

July 2014

NIEHS Spotlight



[Science-ready — enabling public health research during disasters](#)

More than 200 researchers, responders, and planners participated in a June workshop exploring the need for public health research during and after disasters.



[NTP board green lights research concepts and predictive toxicology efforts](#)

NTP received the go-ahead June 17-18 to pursue six research concepts, ranging from bisphenol S to xylenes, from its Board of Scientific Counselors.



[Redesigned Agricultural Health Study website launched](#)

The new user-friendly and platform-responsive AHS website launched April 25, designed to assist study participants and promote use of data.



[NIEHS research fellow earns endocrinology internship](#)

NIEHS research fellow Diana Cruz-Topete, Ph.D., received a 2014 Future Leaders Advancing Research in Endocrinology Internship from the Endocrine Society.



[Birnbaum recognized for leadership by USPHS](#)

NIEHS and NTP Director Linda Birnbaum, Ph.D., was among civilians and commissioned officers honored by the U.S. Public Health Service June 10 in Washington.

Science Notebook



[NIEHS employees honored at NIH Director's Awards Ceremony](#)

Director Linda Birnbaum, Ph.D., and 13 employees of NIEHS and NTP were among recipients of NIH Director's Awards presented at a ceremony June 12 in Bethesda.



[Large-scale analysis yields new DNA regions involved in lung function](#)

A global consortium using GWAS reported in Nature Genetics six new loci that influence lung function, possibly leading to new therapies for lung diseases.



[Accidental oceanographer discusses aquatic models in exposure research](#) ▶ Video

At the May 29 Keystone lecture, John Stegeman, Ph.D., discussed his work in ecotoxicology, focusing on both manmade and algal toxins.



[NIH scientists study brain region required for social aggression](#)

Scientists from NIEHS and the National Institute of Mental Health were the first to show that a specific area of the brain allows animals to respond to social threats.



[The economic costs of environmental health impacts](#)

Leonardo Trasande, M.D., drew a full house to his Keystone lecture, discussing the economic costs of environmental chemical exposures.

NIEHS Spotlight



[Predictive toxicology faculty rallies around new directions](#)

The NIEHS Predictive Toxicology and Disease faculty meeting June 2 attracted some fifty scientists from across the three research divisions.



[Program highlights issues and progress in transgender health disparity](#)

The NIH Office of Equity, Diversity, and Inclusion marked yet another first, this June, with a panel discussion on transgender health disparity to kick off LGBT Pride Month.



[Scholars Connect launches third year of internships](#)

Now in its third year, the NIEHS Scholars Connect Program got off to a busy start June 2-4 with an intensive training program taught by NIEHS postdocs.



[NIEHS welcomes 2014 summer interns](#)

The NIH Summer Intern Program welcomed participants with a breakfast seminar June 12. The following week, the program held a panel session on scientific career paths.

[Seventeen trainees join FARE winners' circle](#)

When the results of the 2015 Fellows Award for Research Excellence were announced in June, 17 NIEHS trainees joined the elite group of young scientists so honored by NIH.



Science Notebook



[Air pollution from planes impacts wide area](#)

NIEHS-funded scientists at the University of Southern California found that plane activity at Los Angeles International Airport worsens air quality 10 miles away.



[International conference promotes environmental health research exchange](#)

NIEHS staff and grantees travelled to Cluj-Napoca, Romania, May 25-29, for the Central and Eastern European Conference on Health and the Environment.



[New research sheds light on melanoma formation](#)

NIEHS-funded researchers discovered a mechanism that causes healthy cells to transform into cancerous melanoma.



[Exploring interactions between microbes and environmental exposures](#)

Intestinal microbiota and how they might contribute to obesity and brain metastases were highlighted in a May 21 NIEHS Partnerships for Environmental Public Health webinar.



[Work-related solvent exposure may increase breast cancer risk](#)

NIEHS researchers find that women with occupational exposure to solvents between puberty and birth of their first child may have increased risk of breast cancer.



[SRP promotes innovative research tools for environmental remediation](#)

SRP staff showcased available tools and resources at the National Association of Remedial Project Managers Training Program June 16-20 in Atlanta.

NIEHS Spotlight



[Conway selected for NIGMS PRAT fellowship](#)

NIEHS IRTA Fellow Amanda Conway, Ph.D., was selected to receive a 3-year NIGMS PRAT Program fellowship to study gene regulation during early embryonic development.



[Postdocs launch initiatives for summer interns](#)

Postdoctoral fellows are involved in two new support efforts for the 2014 NIH Summer Internship Program at NIEHS.

Inside the Institute



[NIEHS celebrates Bring Your Kids to Work Day](#)

This year's NIEHS Bring Your Kids to Work Day June 12 allowed grandparents, parents, and children to join in a day of food, fun, and science.



[NIEHS cleans up local highway for World Environment Day](#)

NIEHS celebrated World Environment Day June 5 by cleaning up the 1.2-mile stretch of Hopson Road between its main campus and Keystone building.

Science Notebook



[Shaughnessy to give keynote at upcoming Metabolomics Symposium](#)

NIEHS Health Scientist Administrator Daniel Shaughnessy, Ph.D., is one of two principal speakers at a Metabolomics Symposium Aug. 22 at RTI International.



[This month in EHP](#)

July's Environmental Health Perspectives examines the microbial environments of hospitals, and emerging initiatives to improve reproducibility of scientific findings.

Extramural Research

[Extramural papers of the month](#)

- Prenatal exposure to flame retardants linked with lower IQ
- Technique for identifying safe alternatives to BPA
- Repairing UV-induced DNA damage
- High molecular weight phthalates linked to later puberty onset

Intramural Research

[Intramural papers of the month](#)

- NTP review framework addresses environmental health questions
- Polymerase beta complements aprataxin function by catalyzing a de-adenylation reaction
- RORgamma regulates hepatic glucose metabolism and insulin sensitivity
- INO80 regulates embryonic stem cell fate and blastocyst development
- Novel structural insights into HIV reverse transcriptase

Calendar of Upcoming Events

- **July 1-2**, in Rodbell Auditorium, 8:30 a.m.-5:00 p.m. — Outstanding New Environmental Scientist (ONES) Awardee Symposium
- **July 8 (offsite event)**, 8:45 a.m.-5:00 p.m. — Interagency Autism Coordinating Committee meeting, [webcast](#)
- **July 10**, in Rodbell Auditorium, 10:00-11:30 a.m. — Summer Internship Program seminar, “Climate Change and Human Health”
- **July 15**, in Keystone 1003A/B, 10:00-11:00 a.m. — Keystone Science Lecture Seminar Series featuring Birgit Claus Henn, S.D., discussing metal mixtures and neurodevelopment
- **July 15**, in Rodbell Auditorium, 11:15 a.m.-12:15 p.m. — Office of the Director Seminar Series featuring Christopher Austin, M.D., “Catalyzing Translational Innovation”, [webcast](#)
- **July 17**, in Keystone 1003A/B, 1:00-2:00 p.m. — NTP seminar with Brandon Ballengee, Ph.D., discussing “Predation-induced Limb Deformities in Southern Quebec Amphibians”
- **July 21-22 (offsite event)**, 8:30 a.m.-5:00 p.m. — [Emerging Science for Environmental Health Decisions](#) workshop, “Biological Platforms: The Potential of the Tissue Chip for Environmental Health Studies,” [register](#)
- **July 22 (offsite event)**, 4:00-5:00 p.m. — Seminar, “The Environment and Lung Cancer: Old and New Causes,” featuring Jonathan Samet, M.D., [webcast](#)
- **July 24**, in Rodbell Auditorium, 9:00 a.m.-noon — Summer Internship Program poster session
- **July 28**, in Rodbell Auditorium, 9:00-11:00 a.m. — Clinical Research Program seminar, “Conducting Human Subjects Research (Practical Applications)”
- View More Events: [NIEHS Public Calendar](#)

NIEHS Spotlight

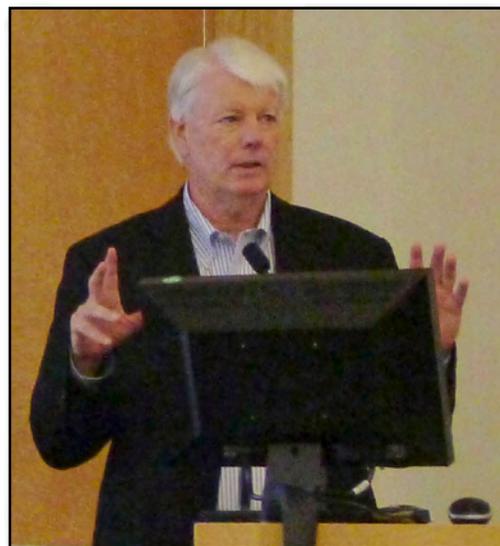
Science-ready — enabling public health research during disasters

By Paula Whitacre

Every disaster, no matter the cause, is unique in its effects on the environment and people. Yet common elements highlight the need for research to help in recovery and lessen the negative impacts of future events. A workshop June 12-13 on the NIH campus in Bethesda, Maryland, provided the opportunity to explore these concerns.

More than 200 researchers, responders, and planners participated in the Workshop on Enabling Public Health Research During Disasters. Disaster research requires science on steroids, noted NIEHS senior medical advisor Aubrey Miller, M.D.

“We have to do better than the time before,” said Nicole Lurie, M.D., U.S. Department of Health and Human Services assistant secretary for preparedness and response (ASPR), and a rear admiral in the U.S. Public Health Service. Describing research challenges in the wake of events from the H1N1 flu epidemic to the Deepwater Horizon oil spill, she identified the development of rosters of experts, preapproved clinical research protocols, and more rapid ways to fund research and start fieldwork, as a few of the many ways that ASPR, NIH, and other agencies seek to improve the process of conducting disaster research.



Joseph (Chip) Hughes distinguished characteristics of research during rescue, which may be chaotic and involve risk-taking; recovery, which is more planned, evenly paced, and presents lower risk; and clean-up, in which risks are assessed and better understood. (Photo courtesy of Paula Whitacre)

Disaster versus nondisaster research

Workshop participants underscored the differences between research around disasters versus other settings. The most compelling examples came from three case studies — Hurricane Katrina, presented by David Abramson, Ph.D., study director of the Columbia University Gulf Coast Child and Family Health Study; the World Trade Center collapse and health effects on first responders, detailed by David Prezant, M.D., chief medical officer at the Office of Medical Affairs for the Fire Department of the City of New York; and Superstorm Sandy, presented by Lewis Goldfrank, M.D., chair of the Department of Emergency Medicine at New York University Langone Medical Center, who described the cracks in health care delivery in Manhattan in the wake of the storm.

NIEHS support for disaster research

Gulf Long-term Follow-up Study — a study of the health of clean-up workers and volunteers who responded to the 2010 Deepwater Horizon oil spill in the Gulf of Mexico.

NIH Disaster Research Response Project — a pilot project to create an environmental health disaster research system through platforms of ready-to-go research data collection tools and a network of specially trained research responders.

NIEHS Worker Education and Training Program — including coordination of a **Disaster Research Response Exercise** in Long Beach, California, in April 2014 (see [story](#)).

