present a poster at the annual NIH Research Festival and attend the FARE award ceremony held on the NIH Bethesda campus in October.
- Eligibility to serve as a peer reviewer for the following year's FARE competition.

Furthermore, the recipients are recognized at the NIEHS Director's Award Ceremony, typically held in December.

This year, the nineteen awardees spanned nine laboratories and branches. Impressively, six recipients came from only two groups:

- Kin Chan, Ph.D., Julie Lowe, Ph.D., Steven Roberts, Ph.D., and Maria Shatz, Ph.D., of the Chromosome Stability Group, mentored by Michael Resnick, Ph.D., and Dmitry Gordenin, Ph.D.
- Georgette Charles, Ph.D., and Xiaofeng Zheng, Ph.D., of the Stem Cell Biology Group, mentored by Guang Hu, Ph.D.



Intramural Research and Training (IRTA) Fellow Kin Chan, Ph.D., “A reporter system for identifying mutagens acting preferentially on single-strand DNA,” lead researcher Dmitry Gordenin, Ph.D. (Photo courtesy of Steve McCaw)

In spite of the stiff competition, two fellows were repeat winners, earning their second FARE awards:

- Lindsay Smith, Ph.D., from the Intracellular Regulation Group, mentored by David Miller, Ph.D., with this year's title of "Glucocorticoid receptor regulation of P-glycoprotein at the blood-brain barrier." She commented, "Submitting a FARE award is a great exercise in writing and winning the FARE award is incredibly affirming and rewarding." Smith was previously awarded as a predoctoral fellow in the Molecular Endocrinology Group, mentored by John Cidlowski, Ph.D.
- Kirsten Verhein, Ph.D., from the Environmental Genetics Group, mentored by Steven Kleeberger, Ph.D., with this year's title of "Differential susceptibility to ozone-induced lung inflammation maps to mouse chromosome 17: role of Notch receptors." Verhein noted, "Submitting an abstract for a FARE award is a great experience, because it's a chance to have your work critically evaluated by the NIH community."



IRTA Fellow Georgette Charles, Ph.D., "Regulation of APA site choice in the maintenance of ES cells," lead researcher Guang Hu, Ph.D. (Photo courtesy of Steve McCaw)



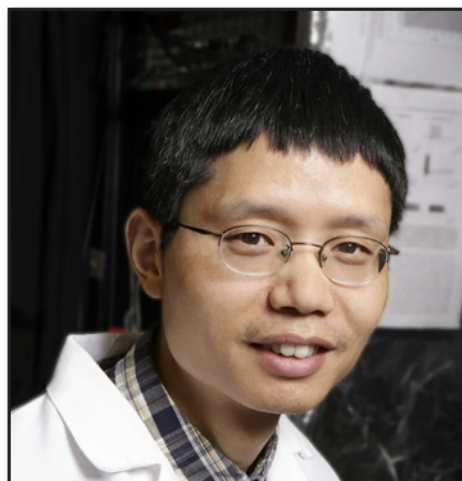
IRTA Fellow Tracy Clement, Ph.D., "Testis expressed actin-like 7b (Actl7b) is required for mouse spermatid morphogenesis and male fertility," lead researcher Mitch Eddy, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Jacqueline de Marchena Powell, Ph.D., "A novel approach to isolate the function of the galanergic subpopulation of the locus coeruleus," lead researcher Patricia Jensen, Ph.D. (Photo courtesy of Steve McCaw)



Visiting Fellow Swati Ghosh, Ph.D., "An integrated approach reveals that Tet1 maintains mouse embryonic stem cell identity partly by regulating LIF dependent Stat3-mediated gene activation," lead researcher Raja Jothi, Ph.D. (Photo courtesy of Steve McCaw)



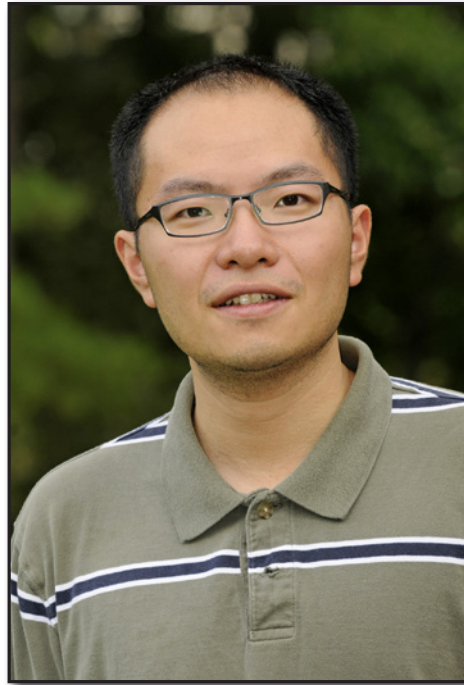
Research Fellow Zhenglin Gu, Ph.D., "Cholinergic coordination of pre- and postsynaptic activity induces time-dependent hippocampal synaptic plasticity," lead researcher Jerrel Yakel, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Brant Hamel, Ph.D., "The N-terminus of the glucocorticoid receptor regulates its nucleocytoplasmic localization," lead researcher John Cidlowski, Ph.D. (Photo courtesy of Steve McCaw)



Research Fellow Bonnie Joubert, Ph.D., “Epigenome-wide association study identifies DNA methylation differences in cord blood related to in utero tobacco smoke exposure,” lead researcher Stephanie London, M.D., Dr.P.H. (Photo courtesy of Steve McCaw)



Visiting Fellow Fumin Lin, Ph.D., “Role of GLIS3 in the generation of pancreatic beta cells from ES and iPS cells,” lead researcher Anton Jetten, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Julie Lowe, Ph.D., “An unexpected role for p53 in NF-kappaB-mediated inflammatory response,” lead researcher Michael Resnick, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Steven Roberts, Ph.D., “A permanent record of transient hypermutation associated with single-strand DNA in human cancers,” lead researcher Dmitry Gordenin, Ph.D. (Photo courtesy of Steve McCaw)



Visiting Fellow Maria Shatz, Ph.D., “p53 cooperates with MAP kinase and NFkB signal transduction pathways to potentiate human immune/inflammatory response,” lead researcher Michael Resnick, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Lindsay Smith, Ph.D., “Glucocorticoid Receptor Regulation of P-glycoprotein at the Blood-Brain Barrier,” lead researcher David Miller, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Dan Su, Ph.D., “Chromatin state primes stress specific p53-regulated gene responses,” lead researcher Douglas Bell, Ph.D. (Photo courtesy of Steve McCaw)



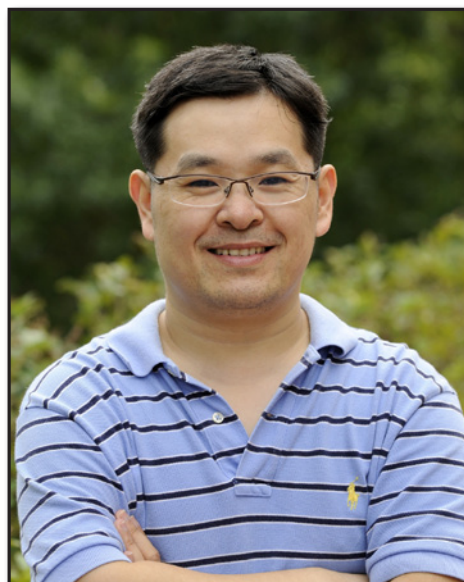
IRTA Fellow Darshini Trivedi, Ph.D., “The deficiency of beta-arrestin2 attenuates abdominal aortic aneurysm formation in mice,” lead researcher Robert Langenbach, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Kirsten Verhein, Ph.D., “Differential susceptibility to ozone-induced lung inflammation maps to mouse chromosome 17: Role of Notch receptors,” lead researcher Steven Kleeberger, Ph.D. (Photo courtesy of Steve McCaw)



IRTA Fellow Staton Wade, Ph.D., “MicroRNA-mediated regulation of the BRG1 chromatin remodeling complex underlies the balance between pluripotency and differentiation in human embryonic stem cells,” lead researcher Trevor Archer, Ph.D. (Photo courtesy of Steve McCaw)



Visiting Fellow Qingshan Wang, Ph.D., “Substance P exacerbates neurotoxins-induced nigral dopaminergic neurodegeneration through activation of microglial NADPH oxidase,” lead researcher Jau-Shyong Hong, Ph.D. (Photo courtesy of Steve McCaw)



Visiting Fellow Xiaofeng Zheng, Ph.D., “Identification of a novel component of the self-renewal circuitry conserved in mouse and human ES cells,” lead researcher Guang Hu, Ph.D. (Photo courtesy of Steve McCaw)

To learn more about submitting an abstract for future FARE awards, please visit the FelCom website at <http://www.training.nih.gov/felcom>.

(Nisha Cavanaugh, Ph.D., is a postdoctoral fellow in the NIEHS DNA Repair and Nucleic Enzymology Group.)

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Possible mechanism between maternal smoking and childhood illness found


By Robin Arnette

Previous research has determined that women who smoke during pregnancy tend to have babies who experience several adverse health effects, such as low birth weight, some childhood cancers, impaired lung function, and early respiratory illness. For years, scientists searched for the connection between exposure to tobacco smoke *in utero* and childhood disease. Now, a new [study](#) published by NIEHS scientists and their collaborators at Duke University, at the University of North Carolina at Chapel Hill, and in Norway may have found the answer.

The team determined that several genes specific to tobacco smoke detoxification and other development processes, in the children born to mothers who smoked during pregnancy, had different amounts of DNA methylation, which is the addition of methyl groups onto DNA, than children of nonsmokers. These specific genes controlled tobacco smoke detoxification and several other developmental processes.



London said that this study was one of the most interesting projects she's been involved with during her tenure at NIEHS. (Photo courtesy of Steve McCaw)

 [Listen as authors Stephanie London and Bonnie Joubert discuss their study on an EHP Researcher's Perspective podcast.](#)

Methylation is a biochemical process that is important for normal development. Scientists consider methylation to be a type of epigenetic control that influences whether, when, and how much a gene is expressed. The authors suggest that the differing amounts of methylation may provide one mechanism for the detrimental health effects seen in these children. The work appeared online July 31 in *Environmental Health Perspectives*, and is the largest study to examine the association between *in utero* exposure and methylation measured at birth.

Biomarker and new technology add power to the findings

The results came from participants in the Norwegian Mother and Child Cohort Study, an ongoing long-term prospective cohort study of 110,000 pregnant Norwegian mothers and their children. Rather than using self-reporting to find out which mothers smoked during pregnancy, the researchers used cotinine, a reliable smoking biomarker. After identifying smoking and non-smoking mothers, the research team examined cord blood from 1,062 infants born to these mothers.

According to [Stephanie London, M.D., Dr. P.H.](#), a lead researcher at NIEHS and corresponding author of the study, the team is the first to use a commercially available method called the Infinium HumanMethylation450 BeadChip (450K) to test the infants' blood.



Joubert is a research fellow in the NIEHS Epidemiology Branch and one of 19 NIEHS trainees (see [related story](#)) who are 2013 NIH Fellows Award for Research Excellence winners. (Photo courtesy of Steve McCaw)

The 450K is reliable, cheaper, and faster than previously used approaches, but still provides good coverage. Its use is what sets this study apart.

“The 450K allowed us to examine methylation across the genome in a much more comprehensive way and on large numbers of subjects than was possible in the past,” London said.

The research team analyzed samples from a birth cohort study in the U.S. and observed the same findings, which provides important confirmation.

“Another unique aspect of this study is the replication of our results in an independent sample from the U.S.,” said first author Bonnie Joubert, Ph.D. “Although this sample was smaller, with 18 babies born to smoking mothers and 18 born to nonsmokers, the relationship between newborn methylation and maternal smoking was consistent.”

The work offers new insight into understanding the underlying cause of adverse health effects in the children of mothers who smoke during pregnancy.

Citation: Joubert BR, Haberg SE, Nilsen RM, Wang X, Vollset SE, Murphy SK, Huang Z, Hoyo C, Middtun O, Cupul-Uicab LA, Ueland PM, Wu MC, Nystad W, Bell DA, Peddada SD, London SJ. 2012. 450K Epigenome-wide scan identifies differential DNA methylation in newborns related to maternal smoking during pregnancy. *Environ Health Perspect*; doi:10.1289/ehp.1205412 [Online 31 July 2012].

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High school science teacher wraps up a summer of exploration at NIEHS


By *Darshini Trivedi*


For high school science teacher Kelly Estes, this summer’s externship at NIEHS was an eye-opening, curriculum-enriching experience that culminated in an informal seminar Aug. 9. Speaking to a small group of colleagues at NIEHS, Estes described the ways her summer in the lab will benefit students when she begins her new year as a teacher at Broughton High School in Raleigh, N.C.

Estes is the first graduate of a new program launched by the NIEHS [Office of Science Education and Diversity \(OSD\)](#) this summer, called the Science, Teachers, and Research Summer (STaRS) Program, led by OSD Director Ericka Reid, Ph.D., in partnership with the [North Carolina New Schools Project \(NCNSP\)](#). STaRS provides outstanding high school science teachers an opportunity to work alongside top NIEHS scientists, to further their knowledge and experience in environmental health sciences research and expand their classroom curriculum.



Estes described her experience at NIEHS with infectious enthusiasm. “I honestly didn’t know what a knockout mouse was until I got here,” she said. (Photo courtesy of Steve McCaw)

 Watch as former N.C. Governor Jim Hunt places NCNSP programs into the context of advancing science, technology, engineering, and mathematics education in the state (06:18)
(Launches in new window)

Download Media Player:  Flash [↗](#)

Estes, who spent her first year out of college teaching at South Granville High School, worked this summer with Huei-Chen Lao, a biologist in the [Metabolism and Molecular Mechanisms Group](#) of the Laboratory of Toxicology and Pharmacology, headed by lead researcher Robert Langenbach, Ph.D.

“The externship at NIEHS exceeded my expectations,” Estes told the audience. “It was such an educational and enlightening experience, and I can’t wait for the upcoming school year so that I can implement what I learned into my classroom. I feel that I have such a different outlook on research, and truly see how much research benefits society today.”

Mastering the essentials of basic research

Lao designed the externship with the goal of helping Estes gain a better understanding of the what, why, and how of basic science research, as well as an appreciation of the scope of the science at NIEHS. The main objective for Estes was to be able to translate this knowledge of basic biomedical research into the classroom. Estes participated in a variety of hands-on laboratory experiences, from excising skin tumor samples from mice and running western blot analysis of proteins extracted from the skin tumors, to performing histological and immunohistochemical staining of skin tumor cross-sections.

Estes worked closely with the immunohistochemistry and image analysis core labs at NIEHS, to perform part of these studies. She also drew upon the resources of the animal facility, knockout mouse core, the clinical research unit, viral vector core, microarray facility, and stem cell labs. Estes said that being exposed to the variety of research areas at NIEHS gave her a greater appreciation of the complexity of basic science research. She was also impressed with the amount of care that the animals received in the animal research facility, as she learned about the extensive rules and regulations that have to be followed in order to conduct animal research ethically and humanely.

Her experience at NIEHS has energized Estes with a new passion for science, and she feels more motivated than ever to ignite the same passion in her students. Estes believes that it is very important to make classroom material relevant to what her students are exposed to in their day-to-day lives, and she is eager to use her imagination and creativity to incorporate new ideas about emerging research into her classroom curriculum.



Huei-Chen Lao scans through one of Estes’ proposed lesson plans based on her research experience in the Langenbach lab. Lao said she wanted to enhance Estes’ understanding of the nature of science, as well as the essentials of basic mechanistic research. (Photo courtesy of Steve McCaw)



OSD Special Assistant for Community Engagement and Outreach John Schelp, center, browsed the N.C. Essential Standards for teachers, which Lao incorporated into the design of Estes’ externship program. (Photo courtesy of Steve McCaw)

The state of North Carolina requires its teachers to follow certain essential standards when they design their lesson plans. One standard, Bio 3.3.2, specifies that students learn about how transgenic organisms are engineered to benefit society. Estes' experience working with knockout mice in the Langenbach lab has given her a host of new ideas for lesson plans and modified laboratory activities, which will help satisfy the N.C. Essential Standards for teachers, while raising awareness about scientific research among her students.

(Darshini Trivedi, Ph.D., is an Intramural Research and Training Award fellow in the NIEHS Laboratory of Toxicology and Pharmacology.)

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Reid explained that Estes' program was one of several OSED outreach initiatives. "We are definitely trying to take more of what we do at NIEHS into the classroom," she said. (Photo courtesy of Steve McCaw)

NIEHS workshop inspires new papers on autoimmunity

By Cindy Loose

An NIEHS-sponsored [workshop](#) in September 2010, which brought together dozens of experts on autoimmune diseases to examine the state of the science in the field, has resulted in four new papers published online this summer, each with the goal of improving diagnosis, treatment, and prevention in the future.

"As autoimmune diseases become increasingly prevalent, the urgency to meet these goals grows," said NIEHS Division of Extramural Research and Training program administrator [Mike Humble, Ph.D.](#), who organized and moderated the workshop.

The more than 80 autoimmune diseases include relatively well-known illnesses, such as multiple sclerosis, lupus, and rheumatoid arthritis, as well as those that are extremely rare. Although most autoimmune diseases are individually unusual, collectively they are among the most prevalent diseases in the U.S., affecting as many as 23.5 million Americans. Although various autoimmune diseases impact different parts of the body, they share a common characteristic — in each case, autoantibodies attack the host's own cells, tissues, or organs.

The papers from the NIEHS expert panel workshop, all of which were e-published in the Journal of Autoimmunity, demonstrate that increasing evidence supports a role for the environment in the development of autoimmune diseases.

Making sense of what is known about a mysterious cluster of diseases

One group of experts was led by [Fredeick Miller, M.D., Ph.D.](#), who is NIEHS acting director of clinical research and chief of the Environmental Autoimmunity Group based in Bethesda, Md. Miller worked on



Miller's group conducts clinical research on autoimmune diseases at the NIH Clinical Center. (Photo courtesy of Steve McCaw)

[developing criteria](#) for identifying which autoimmune disease phenotypes are associated with environmental triggers. The paper laid out approaches that are useful for developing criteria and outlined the types of studies needed to identify autoimmune diseases in which the environment plays a causative role.

A [second paper](#) reviewed available evidence about environmental factors in specific autoimmune diseases. It also identified both the gaps in knowledge and the research needed to fill those gaps. “Identifying environmental risk factors is a critical first step in prevention,” said Miller, who was the lead author of the paper and coordinated an expert panel on the epidemiology of environmental exposures.

The panel concluded with confidence that crystalline silica exposure can contribute to the development of several autoimmune diseases, solvent exposure can contribute to the development of systemic sclerosis, and smoking can contribute to the development of seropositive rheumatoid arthritis. The group also concluded that ultraviolet radiation exposure has an inverse association with the risk of developing multiple sclerosis.

The panel identified high priority areas that need more study. For example, although a review of existing data could not definitively establish a link between autoimmune diseases and pesticides, the experts noted that repeated epidemiological studies have found that farmers have higher risks for rheumatoid arthritis and lupus.

[Dori Germolec, Ph.D.](#), head of the NIEHS Division of the National Toxicology Program Systems Toxicology Group, was the first author of a [paper assessing animal model studies](#) that increased confidence in links between autoimmune diseases and the environment.

The review concluded, for example, that studies in animals had led to a high degree of confidence that exposures to mercury and pristane, as well as infection with Streptococcus and Coxsackie B virus, affected development of specific autoimmune diseases. A second level of consensus identified exposures likely to influence autoimmunity, and recommended more study.

A fourth [paper](#) reviewed the most promising major theories about the mechanisms by which the environment influences autoimmunity. The paper concluded that those theories, used in concert with animal models and epidemiological studies, can provide a comprehensive picture of the environmental causes of autoimmune diseases. The lead author on the study was Carlo Selmi, M.D., a physician-scientist with joint appointments at the Humanitas Clinical and Research Center in Milan and the University of California, Davis.