According to Prezant, nondisaster research is deliberative. A disaster, on the other hand, presents the need to gather data as soon as possible, under difficult circumstances, with many confounding elements. “Disaster science is not an experiment, but a promise to help recovery,” Prezant noted.

NIEHS and NTP Director Linda Birnbaum, Ph.D., highlighted NIEHS support for disaster research (see [side bar](#)), noting that research must take place not only acutely, but also long term. “We must study the impacts of exposures and stressors on the most vulnerable — the young, the old, the sick, the poor, and those in disadvantaged communities,” she said.

Conducting disaster research

Concurrent sessions addressed specific aspects of conducting disaster research. Each of them reported back with recommendations, including:

- Build partnerships and establish trust with health agencies, Institutional Review Boards, and the public, before a disaster strikes.
- Share data with those affected, to aid in recovery.
- Develop a repository of tools and practices.
- Integrate research into existing response structures.
- Collect data as rapidly as possible, and through various means, such as responders and citizen-scientists.

Responding to the recommendations, Irwin Redlener, M.D., from Columbia University, stated his perspective on the role of disaster research. “[It must] save lives and guide policy,” he said.

Marcia McNutt, Ph.D., editor in chief of the journal *Science*, emphasized the critical, often unheralded role of science behind the scenes. “Keep an eye on the real prize — using science to reduce disaster risk and help with mitigation,” she said. “The most important disaster is the one that never made the headlines, because of prevention.”



From left, Birnbaum; Toby Schonfeld, Ph.D., U.S. Environmental Protection Agency (EPA); Glenn Paulson, Ph.D., EPA; and Miller take a break during the workshop. (Photo courtesy of Paula Whitacre)



From left, Abramson, Goldfrank, and Prezant shared firsthand experiences in disaster research in the aftermath of Hurricane Katrina, Superstorm Sandy, and 9/11, respectively. (Photo courtesy of Paula Whitacre)



With a photo taken after the collapse of the World Trade Center as a dramatic backdrop, Birnbaum emphasized the need for research into acute and long-term disaster impacts. (Photo courtesy of Paula Whitacre)

NIEHS co-sponsored the workshop with the U.S. National Library of Medicine, ASPR, Centers for Disease Control and Prevention, and Institute of Medicine of the National Academies. The workshop presentations and audio are available [online](#). The Institute of Medicine will be publishing a summary report in the near future.

(Paula Whitacre is a contract writer with the NIEHS office in Bethesda, Maryland.)

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NTP board green lights research concepts and predictive toxicology efforts

By Robin Mackar

NTP received the go-ahead June 17-18 to pursue six research concepts, ranging from bisphenol S to xylenes, from its Board of Scientific Counselors (BSC). Predictive toxicology efforts underway by NTP and its federal partners were also presented and well-received by BSC.

NIEHS and NTP Director Linda Birnbaum, Ph.D., and NTP Associate Director John Bucher, Ph.D., kicked off the meeting with brief updates on activities going on at NIEHS and NTP. Scott Masten, Ph.D., who heads the NTP [Office of Nominations and Selection](#), provided a brief introduction to the research concepts to be presented.

Bisphenol S and triclocarban

Vicki Sutherland, Ph.D., a relatively new NTP staff member in the [Toxicology Branch](#), presented the first two concepts. Bisphenol S (BPS) and some of its derivatives are chemicals being used to replace Bisphenol A, a chemical used in many consumer products, including thermal paper and food packaging.

Sutherland said there is limited toxicological data on the effects of BPS. NTP proposed looking at the endocrine activity and other endpoints, using *in vitro* and *in vivo* studies, to predict adverse health effects associated with BPS and other bisphenols.

BSC member Robert Chapin, Ph.D., of Pfizer, said, “No one can do this kind of project better than the NTP. I give it three thumbs-up.” All board members agreed it was a high priority project for NTP to pursue, especially given widespread use of BPS and efforts currently underway by NTP on related chemicals.



Birnbaum, left, presented NIOSH representative Gayle DeBord, Ph.D., with a certificate of appreciation for her many years of service to NTP. (Photo courtesy of Steve McCaw)



Paules, left, who provides his expertise to both NTP and the NIEHS Division of Intramural Research, joined Tice to update BSC about predictive toxicology efforts at NTP. (Photo courtesy of Steve McCaw)

Sutherland also presented a research concept on triclocarban, an antibacterial chemical used in soaps and skin care products. NTP proposed studies to evaluate developmental and reproductive outcomes, and the board deemed it a moderate to high priority.

“This product has been in use a long time but has not been thoroughly assessed for endocrine activity,” Sutherland said.

C9 alkylbenzenes and xylenes

Brian Sayers, Ph.D., also of the NTP Toxicology Branch, presented the concept of C9 alkylbenzenes, a group of eight chemicals that occur naturally in crude oil and are used as additives for gasoline blending. Sayers said NTP would conduct a series of short-term and chronic inhalation studies to determine reproductive, developmental, neurotoxic, and carcinogenic potential. After a fruitful discussion on the appropriate scope of the testing effort, BSC Chair Lisa Peterson, Ph.D., of the University of Minnesota, said the board supports this project.

Matthew Stout, Ph.D., from the [NTP Program Operations Branch](#), presented the approach NTP would take to characterize the toxicity and carcinogenicity of xylenes, high volume chemicals produced from petroleum and used to make solvents, paints, and coatings. Stout explained NTP would likely test a high purity mixture of three isomers. As with the prior concept, the board had much discussion on the relative merits of testing mixtures versus individual compounds and considered it a moderate priority.

Health and translation concepts

Kyla Taylor, of the NTP Office of Health Assessment and Translation ([OHAT](#)), presented a concept that would involve collaborating with EPA to assess the accuracy of questionnaires used in epidemiological studies as they relate to exposure information about personal care products. BSC gave the overall concept a moderate to high priority.

Andrew Rooney, Ph.D., also of OHAT, presented a concept that would use a two-pronged approach for a literature-based evaluation — a systematic review and the development of an adverse outcome pathway.



Stout responded to questions from BSC about xylenes. (Photo courtesy of Steve McCaw)



Sayers, right, presented on C9 alkylbenzenes and responded to questions from BSC. Nigel Walker, Ph.D., NTP Deputy Division Director for Science is seated to his left. (Photo courtesy of Steve McCaw)



Taylor presented before BSC for the first time. (Photo courtesy of Steve McCaw)

NTP would examine the evidence that environmental substances contribute to inflammation that ultimately leads to health effects. NTP also would identify biomarkers of the inflammation involved.

NTP would restrict its evaluation to a single health effect, in this case, atherosclerosis, a disease in which plaque builds up in arteries. Board member David Dorman, D.V.M., Ph.D., of North Carolina State University, pointed out that the comorbidity issues related to atherosclerosis could complicate the evaluation. BSC member Iris Udasin, M.D., of Robert Wood Johnson Medical School, also raised concern about comorbidities, but gave the concept a thumbs-up and said the evaluation would be extremely relevant to clinicians.

(Robin Mackar is news director in the NIEHS Office of Communications and Public Liaison, and a frequent contributor to the Environmental Factor.)



Casey discussed work being done on identifying adverse outcome pathways. His group provides scientific and operational support for the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM), an interagency committee of 15 U.S. federal regulatory and research agencies that generate and use toxicity testing data. (Photo courtesy of Steve McCaw)

Predictive toxicology efforts

BSC members also had a chance to hear about efforts underway in the area of predictive toxicology. Raymond Tice, Ph.D., head of the NTP [Biomolecular Screening Branch \(BSB\)](#), provided an update on [Tox21](#), a federal collaboration aimed at improving hazard identification of substances. He provided a timeline and talked about some accomplishments made in the first two phases of the program. He also noted how they are working on improving their biological coverage and relevance in phase III. Tice said there will be more focus on physiologically relevant *in vitro* cell systems, and more emphasis on developing computational models. They also plan to focus on high content screens and high throughput gene expression platforms.

Tice's talk set the stage for Richard Paules, Ph.D., also of BSB, who talked about a Tox21 phase III activity called the S1500 Genes High Throughput Transcriptomics Project. The project builds off information gathered at a [workshop](#) in fall 2013, and will develop a Tox21 sentinel gene set comprised of 1,500 genes, to be used for determining the effects of environmental toxins on cells or tissues. The initial focus is on a human gene set, with a similar approach to be used to identify gene sets for rats, mice, zebrafish, and *Caenorhabditis elegans*.

Warren Casey, Ph.D., director of the NTP Interagency Center for the Evaluation of Alternative Toxicological Methods ([NICEATM](#)), presented the role his group plays in evaluating the applicability of new alternative methods for regulatory use. Casey focused his talk on adverse outcome pathways, which attempt to link exposure to a chemical with a health event or an adverse outcome. He described the role the [Organisation for Economic Co-operation and Development](#) plays in processing and publishing information about adverse outcome pathways, and also talked about the role NICEATM plays in helping federal regulatory agencies develop testing strategies to do risk assessments using Bayesian networks, a mathematical approach.



Timothy Buckley, Ph.D., Director of the Human Exposure and Atmospheric Sciences Division at EPA, and NTP OHAT Director Kristina Thayer, Ph.D., responded to questions from BSC about a unique proposed pilot, between NTP and EPA, to assess how questionnaires reflect personal care product use and exposure. (Photo courtesy of Steve McCaw)



Peterson listened carefully to all the discussions that took place over the day and a half. (Photo courtesy of Steve McCaw)



Sutherland ably presented two research concepts to BSC. (Photo courtesy of Steve McCaw)



Birnbaum, front, enjoyed a light-hearted moment with BSC members. Bucher, left, listened closely to all the presentations and discussions. (Photo courtesy of Steve McCaw)

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Redesigned Agricultural Health Study website launched

By Kelly Lenox

The [Agricultural Health Study](#) (AHS) website was recently redesigned for easier navigation and to be responsive to the user's platform, whether mobile or desktop. The new design was intended to promote use of study findings, assist potential collaborators, and energize participation.

In 1993, before the Internet was widely used, AHS began its study on how agricultural, lifestyle, and genetic factors affect the health of farming populations. More than 89,000 farmers and their spouses in Iowa and North Carolina have been involved in AHS since its inception.

A collaborative effort between NIEHS, the National Cancer Institute (NCI), National Institute of Occupational Safety and Health, and U.S. Environmental Protection Agency, AHS was designed to offer unique opportunities for researchers interested in helping farmers and their families live healthier lives. The study continues to advance understanding of links between pesticides and human health (see [text box](#)).

Designed with users in mind

In the years since 2001, when the first study website was launched, the need for a redesign became increasingly evident. The site architecture was out-of-date and the site navigation needed simplifying. NIEHS Office of Communications and Public Liaison (OCPL) staff spearheaded the site redesign, ensuring review of content by all four agencies involved.

One of the guiding principles was to make the site more usable to a wide range of users, from farmers to scientists to the general public. Meeting that challenge involved close cooperation between NIEHS and counterparts at NCI, including AHS researchers from the NCI Division of Cancer Epidemiology and Genetics, and contractors.

“In redesigning the website, we sought to strike the appropriate balance between being informative to scientists and understandable to the public,” said [Dale Sandler, Ph.D.](#), head of the NIEHS Epidemiology Branch and lead of the Chronic Disease Epidemiology Group.

Visual elements were an important focus as well, according to Cheryl Thompson, NIEHS Web manager. “We wanted the site to be engaging and to feel trustworthy, so site visitors would know they were in the right place. We used themes related to agriculture, which weren't evident in the old site.”

Even more noteworthy, the new site adapts to a variety of browsing platforms. “One of the novel features of the site design is that it is responsive, so that it works on tablets and mobile devices, as well as it does on desktops,” said Joe Poccia, NIEHS Web information development specialist. “You don't usually see that on a government website — we're really at the forefront, as far as I can tell, in making all NIEHS websites responsive.”



Smartphone users now have full access to the site, in a readable, easily navigated format.



Poccia was key in working with stakeholders, to ensure usability of the new site by the various users AHS researchers seek to reach. “It was a collaborative effort,” he said. (Photo courtesy of Steve McCaw)



According to Thompson, NIEHS reviewed content on the old site and made recommendations to researchers about elements that should be retained, updated, or archived. (Photo courtesy of Steve McCaw)



Sandler partnered with NCI in 1990 to develop AHS, and in the years since, expanded its focus to include non-cancer outcomes. (Photo courtesy of Steve McCaw)

Diabetes among wives of farmers

In one of the latest findings from the Ag Health Study, NIEHS researchers and colleagues reported further evidence of an association between specific organochlorine pesticides and diabetes. In addition, the study added to growing evidence that certain organophosphate pesticides may increase risk of diabetes.

This paper is among the hundreds of papers listed on the new Ag Health website — evidence of the increasing body of knowledge AHS contributes to medical science.

Citation: [Starling AP, Umbach DM, Kamel F, Long S, Sandler DP, Hoppin JA](#). 2014. Pesticide use and incident diabetes among wives of farmers in the Agricultural Health Study. *Occup Environ Med*; doi:10.1136/oemed-2013-101659 [Online 12 April 2014].

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NIEHS research fellow earns endocrinology internship

By Robin Arnette

NIEHS Research Fellow Diana Cruz-Topete, Ph.D., was one of seven young scientists to receive a 2014 Future Leaders Advancing Research in Endocrinology (FLARE) Internship from the Endocrine Society. She accepted the award at a [joint meeting](#) of the International Society of Endocrinology and the Endocrine Society June 21-24 in Chicago (see [text box](#)).

As a FLARE intern, [Cruz-Topete](#) will participate in several society-based committees, and mentor undergraduate students from underrepresented groups participating in the Endocrine Society program, to increase diversity in the biomedical sciences.

Cruz-Topete's mentor, [John Cidlowski, Ph.D.](#), head of the NIEHS Laboratory of Signal Transduction, as well as the Molecular Endocrinology Group, encouraged her to apply for the FLARE Workshop, which provides leadership training. She was fortunate to be accepted into the workshop, and took part in the two-day training Feb. 7-8 in New Orleans.

"The workshop was very helpful, because it went through all of the choices you have as a Ph.D., with talks on academia, industry, grant writing, and how to improve your CV," Cruz-Topete said.

Having a FLARE for science

At the end of the workshop, the FLARE committee interviewed attendees and named Cruz-Topete as one of the winners of the coveted one-year internship. The internship gives her the opportunity to encourage young people from underrepresented groups to continue their paths in science, and, at the same time, gives her a chance to talk about her research and why endocrinology is so exciting.

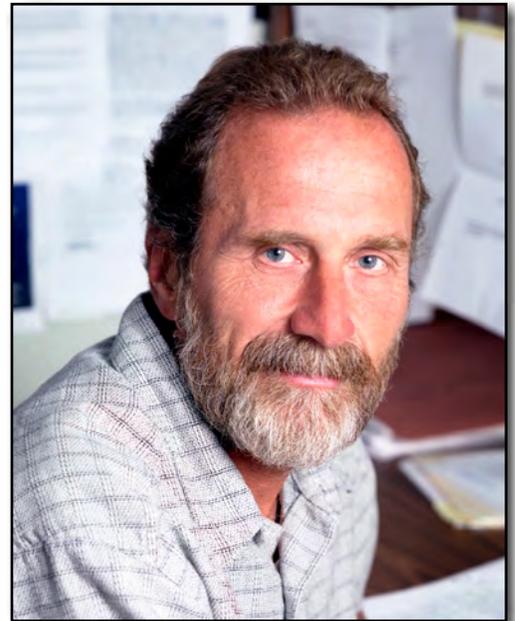
Members of the Cidlowski group study the effect glucocorticoids and the glucocorticoid receptor have on various systems of the body. Specifically, Cruz-Topete examines how they regulate cardiac function under normal and stressful conditions.

She hopes to bring what she's learned at NIEHS, and the skills gained under FLARE, to an academic position someday. Cidlowski believes she'll make a great mentor. "Diana thoroughly loves doing research, and that drive will inspire her students," he said.

The FLARE program, which launched in August 2012, provides training and professional development opportunities for senior graduate students, postdocs, and clinical research fellows from underrepresented groups doing hormone health research. The FLARE awards are supported by the National Institute of Diabetes and Digestive and Kidney Diseases, part of the National Institutes of Health.



Cruz-Topete is a native of Vera Cruz, Mexico, and has been with NIEHS since 2012. (Photo courtesy of Steve McCaw)



Cidlowski urges his postdocs to apply to several programs to advance their careers. (Photo courtesy of Steve McCaw)

NIEHS had broad representation at the joint meeting of the International Society of Endocrinology and the Endocrine Society in Chicago.

- **Yukitomo Arao, Ph.D.** — staff scientist, Receptor Biology Group
- **Christine Bruske Flowers** — director, Office of Communications and Public Liaison
- **John Cidlowski, Ph.D.** — head, Laboratory of Signal Transduction and the Molecular Endocrinology Group
- **Jerrold Heindel, Ph.D.** — health scientist administrator, Division of Extramural Research and Training
- **Christine Jewell** — biologist, Molecular Endocrinology Group
- **Kenneth Korach, Ph.D.** — head, Laboratory of Reproductive and Developmental Toxicology and Receptor Biology Group
- **Sivapriya Ramamoorthy, Ph.D.** — research fellow, Molecular Endocrinology Group
- **William Schrader, Ph.D.** — Deputy Scientific Director, Division of Intramural Research
- **Thaddeus Schug, Ph.D.** — health scientist administrator, Division of Extramural Research and Training

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Birnbaum recognized for leadership by USPHS

By Eddy Ball

NIEHS and NTP Director Linda Birnbaum, Ph.D., was among civilians and commissioned officers honored by the U.S. Public Health Service (USPHS) June 10 in Washington, D.C. Birnbaum received a certificate of appreciation and medal from Acting Surgeon General [Boris Lushniak, M.D.](#)

Lushniak specifically commended Birnbaum for her exemplary service to the Office of the Surgeon General through unwavering support to the Commissioned Corps as Director of the National Institute of Environmental Health Sciences.

The 6,500 member Commissioned Corps is an essential component of the largest public health program in the world. Corps officers hold a variety of positions throughout the U.S. Department of



Birnbaum's USPHS medal and certificate joined a number of other honors she has received as director of NIEHS. (Photo courtesy of Steve McCaw)

Health and Human Services (HHS) and certain non-HHS federal agencies and programs in the areas of disease control and prevention; biomedical research; regulation of food, drugs, and medical devices; mental health and drug abuse; and health care delivery.

NIEHS counts several active and retired USPHS officers among its employees, including Senior Medical Advisor Aubrey Miller, M.D., and Chief of Staff Mark Miller, Ph.D.

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Lushniak, in full dress uniform, presented the certificate and medal to Birnbaum. (Photo courtesy of Kun Shen)

Predictive toxicology faculty rallies around new directions

By Eddy Ball

The Predictive Toxicology and Disease (PT&D) faculty meeting June 2 attracted some fifty scientists from across the three research divisions at NIEHS. The meeting provided historical perspective on the PT&D initiative and activity updates, and solicited ideas from the audience for implementing the Institute's [2012-2017 strategic plan](#).

PT&D is one of eight crosscutting themes in the strategic plan. The faculty concept is an effort to marshal resources developed in the various labs, sections, and groups where science is being conducted, into a unified effort.

“The implementation teams were the obvious next step for the strategic plan,” said NIEHS planning and policy lead [Sheila Newton, Ph.D.](#), in her opening talk on historical perspective. Since the themes are ones that all the divisions independently identified as priorities, she continued, “[Leaders proposed] we should have the planning process be one that involves all of the divisions working together, rather than [having each division] independently come up with a plan.”

Deconstructing silos

Representatives of the three divisions — the Division of Intramural Research (DIR), Division of Extramural Research and Training (DERT), and Division of the National Toxicology Program (DNTP) — took turns at the podium, describing their respective programs and resources, in a demonstration of the kind of proactive communication the faculty concept is working to inspire. As speakers shared the details of their predictive toxicology and disease programs, they also attempted to identify intersections among their divisions' efforts.

Putting the strategic plan into action

NIEHS is using the concept of cross-divisional faculties and overarching themes to unite efforts to implement the strategic plan and advance research and public health in eight key areas of interest and concern:

- **Epigenetics**
- **Exposome** (see [story](#))
- **Global Environmental Health**
- **Inflammation** (see [story](#))
- **PT&D**
- **Stem Cell Biology**
- **Website and Social Media**
- **Scientific Data Management**

DNTP [Tox21](#) lead and Biomedical Screening Branch (BSB) head [Raymond Tice, Ph.D.](#), helped set the tone with his report on the federal partner consortium formed in 2008 to address the development of next-generation high-throughput toxicology testing for thousands of chemicals. Colleague [Stephen Ferguson, Ph.D.](#), joined in to discuss progress in Phase III of the Tox21 program now underway.

“We’re actively seeking the opportunity for cross-division collaborations,” Tice told the group, “and one of the purposes of the faculty is to provide a forum for the free exchange of information.”

In her report, DERT representative [Claudia Thompson, Ph.D.](#), briefly discussed a database that coded all the epidemiology projects supported by NIEHS. She said the database could be used as a resource to identify potential sources of biological samples, to address questions of concern for the PT&D initiative.

DIR toxicogenomics veteran [Richard Paules, Ph.D.](#), described a leadership-sponsored, cross-division effort to develop a high-throughput transcriptome platform using approximately 1,500 genes that could be used to greatly expand our understanding of the relationship between chemicals, genes, pathways, and disease.

DERT program lead [Daniel Shaughnessy, Ph.D.](#), offered a preview of the stem cell development meeting June 3-4 and its significance for PT&D implementation efforts.

DERT representative [Kimberly McAllister, Ph.D.](#), pointed to an upcoming workshop on collaborative cross and diversity outbred mice models.

[Warren Casey, Ph.D.](#), director of the NTP Interagency Center for the Evaluation of Alternative Toxicological Methods (NICEATM), reviewed his group’s work in adverse outcome pathway research using *in vitro* testing, as well as alternative animal models, including zebrafish, and noted the added benefit of an integrated predictive toxicology program, with the reduction of the number of animals used in testing.