Humble administers NIEHS grants for extramural research of autoimmune diseases. (Photo courtesy of Steve McCaw)



Germolec's group leads the NTP immunotoxicology program. (Photo courtesy of Steve McCaw)

Citations:

Germolec D, Kono DH, Pfau JC, Pollard KM. 2012. Animal models used to examine the role of the environment in the development of autoimmune disease: Findings from an NIEHS expert panel workshop. *J Autoimmun*; doi:10.1016/j.jaut.2012.05.020 [Online 27 June 2012].

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Selmi C, Leung PS, Sherr DH, Diaz M, Nyland JF, Monestier M, Rose NR, Gershwin ME. 2012. Mechanisms of environmental influence on human autoimmunity: A National Institute of Environmental Health Sciences expert panel workshop. *J Autoimmun*; doi:10.1016/j.jaut.2012.05.007 [Online 28 June 2012].

(Cindy Loose is a contract writer with the NIEHS office in Bethesda, Md.)

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Fenton examines effects of exposure to endocrine disrupting chemicals

By Sonika Patial

A capacity audience filled the NIEHS Executive Conference Room Aug. 7 to hear Suzanne Fenton, Ph.D., discuss “Mammary Gland as a Sensitive Target Tissue for Endocrine Disruption.” Fenton’s talk was hosted by NIEHS lead researchers Ken Korach, Ph.D., and John Cidlowski, Ph.D., as part of the monthly NIEHS Receptor Mechanisms Discussion Group Series.

Fenton, a group leader in the NIEHS NTP Labs, utilizes rodent models to examine the effects of prenatal and lactational exposure to endocrine disrupting chemicals (EDCs) on mammary gland development and later life disease. EDCs are substances in the environment that interfere with the synthesis, metabolism, and action of natural hormones present in the body that are responsible for several normal functions, such as development, reproduction, and metabolism.



Fenton joined lecture co-host Korach following the seminar. Korach is head of the NIEHS Laboratory of Reproductive and Developmental Toxicology and lead researcher in the [Receptor Biology Group](#). (Photo courtesy of Steve McCaw)

Fenton presented findings from recent studies by her group and underscored the importance of evaluating mammary tissue following exposures during critical periods in mammary gland development. She raised the issue that breast cancer incidence and rates of precocious breast development in girls have not decreased, and that unidentified environmental factors may play important roles.

“There is an urgent need to perform evaluation of mammary glands at low dose exposures as well as during critical periods in mammary gland development,” Fenton explained. “The general trend is towards identifying chemicals that can be potential carcinogens,” she added. “However, there is also a need to identify chemicals or compounds that alter susceptibility.”

Mammary gland development is sensitive to environmental influences

Fenton specifically presented her findings on the effects of three different EDCs on mammary gland development — dioxin or TCDD, a combustion by-product and known human carcinogen; the high use herbicide atrazine; and the industrial surfactant perfluorooctanoic acid (PFOA).

Fenton’s findings highlighted the importance of exposure to environmental contaminants during fetal and neonatal developmental periods on latent mammary effects. According to Fenton, the fetal and neonatal developmental period is a particularly sensitive time in development when external environmental contaminants can disrupt active mammary branching, signaling mechanisms, and tissue remodeling processes.

For example, a single prenatal exposure to TCDD in female rats a week before birth induces significant gene induction and drastic and persistent delay in mammary gland differentiation. These defects include decreased ductal branching and delayed migration of epithelial cells to the fat pads of mammary tissue. Similarly, prenatal exposure of rats to atrazine for three days during the later stages of pregnancy triggered persistent delays in mammary gland development. Interestingly, rats exposed for five days also showed a delayed vaginal opening, a pubertal change lacking in rats exposed for only three days.

Fenton’s group also found that rats exposed for five days to atrazine metabolite mixtures (AMM) at doses 10-1000 times lower than atrazine by itself also showed abnormal mammary gland development. These findings suggest that atrazine metabolites are biologically active, which is important from the standpoint that atrazine normally exists in nature in a mixture form and that the effects of a mixture may be much more drastic than the effects of pure atrazine.

PFOA exposure either during lactation or through the intra-uterine route also led to delayed mammary gland development. This delay was visible as early as birth and has been found to extend into adulthood. In PFOA studies, the lowest doses that were tested produced blood levels in mice similar to the levels seen in humans in PFOA-contaminated areas in Ohio and West Virginia.



Fenton and David Malarkey, D.V.M., Ph.D., discussed the results of her group’s recent studies. Malarkey is the group leader and head pathologist in the [NTP Pathology Group](#), which is an important contributor in NTP two-year rodent studies. (Photo courtesy of Steve McCaw)

Fenton concluded that low dose, biologically relevant exposures to EDCs may cause long-lasting effects in sensitive tissues, such as the mammary gland. For example, PFOA exposure induced stromal hyperplasia at 18 months in mouse mammary glands, an effect that is hypothesized to increase susceptibility for tumor growth in rodents and humans. Those effects were also detected in young adult mice.

(Sonika Patial, D.V.M., Ph.D., is a fellow in the Laboratory of Signal Transduction at NIEHS)

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Neurobiology fellows win competitive travel awards

By Eddy Ball

Travel awards are making it possible for two NIEHS [Developmental Neurobiology Group](#) trainees to attend a major international conference.

With their travel and living expenses covered, postdoctoral fellows Sabrina Robertson, Ph.D., and Jacqueline de Marchena, Ph.D., will spend Sept. 9-13 in Pacific Grove, Calif. at the [Tenth International Catecholamine Symposium \(XICS\)](#). The meeting will focus on leading-edge research on catecholamines, a class of neuromodulating chemicals in the central nervous system known as aromatic amines, including dopamine, norepinephrine, and epinephrine.

An opportunity to shine among the stars of catecholamine research

Judged on the basis of the quality of their abstracts, letters of interest and commitment to catecholamine research, and external recommendations, Irwin J. Kopin Travel Awardee Robertson and Catecholamine Society Travel Awardee de Marchena joined a select group of young researchers selected from applicants worldwide whose \$650 registration fee is waived as part of the award.

During the symposium, Robertson and de Marchena will make poster presentations ([see text box](#)), as well as have an opportunity to network with some of the leading researchers in their field. The impressive lineup of plenary and session speakers includes National Institute on Drug Abuse Director Nora Volkow, M.D., several NIEHS [Centers for Neurodegeneration Science grantees](#), and previous NIEHS Distinctive Lecture Series speakers Robert Lefkowitz, M.D., and Susan Amara, Ph.D.

“The list of speakers is really phenomenal,” Robertson said. “It’s a great opportunity for us to stand out.” De Marchena added, “We’re developing novel genetic tools in the lab, and we feel there’s a potential for collaborating with some of the prominent people in the field [of catecholamine research].”

Potentially groundbreaking findings about neuronal transmission

For their mentor, lead researcher [Patricia Jensen, Ph.D.](#), showing off her trainees’ work, using genetics to define different neuronal subtypes to better understand cellular diversity, could raise the



*Irwin J. Kopin Travel Awardee Robertson
(Photo courtesy of Steve McCaw)*

group's profile and lead to new productive collaborations. "The goal is to be invited as key speakers at the next international symposium," said Jensen, who will also be attending the meeting in September.

"I'm just thrilled that their work is being recognized," Jensen explained. "The neurons that synthesize norepinephrine play an important role in diverse functions such as attention, mood, appetite, memory, and stress. Select subsets of these neurons are differentially susceptible to disease and environmental insult. Our research presents a whole new way of studying subpopulations of noradrenergic neurons based on differential gene expression."

The work coming out of Jensen's group promises to overcome major obstacles to studying the mechanism of selective neuronal dysfunction and vulnerability to environmental factors.



In addition to her travel award, de Marchena won a 2013 Fellows Award for Research Excellence this summer. (Photo courtesy of Steve McCaw)

New insights into neurotransmission

- **Jacqueline de Marchena — A novel approach to isolate the function of the galanergic subpopulation of the locus coeruleus (LC)**

Using a dual recombinase-based genetic strategy to specifically label noradrenergic neurons that express the neuropeptide galanin (GAL) in a mouse model, de Marchena and her team determine where these neurons are located and to which brain areas they project. The team was the first to make a genetic model that takes advantage of a unique developmental pattern of gene expression, alongside a dual recombinase-based strategy, to knock out gene expression.

The researchers observed a developmental upregulation in the number of GAL-expressing LC neurons. Ultimately, they plan to use these tools to uncover how the specific loss of GAL in the LC affects neurodevelopment as well as learning and memory, with potential applications for treatment of neurological disorders, including depression, Alzheimer's disease, and epilepsy.

- **Robertson SD, Plummer NW, de Marchena J, Goulding D, Harry J, Jensen P — Genetic Lineage Dictates Noradrenergic Fate and Function**

Using a newly developed norepinephrine (NE) neuron-specific Flpo recombinase driver allele, Robertson's team produced fate-mapping results that reveal a novel organization of the NE system based on genetic lineage. The researchers found that the projection patterns of these genetically defined NE subpopulations are unique.

The ability to assess the role of NE in prenatal brain development has long been hindered by the embryonic lethality associated with developmental disruption of peripheral NE. Thus, by capitalizing on these fate mapping results, the researchers have utilized a unique genetic solution to this long-held challenge in the monoamine field. Indeed, mice expressing TeTxLC within the NE R1 lineage survive to adulthood and, for the first time, are investigated here for the behavioral consequences associated with silencing the LC throughout development.

Rounding out scientific training with career development

Along with their outstanding work at the bench during their two years with Jensen's group, Robertson and de Marchena have also worked to hone career skills in such areas as lab management and grant writing. "We take advantage of as much as we can," de Marchena said. "Tricia has been really supportive in letting us do anything we can to move our careers forward, and I think the Institute does a pretty good job of giving us access to all kinds of [career development] workshops and career advisors," Robertson added.

With a sign on her office door proclaiming "I love my postdocs... They're awesome," Jensen underscores her appreciation for her trainees' hard work. "They [de Marchena and Robertson] have a clear vision of their future," she said, "[and] I'm doing everything I can to support them."

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Now approaching her third anniversary at NIEHS, Jensen focuses on how genetic and environmental perturbations during development alter the fates and functions of noradrenergic neurons. (Photo courtesy of Steve McCaw)

Infants exposed to specific molds have higher asthma risk

By Amanda Harper

In the U.S., one in ten children suffers from asthma, but the potential environmental factors contributing to the disease are not well known. In a new [study](#), partially funded by an NIEHS grant, Cincinnati-based researchers report new evidence that exposure to three types of mold during infancy may have a direct link to asthma development during childhood.

These forms of mold — *Aspergillus ochraceus*, *Aspergillus unguis*, and *Penicillium variable* — are typically found growing in water-damaged homes, putting a spotlight on the importance of mold remediation for public health.

Lead author [Tiina Reponen, Ph.D.](#), and colleagues report these findings in the August 2012 issue of the [Journal of Allergy and Clinical Immunology](#), the official scientific publication of the American Academy of Allergy, Asthma and Immunology.



Reponen was first author on a study last year ([see story](#)) that laid the foundation for her work with the three specific molds linked to asthma development. (Photo courtesy of UC)

Exposure in infancy linked to asthma at age 7

In a long-term population study of nearly 300 infants, researchers from the University of Cincinnati (UC), U.S. Environmental Protection Agency (EPA), and Cincinnati Children's Hospital Medical Center assessed allergy development and the respiratory health of children, annually, for the first four years of life, and then again at age 7 — an early age for objective diagnosis of asthma in children. The team also monitored home allergens and mold. All infants enrolled in the study were born to at least one parent with allergies.

They found that 25 percent of children whose parents had allergies were asthmatic by age 7. Among the multiple indoor contaminants assessed, only mold exposure during infancy emerged as a risk factor for asthma at age 7.

“Previous scientific studies have linked mold to worsening asthma symptoms, but the relevant mold species and their concentrations were unknown, making it difficult for public health officials to develop tools to effectively address the underlying source of the problem,” explains Reponen, who is a professor in the UC College of Medicine’s environmental health department.

The UC-based team used the Environmental Relative Moldiness Index (ERMI), a DNA-based mold level analysis tool, to determine that exposure to *Aspergillus ochraceus*, *Aspergillus unguis*, and *Penicillium variable* was linked to asthma development in the high-risk study population. The ERMI tool was developed by the EPA to combine analysis results from 36 different types of mold into one index that describes a home’s cumulative mold burden.

“This is strong evidence that indoor mold contributed to asthma development and this stresses the urgent need for remediating water damage in homes, particularly in lower income, urban areas where this is a common issue,” says Reponen. “Therapeutics for asthma may be more efficient if targeted toward specific mold species.”

Children included in this study were part of the [Cincinnati Childhood Allergy and Air Pollution Study \(CCAAPS\)](#), a long-term population-based study of more than 700 children from the Greater Cincinnati area. CCAAPS looked at the effects of environmental particles on childhood respiratory health and allergy development. Participants were identified, during infancy, as being at high risk to develop allergies, based on family medical history.

Co-authors of the study include UC environmental faculty members James Lockey, M.D., David Bernstein, M.D., Linda Levin, Ph.D., Sergey Grinshpun, Ph.D., Manuel Villareal, M.D., Shu Zheng, Ph.D., and Grace LeMasters, Ph.D., principal investigator of CCAAPS. Stephen Vesper, Ph.D., of the EPA, Gurjit Khurana Hershey, M.D., Ph.D., and Patrick Ryan, Ph.D., of Cincinnati Children’s Hospital Medical Center, also contributed to this study.

In addition to NIEHS funding, the study was also supported in part by grants from the U.S. Department of Housing and Urban Development and EPA, through its Office of Research and Development.

Citation: [Reponen T, Lockey J, Bernstein DI, Vesper SJ, Levin L, Khurana Hershey GK, Zheng S, Ryan P, Grinshpun SA, Villareal M, Lemasters G.](#) 2012. Infant origins of childhood asthma associated with specific molds. *J Allergy Clin Immunol*; doi: 10.1016/j.jaci.2012.05.030 [Online 11 July 2012].

(Amanda Harper is a public information officer in the Office of Public Relations and Communications at the UC Academic Health Center. For more information about this study, contact Harper by phone at 513-558-4657 or by email at amanda.harper@uc.edu)



Veteran grantee LeMasters is also a member of the National Advisory Environmental Health Sciences Council, which meets three times a year at NIEHS. A study by her group published earlier this year ([see story](#)) examined the role of secondhand smoke in boys and girls with asthma. (Photo courtesy of UC)



Shown above are the molds *Aspergillus unguis*, left, *Penicillium variable*, right, and *Aspergillus ochraceus*, top. (Photo courtesy of the U.S. Environmental Protection Agency)

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Former NIEHS trainee identifies potential risk factor for autism subgroup

By Carol Kelly

Children born to mothers who smoked during pregnancy have about a 25 percent increased risk for high-functioning autism, according to a recent [study](#) by Amy Kalkbrenner, Ph.D., a former NIEHS predoctoral and postdoctoral training grant recipient, and current assistant professor of epidemiology at the University of Wisconsin-Milwaukee (UWM).

In research funded in part by NIEHS, [Kalkbrenner](#) and her colleagues examined data on maternal smoking from birth certificates of nearly 634,000 children in 11 states. Using appropriate controls for social and demographic confounding factors, the birth certificate data was compared with data obtained from the Centers for Disease Control and Prevention Autism and Developmental Disabilities Monitoring Network on 3,315 children, aged 8 and under, who were diagnosed with an autism spectrum disorder (ASD). About 11 percent of the children with an autism spectrum disorder had mothers who smoked during pregnancy.



In addition to conducting research into environmental chemicals that contribute to neurodevelopmental disorders, Kalkbrenner teaches epidemiology at the Joseph J. Zilber School of Public Health at UWM. (Photo courtesy of Amy Kalkbrenner)

The large, population-based study found an association between maternal smoking and a subgroup of children with higher-functioning ASD, but it did not find an association with more severe forms of ASD. With the spectrum of autism disorders estimated to occur in 1 in 88 children nationally, understanding risk factors for different types of ASD is essential. This study is important because it shows that responses to environmental toxins may differ by children's subtypes of autism, according to Kalkbrenner.

Tobacco compounds and neurodevelopmental disorders

A wide variety of cognitive, achievement, and behavioral deficits have been identified in the children of women who smoked during pregnancy. Cigarette smoke contains more than 1,000 different compounds, but the two suspected of causing harmful effects on a developing fetus are carbon monoxide and nicotine.

“There are many potential biological pathways through which tobacco can harm the developing baby,” said Kalkbrenner.

The identification of important environmental chemicals that are contributing to neurodevelopmental disorders is the basis of Kalkbrenner's [ongoing work](#). Her research focus areas include the environmental determinants of autism, disparities in autism diagnosis, measurement of exposure to pollutants like tobacco smoke and bisphenol A, and neurodevelopmental impacts of air pollutant exposures.

Citation: [Kalkbrenner AE, Braun JM, Durkin MS, Maenner MJ, Cunniff C, Lee LC, Pettygrove S, Nicholas JS, Daniels JL. 2012. Maternal smoking during pregnancy and the prevalence of autism spectrum disorders, using data from the Autism and Developmental Disabilities Monitoring Network. Environ Health Perspect 120\(7\):1042-1048.](#)

(Carol Kelly is a research and communication specialist with MDB Inc., a contractor for the NIEHS Division of Extramural Research and Training.)

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Researchers report lessons learned from Katrina

By Cindy Loose and Robin Mackar

Three new papers published online Aug. 15 in *Environmental Health Perspectives* provide insight into how researchers can work with communities to reduce children's asthma rates, even under the most difficult conditions.

In the aftermath of Hurricane Katrina in 2005, NIEHS and several partners ([see story](#)) formed a community-based research collaboration, known as Head-off Environmental Asthma in Louisiana (HEAL), with the goal of helping asthmatic children return to New Orleans and surrounding parishes, where much of the infrastructure had been destroyed. The new papers discuss some of the devastating conditions at the time, including mold growing in homes and buildings, and the fact that 50 percent of children who had previously had a healthcare provider were without one, after 4,500 physicians and health care workers left the region.

Despite the odds that faced both the researchers and the children recovering from the storm, HEAL was able to accomplish many things, including decreasing the numbers of days children suffered with asthma symptoms by nearly half, and clearly showing the relationships between environmental triggers and childhood asthma. HEAL children received a special type of asthma counseling, which included guidance for caretakers on reducing mold and allergens in the home.

One of the [papers](#) points out that HEAL children were suffering asthma symptoms an average of 6.64 days before the study began, and 76 percent had problems that prompted unscheduled emergency room or clinic visits in the three months prior to the study's start. However, by the end of the yearlong study, which included a number of tailored interventions and approaches, the children averaged only 3.6 days of asthma symptoms in a two-week period, and had fewer emergency room and clinic visits.

Public health implications

"The study has public health implications for the treatment of all cases of asthma," said Patricia Chulada, Ph.D., a primary author of the study papers who, at the time of the study, was employed by NIEHS. "In HEAL, asthma counselors focused on specific asthma triggers that the children were sensitive to and helped caretakers deal with post-Katrina stress. These are measures that can be effective in any setting." Chulada and her colleagues expect to publish several more papers on HEAL.

To conduct the study, children with moderate-to-severe asthma were recruited from 184 schools. The families of children studied had moved an average of three times in the previous year and 62 percent were living in homes that had experienced water damage from Katrina.

In the intervention phase of the study, detailed in two of the papers, homes were tested for mold and other allergens. Although researchers were pleased they did not find high levels of the most toxic molds, 98 percent of children's bedrooms tested positive for some level of the mold *Alternaria*; 60 percent showed allergens associated with mice; and 20 percent had allergens associated with cockroaches.



Head-off Environmental Asthma in Louisiana

A public-private partnership addressing childhood asthma in post-Katrina New Orleans



Chulada coordinated the NIEHS response in the aftermath of Katrina. (Photo courtesy of Steve McCaw)

In addition to testing the air, researchers tested each child to determine sensitivity to specific allergens and asthma counselors devised plans tailored to each child. For example, if a child was found to be highly sensitive to roach allergens, the counselor made sure caretakers knew how to reduce roaches in the homes by cleaning and keeping food tightly contained and, if necessary, provided food containers and helped caretakers find an exterminator, as well as a way to pay for it.