Tice led off the agenda of division reports with a summary of Tox21 activities. (Photo courtesy of Steve McCaw)



The speakers listened, as audience members made comments on Tice’s report. Shown, from left, are Shaughnessy, Ferguson, McAllister, and Newton. (Photo courtesy of Steve McCaw)



NIEHS Deputy Director Rick Woychik, Ph.D., offered insights about silos in private industry, where programs within an organization generally work independently and sometimes at cross-purposes, often failing to discover where they might collaborate to the best interest of the organization’s overall goals. (Photo courtesy of Steve McCaw)

Facilitator [Elizabeth Maull, Ph.D.](#), of DNTP, closed the meeting with a look at next steps, including a possible PT&D lecture series. By specifically describing itself as a faculty activity, such a series might lure scientists away from their silos of specialization and into the broader arena of communication, and help people perceive, more acutely, activities across the divisions.



Paules, who holds a joint appointment in DIR and DNTP, was a leader in the former National Center for Toxicogenomics, which played an important role in inspiring the now firmly established relationship between bioinformatics and computational toxicology. (Photo courtesy of Steve McCaw)



Casey heads the NTP center that promotes federal agencies' adoption of testing methods to reduce the use of animals in safety testing, through refinements in predictive toxicology. (Photo courtesy of Steve McCaw)



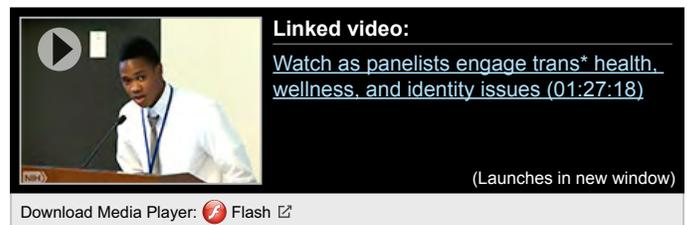
Maull is one of the heavy lifters for the PT&D faculty. Her experience with DERT and BSB, prior to joining NICEATM, has been instrumental in highlighting the connections among NIEHS divisions, as well as external agency and private sector programs. (Photo courtesy of Steve McCaw)

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Program highlights issues and progress in transgender health disparity

By Eddy Ball

The National Institutes of Health (NIH) Office of Equity, Diversity, and Inclusion marked yet another first, this June, with a panel discussion on transgender health disparity. The program kicked off Lesbian, Gay, Bisexual, Transgender, and Intersex (LGBTI) Pride Month.



“On Being Human: Reflections on Trans* [Transgender] Health and Wellbeing” brought together five leading trans* activists and researchers June 10 at NIH in Bethesda, Maryland. Prompted by questions from moderator [Rayceen Pendarvis](#), a prominent Washington, D.C., author and columnist, panelists shared personal experiences about trans* issues, through the perspectives of health, research, employment, law, and culture.

The panel was part of the Special Emphasis Program on LGBTI at NIH, led by strategist Albert Smith Jr., with support from the NIH Office of the Director, National Institute for Minority Health and Health Disparities, and a network of several other groups and individuals at NIH.

“Our stories matter,” Smith told the audience as he described the program’s narrative format. “And I think today’s panel is a testament to that saying.”

The event was groundbreaking, with several new initiatives mentioned by the panelists, in addition to positive developments underway at NIH aimed at greater inclusion of trans* individuals (see [text box](#)).

In search of safe spaces

Panelists included nationally recognized voices in the trans* communities, — [Scout, Ph.D.](#), professor at Boston University and director of CenterLink’s Network for LGBT Health Equity; [Ruby Corado](#), founding director of Casa Ruby in Washington, D.C.; [Sasha Buchert, J.D.](#), staff attorney with the Transgender Law Center in Oakland, California; and [JV Sapiñoso, Ph.D.](#), assistant director of LGBT studies at the University of Maryland in College Park.

Their personal narratives offered insight into the quest of individuals and communities to validate identity in a society that is still struggling to understand fundamental differences between biological determination of sex and psychosocial constructions of gender.

The stories explored the effects of marginalization on the life experiences of a population facing health disparities linked to some of the highest unemployment and poverty rates in the U.S. today. Trans* health is disproportionately affected by higher rates of sexually transmitted disease, discrimination in virtually every aspect of life, homelessness, widespread alienation from family and traditional community, hate crimes, suicide attempts, and violence.

Celebrating identity and progress

Against this backdrop of exclusion, persistent marginalization, and the reality that society has not yet formally recognized LGBT individuals as a population with health disparities, panelists could still point to some signs of progress.



Organizers looked forward to the next generation of biomedical researchers, with their choice of NIH postbaccalaureate fellow [Shane Scott](#), who identified as trans*, to deliver opening remarks. (Photo courtesy of Daniel Sone)



NIH Principal Deputy Director [Lawrence Tabak, D.D.S., Ph.D.](#), didn’t speak, but was in the audience to demonstrate leadership support for LGBTI equal employment opportunity and inclusion. (Photo courtesy of Daniel Sone)



[Tabak’s special assistant and NIH Office of Director LGBTI point person Rashada Alexander, Ph.D.](#), introduced moderator [Pendarvis](#). Alexander and two colleagues received a 2014 NIH Director’s Award for their leadership of the NIH LGBTI Working Group. (Photo courtesy of Daniel Sone)

In final remarks, Pendarvis cited a growing number of stories about families who are embracing gender difference in their children, and singled out NIH for its leadership in inclusion. “We are beginning to tear down barriers and build understanding, and we applaud NIH [for its contribution] to this big step,” Pendarvis said. “Let this be the beginning of a series of dialogue.”

Smith made a fitting choice as a gift for panelists — “Hooray for You: A Celebration of ‘You-Ness,’” — a children’s book of self-affirmation and inclusion. “This book will change your life,” he said. “It reminds me of how important it is for me to be me and for you to be you.”



Pendarvis invoked the memory of earlier generations of trans individuals. “I am reminded of those who are [now] voiceless,” he said. “We are the voices for them today.” (Photo courtesy of Daniel Sone)*

Beginning a long journey with bold first steps

The 2014 Pride Month [statement](#) by NIH Director Francis Collins, M.D., Ph.D., underscored the strong commitment to LGBTI inclusion and equal employment opportunity by leadership at NIH and the U.S. Department of Health and Human Services (HHS), which held its own celebration of Pride Month June 12. As Scout’s own funding suggests, federal agencies are also beginning to show support for trans* health research, although barriers remain with the wording of requests for applications and in the peer review process. Scout also pointed to positive efforts to educate healthcare providers, through grand rounds continuing medical education programs on gender-specific needs of trans* patients.

After years of struggle, Buchert can now point to a handful of gender discrimination cases her clients have won, as well as to the 17 states that have adopted some degree of protection for individual gender identity determination. Several universities have established programs to encourage student involvement in LGBT community programs, and the body of literature on trans* issues is growing dramatically, including the nearly 700-page “Trans Bodies, Trans Selves: A Resource for the Transgender Community,” and a new journal, *Transgender Studies Quarterly*.

On a personal level, panelists responded positively to a question from Pendarvis about the meaning of LGBT pride. “It means I’ve overcome my inner transphobia,” Buchert said. According to Corado, it has helped her, as a trans* Latina, negotiate mainstream society with greater assurance. “LGBT pride is also about responsibility and accountability, and the privilege to speak,” added Sapinoso.

“On Being Human” was the first of three transgender education and sensitivity training events, in June, sponsored by NIH as a part of its 2014 LGBTI Pride Month observance. In keeping with a [proclamation](#) by President Obama, other federal agencies are also sponsoring Pride Month observances.



Corado, left, looked on as Scout followed up on a prompt from the moderator about how to advance inclusion in grant awards. “We’re clearly seeing the lack of knowledge in the peer reviewers,” he said. “Make sure the portfolios echo the commitment.” (Photo courtesy of Daniel Sone)



Pointing to an explosion of literature by, and about, trans people, Sapinosa told the audience, “You are not alone. There is a community.” (Photo courtesy of Daniel Sone)*



As an attorney concerned with equal employment opportunity for trans individuals, Buchert’s job is often an uphill battle. “There’s rarely a smoking gun to prove employment discrimination,” she said. (Photo courtesy of Daniel Sone)*



Smith concluded the program by describing the children’s book he chose as a token of NIH appreciation for the panelists and moderator. (Photo courtesy of Daniel Sone)

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Scholars Connect launches third year of internships

By Kelly Lenox

Now in its third year, the NIEHS Scholars Connect Program ([NCSP](#)) got off to a busy start June 2-4 with an intensive training program taught by NIEHS postdocs.

Open to students in science, technology, engineering, and mathematics (STEM) majors from nearby universities, the internship attracts young adults with a wide range of academic experiences. Scholars in NCSP will work full time over the summer, and 15 hours per week during the academic year.



Huei-Chen Lao of the NIEHS Office of Science Education and Diversity developed the training session, to ensure that each of the six new interns has the basic skills necessary for a successful start in the lab. The 2013 session (see [story](#)) was so successful, NIH requested that four NIEHS interns in its [Community College Summer Enrichment Program](#) — Coral Backman, Tanika Bantukul, Laura Finerty, and Atif Rafique — be included in this year's NCSP training. This year's scholars, listed below, work in labs throughout NIEHS and NTP.

- **Brianda Elzey**, a senior at St. Augustine's University, works with mentor Natasha Clayton in the [Pathology Support Group](#), headed by Ronald Herbert, D.V.M., Ph.D.
- **Nichole Flynn**, a senior at North Carolina State University, works with mentor Ruben Orihuela Garcia, Ph.D., in the NTP [Neurotoxicology Group](#), headed by Jean Harry, Ph.D.
- **DeAsia Lewis**, a junior at St. Augustine's University, works with mentor Natalie Ren, Ph.D., in the NIEHS [Metabolism, Genes, and Environment Group](#), headed by Xiaoling Li, Ph.D.
- **Aaron Manning**, a junior at St. Augustine's University, works in the NIEHS [Nuclear Magnetic Resonance Group](#), with staff scientist Geoffrey Mueller, Ph.D.
- **Carri Murphy**, a senior at North Carolina Central University, works with mentor Daniel Menendez, Ph.D., in the NIEHS [Chromosome Stability Group](#), headed by Mike Resnick, Ph.D.
- **Nicole Sciortino**, a senior at St. Augustine's University, works with mentor Linda Yu, Ph.D., in the NTP [Molecular Pathogenesis Group](#), headed by Darlene Dixon, D.V.M., Ph.D.



Instructor Miranda Bernhardt, Ph.D., postdoctoral fellow in the NIEHS [Reproductive Medicine Group](#), displays the manual dexterity that years of lab work can develop in a researcher. (Photo courtesy of Steve McCaw)



From left, interns Rafique, Finerty, and Elzey looked on as Thomas demonstrated one of the assay preparations. (Photo courtesy of Steve McCaw)

From intro to bioassays in three days

The laboratory boot camp kicked off with a talk on molecular biology, followed by lessons on scientific methods and techniques.