“This study shows that evidence-based clinical trials can be effective, even in real-world settings where a community is struggling to recover from disaster,” said Darryl Zeldin, M.D., scientific director at NIEHS and a leading asthma researcher. “The techniques and interventions used for HEAL are not only applicable during natural disaster situations, but for every child who suffers from asthma.”

Citations:

Chulada PC, Kennedy S, Mvula MM, Jaffee K, Wildfire J, Thornton E, Cohn RD, Grimsley LF, Mitchell H, El-Dahr J, Sterling Y, Martin WJ, White L, Stephens KU, Lichtveld M. 2012. The Head-off Environmental Asthma in Louisiana (HEAL) Study – Methods and Study Population. *Environ Health Perspect*; doi:10.1289/ehp.1104239 [Online 15 August 2012].

Grimsley LF, Chulada PC, Kennedy S, White L, Wildfire J, Cohn RD, Mitchell H, Thornton E, El-Dahr J, Mvula MM, Sterling Y, Martin WJ, Stephens KU, Lichtveld M. 2012. Indoor Environmental Exposures for Children with Asthma Enrolled in the HEAL Study, Post-Katrina New Orleans. *Environ Health Perspect*; doi:10.1289/ehp.1104840 [Online 15 August 2012].

Mitchell H, Cohn RD, Wildfire J, Thornton E, Kennedy S, El-Dahr JM, Chulada PC, Mvula MM, Grimsley LF, Lichtveld MY, White LE, Sterling YM, Stephens KU Sr, Martin WJ 2nd. 2012. Implementation of Evidence-based Asthma Interventions in Post-Katrina New Orleans: The Head-off Environmental Asthma in Louisiana (HEAL) Study. *Environ Health Perspect*; doi:10.1289/ehp.1104242 [Online 15 August 2012].

(Cindy Loose is a contract writer with the NIEHS office in Bethesda, Md. Robin Mackar is news director in the NIEHS Office of Communications and Public Liaison.)

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Study finds a possible biomarker of occupational exposure in firefighters

By Ashley Godfrey

NIEHS grantee [Shuk-mei Ho, Ph.D.](#), professor and chair of environmental health at the University of Cincinnati (UC) and colleagues have found an epigenetic change, a modification of a gene that is independent of any change in the gene sequence itself, which can distinguish firefighters from non-firefighters.

Their NIEHS-funded [study](#) suggests there is a link between exposures to smoke, which contains a mixture of pollutants including polycyclic aromatic hydrocarbons (PAHs), and an epigenetic mark of promoter methylation, the addition of a methyl group to the area that controls gene expression. PAHs are one of the many chemicals found in smoke and products of incomplete combustion, and firefighters are often exposed to this complex mixture of toxicants when fighting fire.

“This work was inspired by the fact that exposure science can now look at the physiological changes caused by a complex mixture of chemicals, and it serves as a proof-of-concept study that this approach can work,” stated Ho.

Understanding the link between exposure and future health risks

According to Ho, one of the motivations for this study came from results published by one of her colleagues at UC, NIEHS grantee [Grace LeMasters, Ph.D.](#) LeMasters had completed a large study combining data from 32 different published reports and found that firefighters are at a higher risk for developing a number of different cancers. Ho wanted to investigate why firefighters are at increased risk by looking for a link between their risk of exposure and epigenetic changes in their genome, which emerging evidence suggests are relevant to disease development.

Ho and her large multidisciplinary team considered four different genes that had been reported to be associated with environmental exposures to traffic-related PAHs in an asthma study of children living in traffic-dense areas in an NIEHS-funded collaborative study with [Frederica Perara, Ph.D.](#), ([see story](#)).

The promoter methylation status of one of the genes (*ACSL3*) was validated to be associated with PAH-induced asthma but the other candidates have not been fully investigated.

In the current firefighter study, her research team showed one of these previously not studied candidates, *DUSP22*, could distinguish between firefighters and non-firefighters.

The study also showed that this mark was associated with years in service because the extent of methylation correlated with the duration of firefighting service and not with age.

“This mark is almost like a memory of how long they have been in service,” said Ho.

She further explained that because epigenetic changes are passed to the next generation of cells over time, the changes could become a signature and a way of measuring both the duration and extent of exposure.

Implications for the field of environmental research

One of the possibilities raised by this study is that environmental exposure can induce epigenetic changes that will last for a long time and could serve as a biomarker for exposure. Combined with other biomarkers, these signatures can help public health professionals better understand the impact of a complex environmental exposure. Ho is hopeful that in the future, measuring this type of exposure related epigenetic marks could help to predict or associate an individual’s risk of developing cancer, or other diseases, in later life.

There are also a number of interesting questions that Ho would like to answer in some of her future studies. One is how long the methylation mark persists after the firefighters stop working and are no longer at risk of being exposed to the toxicants on a regular basis.



Ho has contributed to the recently passed California Assembly Bill 1108, also known as the toxic toy bill, and the re-examination of the risk of bisphenol A by the National Toxicology Program. The results of her recent study could have a large impact on the field of environmental exposure science. (Photo courtesy of Shuk-mei Ho)



First author on the publication Bin Ouyang, Ph.D., is a research scientist at the University of Cincinnati. (Photo courtesy of Shuk-mei Ho)

Another important public health question is whether an intervention strategy would be able to reverse the changes. Ho believes the answers could lay groundwork for future surveillance and intervention strategies. Ho also suggests the broader implications for this research are important, especially in light of this summer's wildfire outbreaks.

“Conceptually it might be possible to find epigenetic changes in residents living in wildfire areas and see who has been exposed and for how long,” explained Ho.

She is also interested in expanding this type of research to other types of exposures related to the intense or incomplete combustion of fossil fuels, such as exposures experienced by individuals living in traffic laden cities or oil rig workers and oil spill clean up crews.

Citations:

Ouyang B, Baxter CS, Lam HM, Yermaneni S, Levin L, Haynes E, Ho SM. 2012. Hypomethylation of Dual Specificity Phosphatase 22 Promoter Correlates With Duration of Service in Firefighters and Is Inducible by Low-Dose Benzo[a]Pyrene. *J Occup Environ Med* 54(7):774-80.

Perera F, Tang WY, Herbstman J, Tang D, Levin L, Miller R, Ho SM. 2009. Relation of DNA methylation of 5'-CpG island of ACSL3 to transplacental exposure to airborne polycyclic aromatic hydrocarbons and childhood asthma. *PLoS ONE* 4(2):e4488. doi:10.1371/journal.pone.0004488. [Summary](#)

(Ashley Godfrey, Ph.D. is a postdoctoral fellow in the Molecular and Genetic Epidemiology Group in the NIEHS Laboratory of Molecular Carcinogenesis.)

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NICEATM publishes biennial report

By Debbie McCarley and Cathy Sprankle

The National Toxicology Program (NTP) [Interagency Center for the Evaluation of Alternative Toxicological Methods \(NICEATM\)](#) has published a biennial progress report for the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM). The 2010-2011 ICCVAM Biennial Progress Report, NIH Publication No. 12-7873, describes progress in advancing new and improved safety assessment methods based on the efforts of ICCVAM, which is administered and supported by NICEATM.

ICCVAM, composed of representatives from 15 federal regulatory and research agencies, was established to coordinate interagency evaluations of new test methods used to satisfy regulatory requirements for chemical and product safety testing. A provision of the 2000 ICCVAM Authorization Act of 2000 directs ICCVAM to release publically available biennial reports on its progress. This newly available report is the sixth in the series.



“Having accurate safety testing information about chemicals and other substances that might cause injury or disease is key to injury prevention and good health. Innovative new safety testing methods are helping to provide improved information to support these prevention efforts,” commented NIEHS/NTP Director Linda Birnbaum, Ph.D., in her preface to the report. “This biennial report documents the significant progress and contributions that NICEATM and ICCVAM have made during the past two years in achieving the regulatory acceptance and implementation of scientifically valid new safety testing methods.”

Since ICCVAM was established, NICEATM, ICCVAM, and the ICCVAM member agencies have contributed to the regulatory acceptance of more than 50 alternative methods.

“During the past two years, NICEATM, ICCVAM, and ICCVAM agencies have contributed to the national and international endorsement and adoption of 14 new and updated safety testing methods,” notes Rear Adm. William Stokes, D.V.M., director of NICEATM and executive director of ICCVAM. “This has been the most productive period yet for NICEATM and ICCVAM. These new test methods will support and improve public health while also providing for improved testing efficiency and contributing to reduced and more humane animal use.”

“This report highlights the continued commitment of NICEATM and ICCVAM to gaining regulatory acceptance of scientifically valid new and updated test methods that will continue to support the health of people, animals, and the environment,” commented ICCVAM Chair Jodie Kulpa-Eddy, D.V.M., of the U.S. Department of Agriculture.

Report is now available

The 2010-2011 ICCVAM Biennial Progress Report is available on the [NICEATM-ICCVAM website](#). Copies of the report can also be obtained by [contacting NICEATM](#).



NIEHS/NTP Director Linda Birnbaum, Ph.D., left, was among the signers of the updated ICATM agreement in March 2011. Also present at the signing, standing, from left, were ICCVAM Chair Jodie Kulpa-Eddy, D.V.M., and NICEATM Director William Stokes, D.V.M. The signing of the updated ICATM agreement is one of the key events summarized in the ICCVAM 2010-2011 Biennial Report. (Photo courtesy of NICEATM)

Highlights of the report

- NIEHS, on behalf of NICEATM and ICCVAM, signed an agreement to expand the International Cooperation on Alternative Test Methods (ICATM). ICATM was established in 2009 to expedite the worldwide validation, harmonization, and regulatory acceptance of improved alternative test methods.
- The Organisation for Economic Co-operation and Development (OECD) adopted an international guidance document prepared by NICEATM and ICCVAM that describes how to use *in vitro* test methods to reduce animal use for tests required to identify potentially poisonous substances by up to 50 percent.
- Federal agencies and the OECD adopted several new versions and applications of the murine local lymph node assay (LLNA), an alternative method for assessing whether substances may cause allergic contact dermatitis that reduces and refines animal use.
- Federal agencies adopted ICCVAM-recommended alternative test methods and procedures that will further reduce animal use for eye safety testing, and improve animal welfare in those cases where animal testing is still necessary.
- NICEATM, ICCVAM, and their ICATM partners convened a workshop that recommended priority research to develop improved and more efficient test methods for human and veterinary vaccine potency and safety testing. A focused workshop on human and veterinary rabies vaccine test methods was held in 2011, and additional focused workshops are planned for 2012 and 2013.

(Debbie McCarley is a special assistant to Stokes. Cathy Sprankle is a communications specialist with ILS, Inc., support contractor for NICEATM.)

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Federal agencies accept ICCVAM-recommended testing methods

By Debbie McCarley and Cathy Sprankle

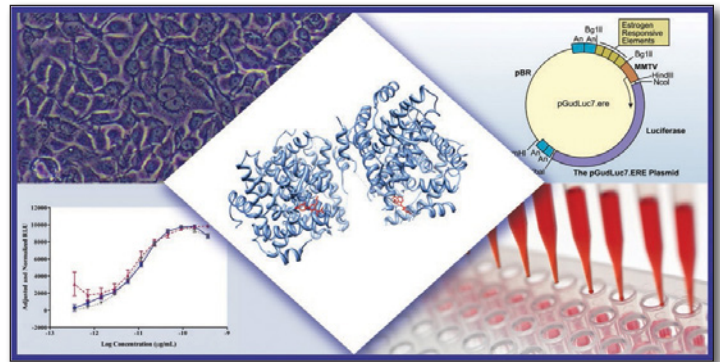
U.S. federal agencies, including NIEHS, have agreed with recommendations on test methods using human cells that can screen substances for their potential to interact with the estrogen receptor. Chemicals that interact with hormone receptors, known as endocrine disruptors or endocrine-active substances, may result in abnormal growth, development, or reproduction.

[The Interagency Coordinating Committee on the Validation of Alternative Methods \(ICCVAM\)](#) evaluated the scientific validity of the proposed methods, the BG1Luc estrogen receptor (ER) transactivation (TA) agonist and antagonist assays, and recommended how they could be used to identify substances that induce or inhibit human ER activity *in vitro*. Representatives of U.S. Environmental Protection Agency (EPA) responded that they regard the BG1Luc ER TA test methods as an alternative to similar test methods currently used in their [Endocrine Disruptor Screening Program](#). Several agencies also indicated that they would communicate the ICCVAM recommendations to stakeholders and encourage their appropriate use.

In her [response](#) to the ICCVAM Committee, NIEHS/NTP Director Linda Birnbaum, Ph.D., noted the advantages offered by the BG1Luc ER TA test methods compared to other methods used to measure interaction with the

estrogen receptor. “NIEHS and the NTP will . . . promote and encourage the consideration and use of the BG1Luc ER TA for research and testing where determined appropriate,” she wrote. “These alternative test methods should be routinely considered and used where appropriate, in order to avoid or minimize animal use.”

Endocrine-active substances mimic or block the action of hormones, causing adverse health effects, by interfering with normal hormone function. Evidence suggests that environmental exposure to endocrine-active substances may cause reproductive and developmental problems in humans and wildlife. There is also concern that exposure to endocrine-active substances may increase cancer incidence in humans.



This collage of pictures includes a drawing representing estrogen receptor molecules bound to 17beta-estradiol surrounded by, clockwise from top left, cells used for the BG1Luc ER TA test method; drawing of a DNA plasmid molecule contained in the cells used for the BG1Luc ER TA test method; pipettor and assay plate representing lab automation; and an example of data from a positive control substance in the BG1Luc ER TA agonist assay. (Courtesy NICEATM-ICCVAM)

The Food Quality Protection Act of 1996 directed the EPA to screen pesticides and environmental contaminants for their potential to affect the endocrine systems of humans and wildlife. The EPA subsequently initiated an endocrine disruptor screening program, and began efforts to standardize and validate test methods to include in the program. At the request of EPA, ICCVAM and the [NTP Interagency Center for the Evaluation of Alternative Toxicological Methods \(NICEATM\)](#), which administers ICCVAM and provides scientific support for its activities, reviewed the validation status of *in vitro* test methods, and developed guidance for future validation studies. NICEATM then conducted validation studies of *in vitro* test methods that could identify potential endocrine disruptors without using animals.

The subject of one of these validation studies was the BG1Luc ER TA agonist and antagonist assays, also known as the LUMI-CELL® ER test method. Xenobiotic Detection Systems Inc. (XDS) developed the LUMI-CELL® ER test method with the support of an NIEHS Small Business Innovation Research grant. NICEATM coordinated an international validation study of the BG1Luc ER TA agonist and antagonist assays at laboratories in Europe, the United States, and Japan.



The ICCVAM evaluation of the BG1Luc ER TA test methods was reviewed by an independent scientific peer review panel that met in March 2011. Appearing here with the panel are NICEATM Director William Stokes, D.V.M., seated third from right, and NICEATM Deputy Director Warren Casey, Ph.D., seated third from left. (Photo courtesy of NICEATM)

The ICCVAM recommendations on the BG1Luc ER TA test methods were based on data from the NICEATM-sponsored independent validation studies. In developing the recommendations, ICCVAM considered comments from its [scientific advisory committee](#), an [independent scientific peer review panel](#), and members of the public.

NICEATM also nominated the BG1Luc ER TA test methods for evaluation in [Tox21](#). The assays have now been adapted to a high-throughput format using 1536-well plates by the [National Center for Advancing Translational Sciences](#) and have been used to screen all compounds in the Tox21 10K chemical library.

Details on the ICCVAM evaluation of the BG1Luc ER TA test methods, including a recommended protocol, more information on the ICCVAM recommendations, and the agency responses, can be found on the [NICEATM-ICCVAM website](#).

(Debbie McCarley is a special assistant to Stokes. Cathy Sprankle is a communications specialist with ILS, Inc., support contractor for NICEATM.)

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This month in EHP

This month's feature stories in [Environmental Health Perspectives \(EHP\)](#) tackle the issues of labeling genetically engineered crops and regulation of trace radioactive contaminants known as radionuclides. Radionuclides, which have always occurred in water and soil as a result of the radioactive decay of naturally occurring elements, are a growing concern because of an increase in radioactive material waste from commercial, medical, and industrial applications.

Unknown Quantity: Regulating Radionuclides in Tap Water

Although radionuclides are widespread, there are large gaps in knowledge about sources of these materials, their distribution, associated health risks, and mitigation measures. The information scientists do have, however, suggests that current drinking water standards for radionuclides established by the U.S. Environmental Protection Agency are not adequately protective of health. The agency is set to review these standards relatively soon, and the next two years are prime time for filling in numerous information gaps and doing other legwork to make sure the review is as well informed as possible.

To Label or Not to Label: California's Upcoming Vote on Genetically Engineered Foods

Since they were first commercially grown in the mid-1990s, genetically engineered (GE) crops have expanded across the globe, cultivated by farmers drawn to their purported resistance to drought, herbicides, and insects. But while GE crop acreage has been steadily increasing, so have public concerns that producing and eating GE foods may pose health and environmental hazards. Now a ballot question in California has the potential to radically alter the GE landscape in the United States, when voters will decide whether GE foods sold in the state must be labeled as such.



<http://twitter.com/ehponline>



Podcast — Epigenomics and Maternal Smoking, with Bonnie Joubert and Stephanie London

It's well known that children whose mothers smoked during pregnancy are more likely to have problems like low birth weight, asthma, and possibly obesity, cancer, and high blood pressure. For clues into the mechanism behind these effects, scientists are looking to the epigenome, the personalized set of directions that tells our cells how and when to produce proteins, which is one of the ways gene activity is controlled. In this month's [Researcher's Perspective](#) podcast, NIEHS researchers Stephanie London, M.D., Dr.PH., and Bonnie Joubert, Ph.D., discuss the results of their recent study, published in EHP ([see story](#)), in which they identified a set of genes with methylation changes present at birth in children whose mothers smoked during pregnancy (“450K Epigenome-Wide Scan Identifies Differential DNA Methylation in Newborns Related to Maternal Smoking During Pregnancy”).

Featured commentaries, reviews, and research this month include:

- Cadmium Induces Pancreatic Tumor Cell Characteristics *in Vitro*
- Early-Life Exposure to Tetrachloroethylene and Adult Vision
- Birth Weight Following Pregnancy During the 2003 Southern California Wildfires
- Placental Mitochondrial DNA and Particulate Air Pollution During *in Utero* Life

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Upcoming international workshop on endocrine active chemicals

By Eddy Ball

NIEHS is one of several sponsors of a [workshop](#) Sept. 11-13 in Berlin on “Low Dose Effects and Non-monotonic Dose Responses for Endocrine Active Chemicals: Science to Practice.” The workshop will be hosted by Charite Medical University Berlin and is offered at no charge to attendees. [Registration](#) is required and limited to 250 attendees.

Organized by NIEHS Health Scientist Administrator [Jerry Heindel, Ph.D.](#), and a committee of scientists from U.S. and European governmental agencies concerned about endocrine disrupting chemicals in the environment, the goals of this workshop, which were inspired by recent research on the dose response curves of endocrine active chemicals, are the following:

- To present and discuss the state of the science for low dose effects and non-monotonic dose response curves for chemicals with endocrine activity.
- To define research needs required to move closer to scientific agreement on the prevalence and importance of low dose effects and non-monotonic dose responses for endocrine active substances.
- To define how research programs, especially those funded by public agencies, could support studies that would produce data most useful for a science-based risk assessment.



Heindel administers a grants portfolio that supports research on the health effects from exposure to endocrine active chemicals. (Photo courtesy of Steve McCaw)

- To initiate a discussion on the implications of low dose effects and non-monotonic dose response curves to risk assessment.
- To develop a plan to continue discussions among basic researchers and risk assessment scientists beyond the current workshop.