The following two days involved hands-on lab experiences that ranged from learning to use the pipette and balance, to preparing the bicinchoninic acid protein assay and gel electrophoresis.

The tasks assigned the students were more than exercises. Instructor Misty Thomas, Ph.D., postdoctoral fellow in the NIEHS Macromolecular Structure Group, surprised the students when she revealed that the gel electrophoresis they would perform was part of her current research.

Diversifying the scientific community

NSCP was started in 2012 to help diversify the biomedical workforce. It offers paid internships to STEM students from historically black colleges and universities and other nearby academic institutions with students from underrepresented populations.

Promoting diversification of the biomedical workforce and training the next generation of environmental health scientists are among the priorities identified in the NIEHS [Strategic Plan](#). Last year's scholars completed successful research projects and delivered polished lectures at the end of the internship (see [story](#)), demonstrating the broad-based value of the experience. This year's group promises to be every bit as impressive.



In the wrap-up session, Lao emphasized the importance of planning. "Before the end of the summer, talk to your mentor and establish the big picture for what you will accomplish over the fall, then set shorter term goals by the week and month," she said. (Photo courtesy of Steve McCaw)



Murphy got plenty of practice with pipette technique in the gel electrophoresis lab. (Photo courtesy of Steve McCaw)



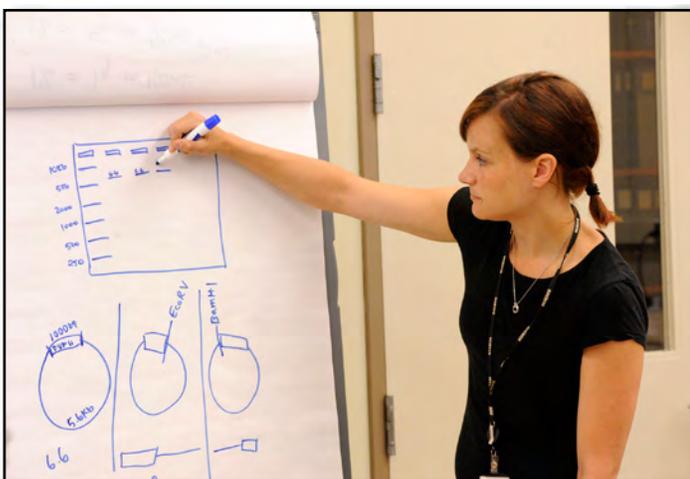
The small group allowed one-on-one instruction for student Manning, right, from Bernhardt. (Photo courtesy of Steve McCaw)



Murphy, left, and Backman paid close attention during one of the lab instruction sessions, which alternated with hands-on work. (Photo courtesy of Steve McCaw)



Backman loaded protein samples for the gel electrophoresis. (Photo courtesy of Steve McCaw)



Thomas illustrated the possible outcomes of the diagnostic tests students were to perform. (Photo courtesy of Steve McCaw)



Finerty and Rafique collaborated to complete the lab exercise. (Photo courtesy of Steve McCaw)

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NIEHS welcomes 2014 summer interns

By Eddy Ball

The National Institutes of Health (NIH) Summer Internship Program (SIP) at NIEHS welcomed participants June 12 with a breakfast seminar. The following week, the program held a panel session on scientific career paths, followed by seminars in applying to graduate and medical school.

The almost 40 high school, undergraduate, and graduate students will receive a stipend for their eight weeks of training in NIEHS and NTP laboratories and divisions. Each will be working on individual research projects, mentored by lead scientists and postdoctoral fellows. At the end of the training, they will highlight their research during a poster competition July 24.

The initial SIP seminars, which focus on training and career development, are followed by scientific seminars. This summer, seminars include the developmental origin of disease, and climate change and human health.

Getting off to the right start

The breakfast seminar was an opportunity for interns to meet fellow participants, as well as for program leaders to orient the students to scientific research at NIEHS, announce new opportunities, and reinforce core concepts of the training experience. Interns were encouraged to strive to answer the question, “How can I maximize my experience this summer?”

NIEHS Deputy Scientific Director and Training Director Bill Schrader, Ph.D., and SIP Coordinator Debbie Wilson made it clear to students that they are expected to take an active role in balancing work in their labs with the many seminars and learning opportunities available, such as the new Journal Club (see [story](#)) and a special tour of the adjacent U.S. Environmental Protection Agency.

“The science has to come first,” Schrader told the students, “but try to budget the time you have to do both.”

Negotiating changing career paths

As Wilson told the students, the career panel has been the most popular seminar experience in the program. Each year, Wilson invites three NIEHS scientists to join University of Maryland professor and NIH training consultant [William Higgins, Ph.D.](#), to share their own experiences and sometimes winding career paths with the interns.

At this summer’s panel discussion, NIEHS scientists included Health Scientist Administrator [Thaddeus Schug, Ph.D.](#), who oversees grants for the Division of Extramural Research and Training (DERT) Population Health Branch; Shepherd Schurman, M.D., acting medical director of the [Clinical Research Unit](#) and head of the [Environmental Polymorphisms Registry](#); and DERT Program Analysis Branch Chief [Christie Drew, Ph.D.](#) None of them now have what might be called a traditional career in bench-based scientific research.



Like Hunt, above, the students were attentive during the breakfast seminar and had plenty of questions for the career panelists. (Photo courtesy of Steve McCaw)

In a nutshell – how to become an NIH summer intern

- Watch the “Applying Successfully” video and carefully read the instructions and frequently asked questions [online](#).
- Approach the application process with passion for science and hard work. Of some 6,500 applications received each year, individual NIH lead researchers choose just 1,000 young people as interns.
- Begin early. Applications are accepted from mid-November 2014 to March 1, 2015, and a comprehensive application package must be submitted online.
- Narrow your search and contact the lead researchers you think will best fit your scientific interests. Individual scientists select their own summer interns and provide their funding. There is no centralized selection process.

Even though Higgins heads a lab and trains postdocs, there is little about him or his career that he would describe as traditional. Among the other panelists, only Schurman said he followed a relatively straight course from his childhood ambition to his current career. Schug's initial career goal involved playing professional basketball, and Drew's career path took her from a doctorate in geography, through an internship with the World Health Organization, before she landed her job at NIEHS.

As Wilson had predicted, the mix of panelists worked well for the students, producing good advice about maximizing opportunities, following vocational passions, and adapting creatively to detours along the career path.

The interns seemed to agree. When asked about his experience so far in the summer program, and his opinion of the career panel session, Wake Forest University rising senior Trevor Hunt said, "It's awesome." Hunt also had unqualified praise for his Laboratory of Neurobiology mentors, lead researcher Jerrel Yakel, Ph.D., and award-winning research fellow Qing Cheng, Ph.D. (see [story](#)).



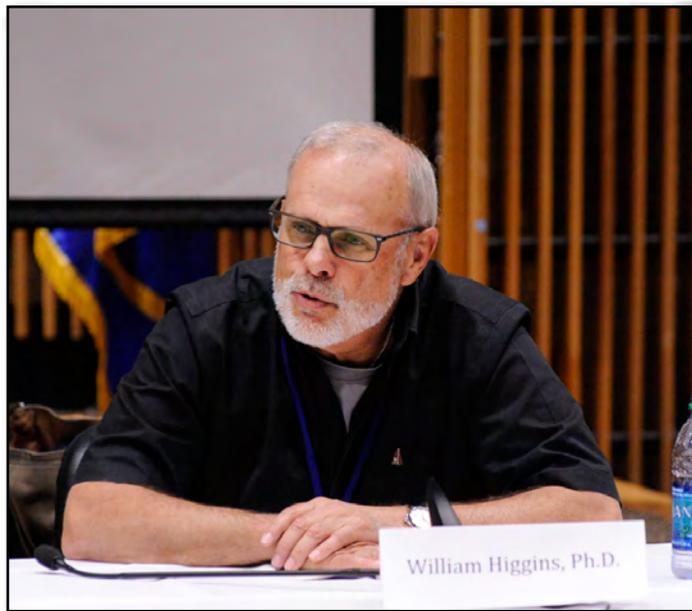
NIEHS postdoctoral fellow Joanne Damborsky, Ph.D., described the critical reading focus of the Journal Club that she and postdoctoral colleague Simone Otto, Ph.D., redesigned for summer 2014. The two will lead weekly sessions analyzing the structure, strengths, and weaknesses of scientific papers. (Photo courtesy of Steve McCaw)



Schrader presented students with a diagram to help explain the science conducted at NIEHS. He showed the progression, from clinical observation through basic research and clinical research, to public reports, connecting the work of scientists across the research spectrum at NIEHS. (Photo courtesy of Steve McCaw)



Schug's winding career path took him from aspiring professional athlete at Potsdam College with a double major in physics and education, to a stint teaching science in high school and community college, through a Ph.D. in cancer biology at Cornell and a postdoc at NIEHS, to his current position administering grants in endocrine disruption and reproductive biology. (Photo courtesy of Steve McCaw)



The students, such as Chase Yuan, left, and Daniel Liaou, picked up useful advice and real-life examples from the panelists. "When you do get an opportunity, put extra effort into it," Schurman told them. "You will get noticed." (Photo courtesy of Steve McCaw)

Higgins said that being a professor has turned out to be the perfect career for him. "I needed to hang around smart people," he said. "I needed questions. I needed problems." (Photo courtesy of Steve McCaw)



Interns from the class of 2014 gathered on the front plaza at NIEHS. (Photo courtesy of Steve McCaw)

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Seventeen trainees join FARE winners' circle

By Eddy Ball

When the results of the 2015 Fellows Award for Research Excellence (FARE) were announced in June, 17 NIEHS trainees joined the elite group of young scientists so honored by NIH.

In his June 13 announcement of the winners, NIEHS Deputy Scientific Director and Training Director Bill Schrader, Ph.D., wrote, "Congratulations to all these FARE awardees, for their ability to carry out exciting science, and to describe it succinctly in abstract form."

The FARE award program is sponsored by the NIH Fellows Committee, scientific directors, and Office of Intramural Training and Education, and is funded by the scientific directors. Earlier this year, fellows submitted their research abstracts, which were then placed in study sections for review by postdoctoral fellows and senior scientists. Abstracts in the top 25 percent of each study section were selected for FARE awards, based on scientific merit, originality, experimental design, and overall quality and presentation.

Distinction that comes with a cash award

Winners of FARE awards receive a \$1,000 stipend to attend a scientific meeting of their choice, where they present their research. They are also invited to present a poster at the annual NIH Research Festival; attend the FARE awards ceremony held on the NIH Bethesda, Maryland, campus in October; and participate in judging the following year's FARE competition. Recipients will also be recognized at the NIEHS Director's Awards ceremony in 2015.

Winning, in its own right, recognizes the exceptional scientific research of trainees and the quality mentorship of the lead researchers involved. In addition, however, there are other notable facts about the winners and their mentors.

Four fellows were repeat winners — Percy Tumbale, Ph.D., and Senthilkumar Cinghu, Ph.D., also won in 2013; Erica Ungewitter, Ph.D., was a 2014 winner; and Qingshan Wang, M.D., won in 2013 and 2014.

One of the winners, Deirdre Robinson, is a doctoral candidate in the NTP Laboratory. No more than one or two predoctoral fellows achieve a FARE in any given year.

Lead researchers with more than one FARE winner from their group included Raja Jothi, Ph.D., with three winners, and John Cidlowski, Ph.D., and Humphrey Yao, Ph.D., with two each.



Margaret Adgent, Ph.D., is a member of the Pediatric Epidemiology Group, headed by Walter Rogan, M.D., and author of "Urinary triclosan and enterolactone: a cross sectional study of environmental influence on gut microbiome function." (Photo courtesy of Steve McCaw)



Georgia Alexander, Ph.D., authored "Neuronal activity in hippocampal area CA2 during spatial processing." She is a member of the Synaptic and Developmental Plasticity Group, headed by Serena Dudek, Ph.D. (Photo courtesy of Steve McCaw)



A member of the Ion Channel Physiology Group, headed by Jerrel Yakel, Ph.D., [Qing Cheng, Ph.D.](#), was recognized for “Activation of a7 nicotinic acetylcholine receptors increased intracellular cAMP levels in cultured hippocampal neurons.” (Photo courtesy of Steve McCaw)



[Cinghu](#) was honored for “Nucleolin regulates the homeostatic balance between self-renewal and differentiation in embryonic stem cells.” He is a member of the Systems Biology Group headed by Jothi. (Photo courtesy of Steve McCaw)



Recognized for “Risk of fetal death with preeclampsia,” [Quaker Harmon, M.D., Ph.D.](#), is a member of the [Reproductive Epidemiology Group](#), headed by Allen Wilcox, M.D., Ph.D. (Photo courtesy of Steve McCaw)



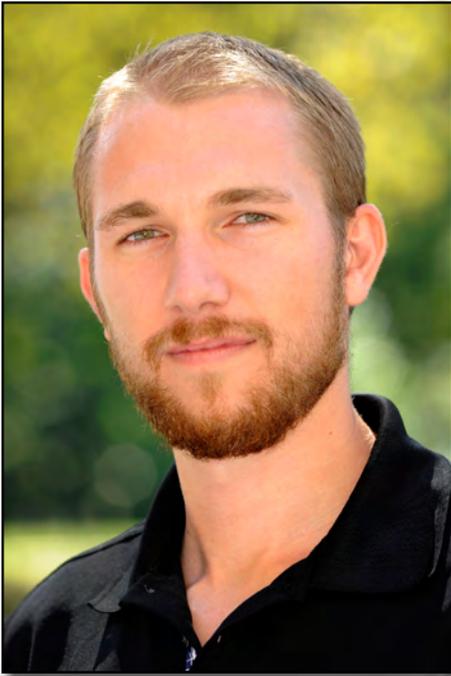
[Mallikarjuna Metukuri, Ph.D.](#), is a member of the Metabolism, Genes, and Environment Group, headed by Xiaoling Li, Ph.D. He is the author of “Deletion of intestinal SIRT1 activates Paneth cells, enhances intestinal inflammation, and alters gut microbiota.” (Photo courtesy of Steve McCaw)



A member of the Chromosome Stability Group, headed by Michael Resnick, Ph.D., [Thuy-Ai Nguyen, Ph.D.](#), was recognized for her study, “The p53 protein interactome is also a p53-regulated cistrome.” (Photo courtesy of Steve McCaw)



[Barbara Nicol, Ph.D.](#), is a member of the Reproductive Developmental Biology Group, headed by Yao. She authored “Uncovering new paradigm in testis differentiation using mouse genetic models.” (Photo courtesy of Steve McCaw)



Andrew Oldfield, Ph.D., was recognized for “NF-Y specifies cell identity by promoting chromatin accessibility for master transcription factors at active enhancers.” He is also a member of Jothi’s Systems Biology Group. (Photo courtesy of Steve McCaw)



Matthew Quim, Ph.D., is part of the Molecular Endocrinology Group, headed by Cidlowski. He authored “Imbalance of endogenous glucocorticoids and estrogen leads to the development of autoimmune hepatitis-like symptoms in mice.” (Photo courtesy of Steve McCaw)



Sivapriya Ramamoorthy, Ph.D., was recognized for her gene expression study, “Glucocorticoid receptor isoform knock-in mice have unique responses to glucocorticoids.” She is also a member of the Molecular Endocrinology Group headed by Cidlowski. (Photo courtesy of Steve McCaw)



Robinson authored “Assessing early developmental and pubertal effects in CD-1 mice following in utero exposure to bisphenol (BP) analogs.” She is a member of the NTP Laboratory Reproductive Endocrinology Group, headed by Suzanne Fenton, Ph.D. (Photo courtesy of Steve McCaw)



Natacha Steinckwich-Besancon, Ph.D., is a member of the Calcium Regulation Group, headed by James Putney, Ph.D. She was recognized for “Role of the calcium sensor protein, STIM1, in neutrophil chemotaxis and infiltration into psoriatic inflamed skin.” (Photo courtesy of Steve McCaw)



Tumbale is author of “Molecular mechanism of the aprataxin-linked neurodegenerative disorder — ataxia with oculomotor apraxia type 1 (AOA1).” She is a member of the Genome Stability Structural Biology Group, headed by Scott Williams, Ph.D. (Photo courtesy of Steve McCaw)



Recognized for her study, “Gli-similar 3 is a master regulator of retrotransposon silencing in male fetal germ cells,” [Ungewitter](#) is also a member of the Reproductive Developmental Biology Group headed by Yao. (Photo courtesy of Steve McCaw)



A member of the Neuropharmacology Group headed by Jau-Shyong Hong, Ph.D., [Wang](#) is author of “Ultra-low dose of diphenyleiiodonium attenuates progressive dopaminergic neurodegeneration and motor deficits in multiple rodent Parkinson’s disease models.” (Photo courtesy of Steve McCaw)



[Pengyi Yang, Ph.D.](#), is also part of Systems Biology Group headed by Jothi. He was recognized for “Master transcription factors establish cell type-specific transcription attenuators for rheostat control of gene expression.” (Photo courtesy of Steve McCaw)

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Conway selected for NIGMS PRAT fellowship

By [Monica Frazier](#)

Amanda Conway, Ph.D., an NIEHS Intramural Research Training Award (IRTA) fellow, was selected for a Postdoctoral Research Associate ([PRAT](#)) Program fellowship from the National Institute of General Medical Sciences (NIGMS). The program provides 3 years of funding for postdoctoral researchers at the National Institutes of Health (NIH) or U.S. Food and Drug Administration. Conway’s term, which begins Oct. 1, will allow her to continue doing research at NIEHS under the mentorship of Raja Jothi, Ph.D., head of the [Systems Biology Group](#).

Jothi said the PRAT Program will give Conway the experience she needs to lead her own lab one day. “The NIGMS PRAT fellowship gives Amanda the independence to study what she is truly interested in, while learning and applying computational and genomics approaches,” Jothi said.

[Conway](#), who received her Ph.D. at Duke University, said her PRAT Program research proposal is a continuation of discoveries she made during her graduate studies at Duke.

“While examining the molecular events underlying an aggressive type of leukemia, I discovered that the nuclear export receptor CRM1 binds genetic loci and recruits a leukemic fusion protein, leading to transcriptional activation of target genes,” she said of her Ph.D. research. “I plan to extend this work by investigating the role for CRM1 in gene regulation during early embryonic development.”

The PRAT Program is a competitive application process, which includes submitting a research plan. While the overall theme of a PRAT research project can relate to any biomedical research field, the current focus of the program is on quantitative and systems pharmacology and computational biology.

In addition to a salary, selected fellows receive a yearly travel allowance, to attend meetings and training sessions at the National Institutes of Health (NIH), as well as conferences and seminars elsewhere. The meetings at NIH include a series of seminars, which bring all PRAT fellows together for career and mentored training.

(Monica Frazier, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Mechanisms of Mutation Group.)

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Conway, left, and Jothi examine a sample for analysis. Jothi said, “Amanda’s research proposal to use interdisciplinary approaches, including pharmacological, genomic, and computational biology techniques, to study the role of CRM1 in gene regulation, nicely fits with the overall focus areas of the PRAT Program.” (Photo courtesy of Steve McCaw)

Postdocs launch initiatives for summer interns

By Eddy Ball

Postdoctoral fellows are involved in two new support efforts for the 2014 NIH Summer Internship Program (SIP) at NIEHS.

Four NIEHS trainees received Summer Research Mentor Awards from the NIH Office of Intramural Training and Education (OITE), recognizing their passion for mentoring and training students, level of creativity for experimental design, and commitment to invest in a summer student’s first NIH research laboratory experience. The winners were Intramural Research and Training Award (IRTA) Fellow [Mahita Kadmiel, Ph.D.](#); Visiting Fellow [Natacha Steinckwich-Besancon, Ph.D.](#); IRTA Fellow [Erica Ungewitter, Ph.D.](#); and Research Fellow [Gary ZeRuth, Ph.D.](#)

In line with NIH-wide efforts by Journal Club-OITE, two IRTA fellows in the NIEHS Ion Channel Physiology Group, Joanne Damborsky, Ph.D., and Simone Otto, Ph.D., worked over the past year to revive and redesign the Summer Journal Club Program, which had been dormant since 2011. The club held the first of four weekly meetings June 25, for discussion and critical reading of journal articles focused on a new technology in neurobiology known as optogenetics, moderated by Otto and Damborsky.



Linked video:
[Watch the MIT video, ‘Optogenetics: controlling the brain with light’ \(04:50\)](#)

(Launches in new window)

Download Media Player:  Flash 

Intensive mentoring for success

The Summer Mentor Award winners will serve as official mentors for Summer Internship Program students at NIEHS participating in the OITE Community College Summer Enrichment Program. Following their selection by OITE this winter, winners attended orientation sessions via webinars and conference calls. The students all attended the NIEHS Scholars Connect boot camp training June 2-4 on laboratory basics (see related [story](#)).

According to OITE Director Sharon Milgram, Ph.D., NIEHS had more winners than any other NIH Institute or Center. NIEHS Deputy Scientific Director Bill Schrader, Ph.D., and Office of Fellows' Career Development Director Tammy Collins, Ph.D., encouraged fellows to apply for the awards, both for the value to students and as a career development experience for the trainees.

“We’re assigned students with a great interest in research, but with little to no research experience,” award winner Kadmiel said. “This kind of teaching in the lab is a vital part of becoming a faculty member. This is definitely a very important step for me in my career [development].”

A journal club with a twist

Damborsky described the new journal club June 12 during the SIP student welcoming event (see [story](#)). “The purpose of this journal club is twofold,” she told the students. “The first is to go over the basic structure of primary research articles and learn how to critically read and evaluate [the studies], and the other goal is to introduce a new technique that may be unfamiliar to many of you, optogenetics..., which uses light to activate neurons.”

Damborsky and Otto selected two primary research articles and one review article on optogenetics for the interns to read and discuss. Their primary goal at the end of the journal club experience is for participants to understand the organization, components, and reasoning employed in research articles, and to develop a working knowledge of the basic concepts of optogenetics.