Other sponsors are the European Commission; French Agency for Food, Environmental and Occupational Health and Safety; the German Federal Environment Agency; and the Danish Ministry of the Environment and National Food Institute. The Pew Charitable Trusts are providing meeting facilitators.

Citation: Vandenberg LN, Colborn T, Hayes TB, Heindel JJ, Jacobs DR Jr, Lee DH, Shioda T, Soto AM, vom Saal FS, Welshons WV, Zoeller RT, Myers JP. 2012. Hormones and endocrine-disrupting chemicals: low-dose effects and nonmonotonic dose responses. *Endocr Rev* 33(3):378-455.

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Extramural papers of the month

By Nancy Lamontagne

- Whole genome sequencing reveals genetic basis for diversity and evolution
- Wearable sensor monitors personal exposure to VOCs
- Biomarker predicts years of service for firefighters
- Long-term air pollution exposure linked with heart problems



Read the current Superfund Research Program [Research Brief](#). New issues are published on the first Wednesday of each month.

Whole genome sequencing reveals genetic basis for diversity and evolution

In one of the first population genomics studies to use high-coverage whole-genome sequencing, NIEHS-supported researchers analyzed the genomes of 15 Africans from three different hunter-gatherer groups. The work reveals new insight into human diversity and evolution and also shows the potential of new genome sequencing technology for uncovering the genetic basis of normal variations in humans and for identifying the genetic basis of disease risk.

The researchers sequenced the genomes of men from the Hadza and the Sandawe groups in Tanzania and the Western Pygmies in Cameroon. These three hunter-gather groups differ greatly from one another in appearance, language, culture, and the environments in which they live. The researchers used a high-coverage whole-genome sequencing approach that is highly accurate.

They found 13.4 million genetic variants, five million of which were new to science at the time of discovery. The results from the genome analysis provide evidence that the direct ancestors of modern humans might have interbred with members of an unknown ancestral group of hominins and that different groups evolved distinctly. The work also identifies new candidate genes that are likely involved in making Pygmies short in stature. The researchers say that these candidate genes would not have been found without comparing multiple genomic sequences from these isolated groups.

Citation: Lachance J, Vernot B, Elbers CC, Ferwerda B, Froment A, Bodo JM, Lema G, Fu W, Nyambo TB, Rebbeck TR, Zhang K, Akey JM, Tishkoff SA. 2012. Evolutionary history and adaptation from high-coverage whole-genome sequences of diverse African hunter-gatherers. *Cell* 150(3):457-469.

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Wearable sensor monitors personal exposure to VOCs

An NIEHS grantee and his colleagues developed a wearable sensor that measures personal exposure to volatile organic compounds (VOCs) and sends that information to a smart phone. The new device allows indoor and outdoor measurements, requires little training to use, and can provide important information about when, where, and how people experience exposure to contaminants.

The sensor can measure concentrations of aromatic, alkyl, and chlorinated hydrocarbons with a resolution as low as four parts per billion (ppb) and a detection range of four ppb to 1,000,000 ppb. It generates data every three minutes and sends this information to a smartphone, where an application processes the data and displays the results.

The researchers field-tested the sensor in several scenarios. They measured exposure to traffic-related pollutants in different cities, pollutants near the 2010 Deepwater Horizon oil spill, and indoor air quality during remodeling. The field tests validated the performance of the new technology and also showed that it could provide high temporal and spatial information on contaminant exposure.

Citation: [Chen C](#), [Campbell KD](#), [Negi I](#), [Iglesias RA](#), [Owens P](#), [Tao N](#), [Tsow F](#), [Forzani E](#). 2012. A New Sensor for the Assessment of Personal Exposure to Volatile Organic Compounds. *Atmos Environ* 54:679-687. [DERT Success story: Nongjian Tao](#)

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Biomarker predicts years of service for firefighters

An NIEHS-funded study shows that firefighters exposed to PAHs have epigenetic modifications that correlate with years of service and offer a potential biomarker for PAH exposure. Epigenetic modifications affect gene expression without changing the genetic code.

Firefighters are exposed to smoke and products of incomplete combustion, which often contain polycyclic aromatic hydrocarbons (PAHs). The researchers analyzed blood DNA from 18 firefighters and 20 non-firefighter controls, looking for a type of epigenetic change known as methylation in the promoters for four genes. They found that firefighters had a higher prevalence of promoter hypomethylation for the *dual specificity phosphatase 22 (DUSP22)* gene and that the extent of hypomethylation correlated with years of firefighting service but not with age. Cell studies confirmed that promotor methylation regulates *DUSP22* expression.

This study's findings indicate that gene expression of *DUSP22* is modified epigenetically by environmental exposure. The researchers say that future studies need to examine whether hypomethylation of this gene can also predict later-life diseases, such as prostate cancer, that can result from long-term exposure to smoke.

Citation: [Ouyang B, Baxter CS, Lam HM, Yeramaneni S, Levin L, Haynes E, Ho SM. 2012. 2012. Hypomethylation of Dual Specificity Phosphatase 22 Promoter Correlates With Duration of Service in Firefighters and Is Inducible by Low-Dose Benzo\[a\]Pyrene. J Occup Environ Med 54\(7\):774-780. \[Story\]\(#\)](#)

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Long-term air pollution exposure linked with heart problems

Studies have shown that short-term exposure to air pollution can trigger heart problems, and a new NIEHS-funded study provides evidence that long-term exposure can also have adverse health effects. The researchers report that mice exposed to air pollution for most of their lives showed heart problems that were consistent with developing heart failure.

The investigators exposed mice to environmentally-relevant levels of particulate air pollution (< 2.5 microns) or filtered air for six hours a day, five days a week, for nine months, which is a large portion of the animal's lifespan. Echocardiography revealed that the mice exposed to air pollution developed heart dysfunction, which could also be seen at cellular and tissue levels. The researchers say that these findings have implications for air pollution as an independent risk factor for cardiovascular disease development.

Citation: [Wold LE, Ying Z, Hutchinson KR, Velten M, Gorr MW, Velten C, Youtz DJ, Wang A, Lucchesi PA, Sun Q, Rajagopalan S. 2012. Cardiovascular remodeling in response to long-term exposure to fine particulate matter air pollution. Circ Heart Fail 5\(4\):452-461.](#)

(Nancy Lamontagne is a science writer with MDB, Inc., a contractor for the NIEHS Division of Extramural Research and Training, Superfund Research Program, and Worker Education and Training Program.)

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Intramural papers of the month

By Mamta Behl, Anshul Pandya, and Sheila Yong

- [Clock gene expression regulated by ROR gamma](#)
- [Fertility drugs and young-onset breast cancer](#)
- [Study estimates the frequency of an autoimmunity biomarker in U.S.](#)
- [Revolutionizing the detection of free radical DNA in cells](#)

Clock gene expression regulated by ROR gamma

A recent study conducted by NIEHS researchers demonstrated that retinoic acid-related orphan receptors (ROR) alpha or ROR gamma significantly reduced the expression level of several genes involved in regulating the body's clock. Since disruptions to a person's 24-hour wake-sleep cycle increases the risk for type 2 diabetes, some cancers, and becoming obese, RORs play a role in maintaining good health.

The scientists examined whether loss of ROR alpha or ROR gamma affected clock gene expression in ROR knockout mice. They found that both RORs regulated the transcription of *Cry1*, *Bmal1*, *Rev-Erb alpha*, and *E4bp4* directly, and that ROR antagonists inhibited this transcriptional activation. Furthermore, chromatin immunoprecipitation sequencing (ChIP-Seq) analysis indicated that RORs were associated with ROR response elements *in vivo*, supporting the conclusion that these clock genes were directly regulated by RORs. ChIP-Seq analysis also showed that ROR gamma bound to the regulatory regions of several metabolic genes, while ROR alpha either didn't bind or exhibited weak binding. As a result, the research team was the first to report that ROR gamma was more important in clock regulation than ROR alpha, countering the view of many in the nuclear receptor community that ROR alpha was more relevant. **(AP)**

Citation: [Takeda Y, Jothi R, Birault V, Jetten AM](#). 2012. RORgamma directly regulates the circadian expression of clock genes and downstream targets *in vivo*. *Nucleic Acids Res*; doi:10.1093/nar/gks630 [Online 29 June 2012]. [Story](#)

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Fertility drugs and young-onset breast cancer

Among participants in the NIEHS Two Sister Study, funded in part by Susan G. Komen for the Cure, women who had used ovary-stimulating fertility drugs, clomiphene citrate or follicle-stimulating hormone, without getting pregnant, had reduced risk of young-onset breast cancer.

Participants were pairs of sisters, one of whom had been diagnosed with breast cancer before the age of 50. They were categorized based on whether they had used ovulation-stimulating fertility drugs and whether pregnancy had resulted. Women who had been treated without conceiving showed a significantly reduced risk compared with non-treated women. The use of those drugs likely serves as a marker for the fertility problems for which they are prescribed, problems that may confer reduced risk. By contrast, women who conceived through fertility treatment had significantly elevated risk, comparable to that of women in the population. The use of ovulation-stimulating fertility drugs changes the hormonal profiles of the first trimester pregnancy in ways that may increase the risk of breast cancer.

Unlike previous studies, the Two Sister Study distinguished between fertility treatments that produced pregnancy versus those that did not. Moreover, use of sisters who are well-matched for many factors allows for a fair comparison. **(SY)**

Citation: [Fei C, DeRoo LA, Sandler DP, Weinberg CR](#). 2012. Fertility drugs and young-onset breast cancer: Results from the Two Sister Study. *J Natl Cancer Inst* 104(13):1021-1027.

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Study estimates the frequency of an autoimmunity biomarker in U.S.

Scientists from NIEHS, the University of Florida, and SRA International have determined that more than 32 million people in the United States have antinuclear antibodies (ANA), a group of proteins called autoantibodies produced by the immune system that target its own tissues. ANA are frequently measured biomarkers for detecting autoimmune diseases, but the presence of ANA does not necessarily mean a person will get an

autoimmune disease. This study presents the first nationally representative estimates of ANA prevalence based on sociodemographic groups, and provides an important baseline for future autoimmunity research.

The research team used indirect immunofluorescence to analyze sera from 4,754 participants in the 1999-2004 U.S. National Health and Nutrition Examination Survey (NHANES). The results demonstrated that the prevalence of ANA in the U.S. population varied in different groups, being higher among females, older individuals, African-Americans, and those with a normal body weight. Furthermore, the team found no significant associations of ANA with education, family income, alcohol use, smoking history, serum levels of cotinine, or C-reactive protein, a protein that increases in blood in response to inflammation. This work should serve as a useful baseline for future studies looking at changes in ANA prevalence over time and the factors associated with ANA development. **(MB)**

Citation: [Sato M, Chan EK, Ho LA, Rose KM, Parks CG, Cohn RD, Jusko TA, Walker NJ, Germolec DR, Whitt IZ, Crockett PW, Pauley BA, Chan JY, Ross SJ, Birnbaum LS, Zeldin DC, Miller FW. 2012. Prevalence and sociodemographic correlates of antinuclear antibodies in the United States. *Arthritis Rheum* 64\(7\):2319-2327.](#)

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Revolutionizing the detection of free radical DNA in cells

NIEHS researchers made a major breakthrough in DNA damage research by revealing a new and improved method for detecting intracellular free radical DNA resulting from oxidative stress.

Antibody-based assays for detecting free radical DNA oxidation products are inadequate, due to the difficulty in generating antibodies against specific nucleotide oxidation products, which, in general, differ from their reduced counterparts by only one oxygen atom. Furthermore, identification of primary free radicals by electron spin resonance (ESR) in cells is impossible due to their instability. To address these issues, the team previously developed the immuno-spin trapping technique (IST), which traps free radicals with 5,5-dimethyl-1-pyrroline N-oxide (DMPO), and is then oxidized to its stable nitron products that can be detected by antibodies or other analytical methods.

The present study illustrates the ability of IST to detect DNA free radicals, while minimizing artifacts characteristic of traditional approaches. The resulting DMPO-DNA adducts may also be visualized by confocal microscopy, allowing researchers to determine where the damage occurs in the cell. More importantly, this work also described a time lapse experiment during which both the initial DNA damage and subsequent repair were observed. **(SY)**

Citation: [Bhattacharjee S, Chatterjee S, Jiang J, Sinha BK, Mason RP. 2012. Detection and imaging of the free radical DNA in cells — Site-specific radical formation induced by Fenton chemistry and its repair in cellular DNA as seen by electron spin resonance, immuno-spin trapping and confocal microscopy. *Nucleic Acids Res* 40\(12\):5477-5486.](#)

(Mamta Behl, Ph.D., is a contract neurotoxicologist in the NTP Toxicology Branch. Anshul Pandya, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Laboratory of Neurobiology. Sheila Yong, Ph.D., is a visiting fellow in the NIEHS Laboratory of Signal Transduction.)

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Inside the Institute

NIEHS volunteers return to summer science camp in Durham

By Eddy Ball

The innovative Science and Everyday Experiences (SEE) summer camp held its seventh annual session June 30 at the Durham (N.C.) Alumnae Delta House, with scientific leadership by volunteers from NIEHS (see text box). The theme for this year's camp, which attracted more than 40 children from grades four through nine, was "African-American Contributions to Science."

Coordinated by Durham SEE chair Sharon Beard, an NIEHS program manager, this year's camp, like its predecessors, developed its theme through hands-on experiments that illustrated the accomplishments of African-American scientists Charles Drew, M.D., Lewis Latimer, and Benjamin Bradley as they related to everyday experiences. "For the first time at the SEE summer science camp, all the people who planned and developed the activities were scientists and staff from NIEHS," Beard noted with pride.

According to Beard, focusing on African-American scientists offered students the added motivation of learning about role models as they learned about science. "They needed to see the different types of people who've been an important part of scientific progress, to see what they'd done and how they did it," she said.

During the half-day camp, students rotated through three instructional modules, as their parents met with Beard and co-presenter Joan Pakenham, Ph.D., director of the NIEHS Office of Human Research Compliance. Pakenham and Beard explored resources available to parents and home-based strategies for helping develop their children's interest in careers in science, technology, engineering, and mathematics.

The steam engine — a stolen invention

Led by NIEHS biologist Agnes Janoshazi, Ph.D., the steam engine module included a brief overview and history of the life of a slave, Benjamin Bradley, who never received the patent for the invention because it was given to his owner. Janoshazi and her team explained the function and design of the steam engine and demonstrated how to build one.



Kudumu, second from left, joined her children at the camp sign, during the morning registration. (Photo courtesy of Willis Page)



NIEHS volunteer Shawn Jeter checks her email and selects the music for the camp's warm-up exercises. Along with teaching science, SEE traditionally devotes some time to health and fitness, with physical activities and nutritious snacks. (Photo courtesy of Willis Page)

Students then gathered around a wading pool in the classroom to race their own steamboats with flags and mirrors on the top. Constructed on an aluminum pan platform and powered by water-filled copper coils heated by burning alcohol that produced the steam to propel them, the boats sped around the pool, much to the obvious delight of their young builders.

Let there be light — but first, there needs to be a filament

Every school child knows that Thomas Edison is acknowledged as the father of electric lighting, and some may recall that finding the right material was a major obstacle to everyday use of the light bulb. But few realize that it took the insight of a competitor's draftsman, the son of a freed slave, and, later, the only African-American member of the Edison Pioneers, Lewis Latimer, to make it practical for widespread use.

Designed and led by NIEHS staff scientist Elena Braithwaite, Ph.D., [the light bulb experiment](#) used a battery, alligator clips, a pie pan, thin metal wire, and a mason jar to demonstrate how light bulbs work. Students tried different configurations of the thin wire — wires made from different types of metal and with different thicknesses — and recorded how long and how brightly each version of the filament glowed.

Blood banks — the gift of life

Moving into the 20th century, NIEHS postdoctoral fellow Danielle Watt, Ph.D., led students in a module focusing on Drew. Drew built on his research to develop the blood bank system for soldiers fighting in World War II, establishing protocols for safely and effectively collecting, testing, storing, and transporting large quantities of blood plasma for distribution in Great Britain. Ironically, his death from an automobile accident in 1950 might have been prevented if he had had access to his own invention at the Burlington, N.C. hospital where he was treated.

In the [experiment](#), Watt led students in an edible demonstration of the components of blood using red hot candy, representing red blood cells; marshmallows, standing in for white blood cells; coconut, to signify platelets; and corn syrup, as plasma. The students also learned the differences in clumping and coagulation of noncompatible blood types, using household materials that included vinegar, floor polish, water, and food coloring.



Except for their copper coils, the steamboats were constructed of materials found in most homes, such as light aluminum pans, straws, and binder clips. NIEHS facility staff helped Janoshazi bend the copper pipe to prevent it from crimping. (Photo courtesy of Willis Page)



Students gather around the pool to cheer their entries in the steam boat race. "The kids really, really, really enjoyed the steam engine and were hyped up throughout the activity," Beard said. (Photo courtesy of Willis Page)



Once students connected the batteries, wires, and filaments, their bulbs sprang to life in the darkened room. Pakenham, center, worked with Braithwaite, Holloway, Kudumu, and Charles, helping the students perform the experiment. (Photo courtesy of Willis Page)

The SEE experience — the teachers' perspective

Several veterans of SEE and other outreach programs spoke about the success of the summer camp.

- Agnes Janoshazi, who has almost 20 years of experience teaching popular science in Europe, said she was delighted when Packenham approached her this April about being a part of the SEE teaching staff. “I quite enthusiastically support the SEE camp program, because I think it is a beautifully organized program,” she wrote, “and I feel lucky to have been a part of it this summer.” Also working on the steamboat module team were Reke Janoshazi; Delta volunteer Lillian Horne, M.D., and the husband of NIEHS biologist Mercedes Arana, Ph.D., chemist Frank Boellman, Ph.D.
- SEE veteran Braithwaite praised fellow teachers and colleagues Keith Holloway; postdoctoral fellow Georgette Charles, Ph.D.; Mwenda Kudumu; Antonio Gatling; and Packenham. Braithwaite said the light bulb team enjoyed the energy and enthusiasm of the students. “We were also inspired by the highly intelligent students that attended the camp. They knew several aspects of African-American history and were very excited to expand their knowledge,” she said. “We can’t wait to see what great things are in store for these students.”
- Now in her fourth year at the camp, Watt said she was gratified by the way students changed their attitudes toward science when they saw its everyday applications in their lives. “I love seeing the students getting excited about science, especially when they say that they did not like science. When they learned about blood types, many were eager to ask their parents about their blood type and share the information they learned.”
- One of Watt’s partners in the blood experiments, along with Raven Herndon, was Arana, who has been a part of several outreach activities, including the Citizen Schools program and the NIH Summer Internship Program. “The children were attentive and eager to participate,” Arana observed. “Participants were very involved during the hands-on activities in asking and answering questions. They learned and we learned — a reciprocal exchange and learning experience for all.”



Watt, standing center, and Arana, standing right, helped their young charges mix their blood samples, to see for themselves the differences in compatibility of different blood types. One parent, in red center, observed during the activities. (Photo courtesy of Willis Page)



Posters on the walls of Durham Alumnae Delta House highlighted innovators who make up the texture of African-American scientific cultural heritage, including Rensselaer Polytechnic Institute President Shirley Jackson, Ph.D.; hair products entrepreneur Madam C. J. Walker; the first African-American self-made millionaire; and ophthalmologist Patricia Bath, M.D. (Photo courtesy of Willis Page)



There was an emphasis on movement and hands-on activities, and even when instruction took on the flavor of a lecture format, it was very informal. Shown above, left to right, Reke Janoshazi and Agnes Janoshazi wait their turn, as Boellman explains the steamboat experiment. (Photo courtesy of Willis Page)



NIEHS instructional volunteers gathered at the end of camp. Shown, left to right, Holloway, Braithwaite, Reke Janoshazi, Agnes Janoshazi, Pakenham, Arana, Kudumu, Charles, Watt, and Beard. Not shown are Jeter and Gatling. (Photo courtesy of Willis Page)

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