Like her fellow mentors, 2014 Fellows Award for Research Excellence (FARE) winner Kadmiel has been recognized for her research, as well as her service. (Photo courtesy of Steve McCaw)



Steinckwich-Besancon is a 2015 FARE winner. (Photo courtesy of Steve McCaw)



Ungewitter won a 2014 and 2015 FARE. (Photo courtesy of Steve McCaw)



ZeRuth won a 2014 FARE. (Photo courtesy of Steve McCaw)



Redesigning the SIP journal club called upon the creativity, knowledge of cutting-edge scientific technique, and management skills of organizers Damborsky, above, and Otto. (Photo courtesy of Steve McCaw)



In addition to her service to interns this summer, Otto is also a contributing writer for the NIEHS Environmental Factor newsletter. (Photo courtesy of Steve McCaw)

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Science Notebook

NIEHS employees honored at NIH Director's Awards Ceremony

By Eddy Ball

Director Linda Birnbaum, Ph.D., and 13 employees of NIEHS and NTP (see [text box](#)) were among recipients of National Institutes of Health (NIH) Director's Awards. They were presented at a ceremony June 12 in Bethesda, Maryland, organized around the theme, "Why I Love NIH." The employees were recognized for their outstanding contributions to trans-NIH initiatives in the DREAM Toxicogenetics Challenge, the Tox21 predictive toxicology consortium, remote support technology, and organization of a geroscience summit.

Leading off the ceremony was NIH Director Francis Collins, M.D., Ph.D., who praised employees for their persistence and creativity in making fiscal year 2013-2014 a successful year for the organization, despite fiscal restraints and operational interruptions. He pointed to a long list of achievements, including a record number of Nobel prizes awarded to grantees, the BRAIN (Brain Research Through Advancing Innovative Neurotechnologies) Initiative, and the cooperation established with the family of Henrietta Lacks, source of the famous HeLa cell line.

"NIH was able to avoid almost all delays in the scientific review process [despite the shutdown in October 2013]," he said, noting also that patients at the NIH Clinical Center continued to receive quality care, despite the interruption of operations elsewhere. "[But] we're not out of the woods, yet," he warned.

Collins joined emcee NIH Associate Director for Communications and Public Liaison John Burklow, and NIH Deputy Director for Extramural Research Sally Rockey, Ph.D., on stage for an original song written to the tune of the Beatles' "We Can Work It Out." Addressed to Congress, the song reinforced the NIH message that advancing biomedical research is a national priority that deserves nonpartisan support.

Collins had to leave to make a meeting with President Obama before introductions of Institute and Center (IC) leaders seated on stage and presentation of awards. In his absence, the awards were presented by NIH Principal Deputy Director Lawrence Tabak, D.D.S., Ph.D., and representatives of the lead IC for each initiative.



Collins described the year at NIH as a mix of the good, the bad, and the ugly, as employees succeeded in coping with the shutdown and sequestration, while still performing beyond expectations to serve patients and advance science. (Photo courtesy of Mike Branson)



Burklow, left, Rockey, and Collins called themselves the Doo-Woppers. Although Collins made fun of the group's musical talents, Rockey's soprano vocals clearly stood out. (Photo courtesy of Mike Branson)

DNTP Biomolecular Screening Branch (BSB) Chief [Raymond Tice, Ph.D.](#), and Genetic Toxicology Group lead [Kristine Witt](#) each received two awards. BSB research fellow [Jui-Hua Hsieh, Ph.D.](#), was the youngest NIEHS scientist honored and the sole trainee.



Birnbaum accepted the award for the Tox21 group from NCATS Director Christopher Austin, M.D., center; and Tabak. (Photo courtesy of Mike Branson)



After he finished reading the awards, Burklow joked about an invitation for guests to enjoy refreshments in the space somewhat pretentiously described as the dining room. "It's really just a cafeteria," he said. (Photo courtesy of Mike Branson)



Field is an information technology specialist in the NIEHS Computer Technology Branch. (Photo courtesy of Steve McCaw)



Li is lead researcher in the NIEHS Metabolism, Genes, and Environment Group, where she and her colleagues investigate the role of sirtuin proteins in aging. (Photo courtesy of Steve McCaw)



Although none of the winners, except Birnbaum, were able to attend the ceremony, winners from the DREAM Toxicogenetics Challenge team gathered at NIEHS afterwards. Shown, from left, are Tice, Woychik, Boyles, Witt, and Dearry. (Photo courtesy of Steve McCaw)



NIEHS Tox21 group winners also came together for a group photo. Seated, from left, are Bucher, Tice, Birnbaum, and DeVito. Standing, from left, are Hsieh, Shockley, Witt, Fostel, and Waidyanatha. (Photo courtesy of Steve McCaw)

And the winners were ...

NIEHS-NCATS-UNC DREAM Toxicogenetics Challenge Team

In recognition of significant contributions to the NIEHS-NCATS-UNC Dream Challenge (see [story](#)), the first crowdsourcing collaboration for analysis of high content data — Rebecca Boyles; Allen Dearry, Ph.D.; Tice; Witt; and Richard Woychik, Ph.D.

Tox21 Team, led by the National Center for Advancing Translational Sciences (NCATS)

In recognition of extraordinary vision, effort, creativity, and scientific leadership during the implementation of the Toxicology in the 21st Century ([Tox21](#)) interagency effort — Linda Birnbaum, Ph.D.; John Bucher, Ph.D.; Michael DeVito, Ph.D.; Jennifer Fostel, Ph.D.; Hsieh; Keith Shockley, Ph.D.; Tice; Suramya Waidyanatha, Ph.D., and Witt.

Remote Support Working Group, led by the National Institute of Dental and Craniofacial Research

For the evaluation and piloting of a remote support technology at NIH — Jack Field.

Geroscience Summit Organizing Committee, led by the National Institute on Aging

For dedication and commitment in promoting geroscience, specifically in organizing the multi-disciplinary scientific summit “[Advances in Geroscience: Impact on Healthspan and Chronic Disease](#)” — Xiaoling Li, Ph.D.

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Large-scale analysis yields new DNA regions involved in lung function

By Ernie Hood

A global consortium of researchers discovered six new loci — specific regions of the genetic code — that are associated with individual variations in an important clinical measure of lung function. The results were published [online](#) June 15 in the journal *Nature Genetics*. The findings point to previously unexplored pathways and mechanisms underlying lung function and could lead to the identification of novel therapeutic targets for lung diseases.

The scientists identified six genetic variants that appear to influence an individual’s lung function, as determined by a widely used measurement called forced vital capacity (FVC). FVC is used to diagnose and monitor lung diseases.

Stephanie London, M.D., Dr.P.H., who heads both the [NIEHS Genetics, Environment, and Respiratory Disease Group](#) and [Genetic Epidemiology Group](#), was the senior author on the paper.



London holds a dual appointment at NIEHS, serving as head of the Genetics, Environment, and Respiratory Disease Group, as well as the Genetic Epidemiology Group. (Photo courtesy of Steve McCaw)

She worked closely with others, including co-lead author Martin Tobin, Ph.D., from the University of Leicester in the U.K.; first author Daan Loth, Ph.D., from Erasmus University in the Netherlands; and a senior and junior lead author team from several countries.

The FVC research project was carried out at 134 centers in the U.S., Europe, Korea, and Australia. NIEHS research fellow Bonnie Joubert, Ph.D., and special volunteer Dana Hancock, Ph.D., were among the 160 authors credited in the paper.

Big science

Using a meta-analysis approach, the group analyzed the results of genome-wide association studies (GWAS) in 52,253 individuals from 26 countries. They followed up the FVC associations in 32,917 additional individuals of European descent.

The team found that the genes closest to the six loci they associated with FVC variation were expressed in lung tissue and in primary lung cells. The expression associations were confirmed in 762 whole blood samples, using a method known as expression quantitative trait locus analysis.

Long-term global collaboration

The FVC study builds upon previous work related to GWAS on lung function, conducted by London and her colleagues within the Cohorts for Heart and Aging Research in Genetic Epidemiology (CHARGE) Consortium, a U.S.-based consortium in which London leads the pulmonary group, and SpiroMeta, a European-based consortium. That work resulted in papers in *Nature Genetics* in 2010 and 2011.

The six loci found in the current study were not identified in the previous GWAS, which found 27 loci associated with two other clinical measures of lung function, forced expiratory volume after one second (FEV1) and the ratio of FEV1 to FVC.

“These findings add important new knowledge to our previous work, by extending our grasp of the genetic factors that determine lung function,” said London. “Characterizing these loci will help us understand their contribution to the risk of developing respiratory diseases, and the statistical power produced by the large sample size in these studies gives us confidence that our findings are on target, enabling us to gain new knowledge about the biology of these conditions.”

The consortium has several ongoing and planned projects involving genetics of lung function, including studies of rare variants, ethnic differences, environmental interactions, and integrative genomics.



Joubert, a research fellow in the Genetics, Environment, and Respiratory Disease Group, received an NIH Fellows Award for Research Excellence in both 2013 and 2014. (Photo courtesy of Steve McCaw)



Hancock is particularly interested in the use of family-based samples to explore gene-environment interactions in complex respiratory diseases. (Photo courtesy of Steve McCaw)

Citation: Loth DW, Artigas MS, Gharib SA, Wain LV, Franceschini N, Koch B, Pottinger TD, Smith AV, Duan Q, Oldmeadow C, Lee MK, Strachan DP, James AL, Huffman JE, Vitart V, Ramasamy A, Wareham NJ, Kaprio J, Wang XQ, Trochet H, Kahonen M, Flexeder C, Albrecht E, Lopez LM, de Jong K, Thyagarajan B, Alves AC, Enroth S, Omenaas E, Joshi PK, Fall T, Vinuela A, Launer LJ, Loehr LR, Fornage M, Li G, Wilk JB, Tang W, Manichaikul A, Lahousse L, Harris TB, North KE, Rudnicka AR, Hui J, Gu X, Lumley T, Wright AF, Hastie ND, Campbell S, Kumar R, Pin I, Scott RA, Pietilainen KH, Surakka I, Liu Y, Holliday EG, Schulz H, Heinrich J, Davies G, Vonk JM, Wojczynski M, Pouta A, Johansson A, Wild SH, Ingelsson E, Rivadeneira F, Volzke H, Hysi PG, Eiriksdottir G, Morrison AC, Rotter JI, Gao W, Postma DS, White WB, Rich SS, Hofman A, Aspelund T, Couper D, Smith LJ, Psaty BM, Lohman K, Burchard EG, Uitterlinden AG, Garcia M, Joubert BR, McArdle WL, Musk AB, Hansel N, Heckbert SR, Zgaga L, van Meurs JB, Navarro P, Rudan I, Oh YM, Redline S, Jarvis DL, Zhao JH, Rantanen T, O'Connor GT, Ripatti S, Scott RJ, Karrasch S, Grallert H, Gaddis NC, Starr JM, Wijmenga C, Minster RL, Lederer DJ, Pekkanen J, Gyllensten U, Campbell H, Morris AP, Glaser S, Hammond CJ, Burkart KM, Beilby J, Kritchevsky SB, Gudnason V, Hancock DB, Williams OD, Polasek O, Zemunik T, Kolcic I, Petrini MF, Wjst M, Kim WJ, Porteous DJ, Scotland G, Smith BH, Viljanen A, Heliövaara M, Attia JR, Sayers I, Hampel R, Gieger C, Deary IJ, Boezen HM, Newman A, Jarvelin MR, Wilson JF, Lind L, Stricker BH, Teumer A, Spector TD, Melen E, Peters MJ, Lange LA, Barr RG, Bracke KR, Verhamme FM, Sung J, Hiemstra PS, Cassano PA, Sood A, Hayward C, Dupuis J, Hall IP, Brusselle GG, Tobin MD, London SJ. 2014. Genome-wide association analysis identifies six new loci associated with forced vital capacity. *Nat Genet* 46(7):669-677.

(Ernie Hood is a contract writer with the NIEHS Office of Communications and Public Liaison.)

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Accidental oceanographer discusses aquatic models in exposure research

By Shannon Whirlledge

John Stegeman, Ph.D., senior scientist at the Woods Hole Oceanographic Institution presented an NIEHS Keystone Science Lecture Seminar Series talk to a full house May 29, discussing “Plankton to P450: Models and Mechanisms at the Convergence of Oceans and Human Health.”

[Stegeman](#) is also director of the Woods Hole Center for Oceans and Human Health (COHH), and a project leader in the Boston University [Superfund Research Program](#).

“John Stegeman has a long-standing association with NIEHS and is well-known to the Institute through his many contributions to environmental health science, as well as his collaborative associations with several NIEHS researchers,” said lecture host Frederick Tyson, Ph.D., who oversees the NIEHS [Oceans and Human Health](#) program. “We were pleased he was able to spend the day with us, discussing his cutting-edge research.”



Stegeman spoke warmly of the intellectual and scientific environment at Woods Hole. “You have planetary science to biomedical science and everything in between,” he said. “By being there, you become more broadly engaged than you otherwise might.” (Photo courtesy of Steve McCaw)

Contaminants released into the ocean in one location can circulate globally via dispersal, affecting global food sources and disrupting ecosystems. Stegeman’s research seeks to understand molecular toxicology and its connections with seafood availability, pollution, and climate change.

Stegeman's proximity to the ocean, both physically and through his successful research, led him to describe himself as an accidental oceanographer, in addition to a biochemist. "The connection between oceans and the well-being of life on earth is hard to overstate," he said.

New approaches in ecotoxicology

COHH uses novel molecular sensor technologies and modeling approaches to address questions driving ecotoxicology research. Stegeman's talk highlighted several of these approaches, including the Environmental Sample Processor designed by [Christopher Scholin, Ph.D.](#), of the Monterey Bay Aquarium Research Institute. Deployed in the Gulf of Maine, it sends real-time data on the presence of marine species, in the gulf, to the labs of COHH scientists.



Speaking to a full room, Stegeman described several of the cutting-edge tools that provide data his center uses to track and refine prediction of toxic algal blooms. (Photo courtesy of Steve McCaw)

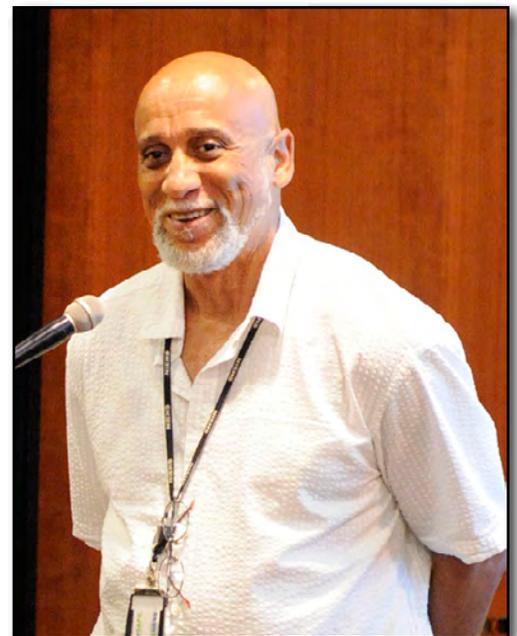
Linked video:
[Watch an animated video of the Environmental Sample Processor, an example of the robotic technology used in Stegeman's research.](#)
(Launches in new window)

Download Media Player: Quicktime

In a model pond on Cape Cod, another submersible sensor, known as [Imaging FlowCytobot \(IFCB\)](#), identifies species, size, and abundance of phytoplankton, also in real-time. According to Stegeman, in 2013, for the first time in nearly 20 years, there was essentially no toxic algal bloom in the study area. Data from IFCB and other sensors will be critical in unraveling the reason behind this important occurrence, providing essential insight into population dynamics of toxic phytoplankton.

Epigenetic changes associated with toxin exposure, and developmental origins of disease, are also studied in Stegeman's lab, especially with respect to neurological diseases. "Shellfish beds are closed to fishing when the presence of toxins reaches a certain level. Below those limits, there are still toxins present," Stegeman said. "No one has any real knowledge of the effects of those lower levels, particularly from developmental exposure."

In addition to effects of algal toxins, both COHH and Stegeman's Superfund project evaluate man-made threats, studying zebrafish exposed to ortho and non-ortho polychlorinated biphenyls (PCBs). Researchers measure persistent effects and associated molecular mechanisms, including changes in DNA methylation and non-coding RNAs.



Tyson hosted Stegeman's talk. In introducing him, Tyson revealed that Stegeman is not only an esteemed scientist, but also an accomplished vocalist who has performed at the Guggenheim Museum Bilbao in Spain. (Photo courtesy of Steve McCaw)

In fish and humans

Stegeman ended his seminar by discussing cytochrome P450 (CYP), a large and diverse group of enzymes that catalyze the oxidation of organic substances. He has been a leader in studies of P450 systems, including functional studies and molecular modeling in aquatic organisms.

Stegeman is particularly interested in a novel CYP gene, CYP20, that is highly expressed in the hippocampus and other regions of the brain involved in cognitive function, learning, and memory — regions that are implicated in Alzheimer's and other neurodegenerative diseases. Stegeman's studies are addressing roles of CYP20 in zebrafish. His group is also exploring whether ortho PCBs, known to alter zebrafish activity levels, might involve CYP20.

Local connection

David Miller, Ph.D., head of the NIEHS Laboratory of Toxicology and Pharmacology, has known Stegeman for almost 40 years. They share a passion for marine models, and have gotten to know each other at various events through the years. "John has been a leader in the field for a long time," Miller said.

(Shannon Whirlledge, Ph.D., is a research fellow in the NIEHS Molecular Endocrinology Group.)

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NIH scientists study brain region required for social aggression

By Robin Arnette

A black bear may mark its territory by rubbing its back on trees or leaving bite and claw marks in the wood. If another bear enters the area, the first bear will determine whether the intruder is a friend or foe and act accordingly. New research from the National Institutes of Health has identified a region of the brain that may be responsible for interpreting these social cues and responding with aggressive behavior.

Researchers from NIEHS and the National Institute of Mental Health (NIMH) were the first to demonstrate that a specific area of the hippocampus, a part of the brain involved in learning and memory, allows animals to assess and respond to social threats. The study, which appeared online May 27 in the journal *Molecular Psychiatry*, may help scientists better understand the network of neurons involved in social recognition memory and aggression.

Neurohormone acts on particular group of neurons

Serena Dudek, Ph.D., leads the NIEHS Synaptic and Developmental Plasticity Group and studies neurons in the CA2 region of the hippocampus. NIMH colleague Scott Young, M.D., Ph.D., also examines CA2, so he suggested they collaborate on a project. Young focuses on a neurohormone receptor that appears in the brain exclusively in the CA2.



Several years ago, Dudek's group found that caffeine strengthens connections on CA2 neurons, which may make people and animals learn faster (see [story](#)). This recent study found that although vasopressin uses a slightly different mechanism, it acts on the same neurons that get a buzz with caffeine. (Photo courtesy of Steve McCaw)

Young and his group are interested in the effects of vasopressin, a neurohormone linked to social behavior. When they developed knockout mice that lacked the vasopressin 1b receptor (Avpr1b), they observed that these mutant mice had extremely poor recall of mice they had seen before, but importantly, they were also less aggressive. These mice could still recognize and attack prey, but their docile state prevented the Avpr1b knockout males from fighting off other mice that entered their area.

In this study, Young's group added Avpr1b back to the CA2 region of the knockouts, and restored their aggressiveness in response to a social threat.

"This experiment points to the CA2 and the vasopressin 1b receptor as enabling the evaluation of social cues and subsequent aggressive response if appropriate," Young said.

Dudek wondered what effects vasopressin had on neurons in normal rats and mice, so her group measured the synaptic responses, or the electrical result of stimulating the CA2 region. They found that either vasopressin or a selective vasopressin 1b receptor agonist caused a considerable increase in CA2 synaptic response, an effect that did not occur in neurons from Avpr1b knockout mice.

A mother's job — guarding her children

If the black bear in the example is a female with cubs, another neurohormone would flood her brain. Oxytocin, like vasopressin, is linked to social behavior, but is commonly associated with maternal nurturing of offspring.

Because oxytocin and vasopressin have similar chemical structures, Dudek compared their effects on CA2 and learned that they both caused increases in synaptic responses.

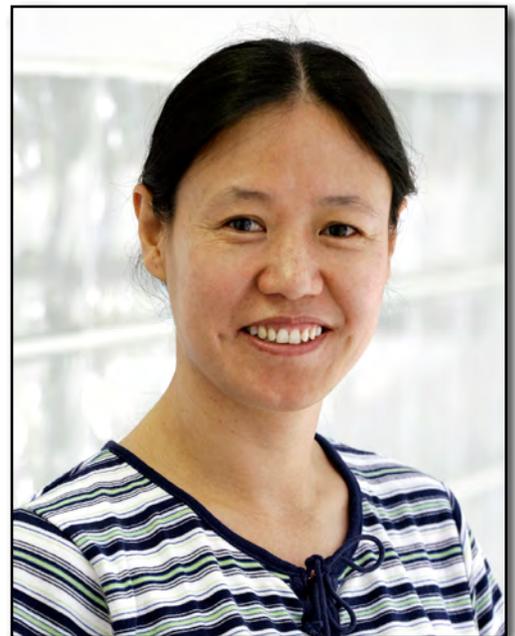
Dudek also tested their effects on neurons from a line of knockout mice Young's team created that lacked the oxytocin receptor (Oxtr). She found that vasopressin still increased synaptic responses in CA2, while the effects of oxytocin were lost.

"Even though they were different hormones, vasopressin and oxytocin enhanced synaptic transmission the same way," Dudek said. "In the end, they had the same effects on CA2 synapses."

Dudek speculated that female Oxtr knockout mice would not respond aggressively to safeguard their pups from harm.



Young is head of the Section on Neural Gene Expression at NIMH, which investigates the roles and regulation of vasopressin and oxytocin expression in the central nervous system. (Photo courtesy of Scott Young)



Meilan Zhao, Ph.D., is a biologist in Dudek's group and shared first authorship on the paper with two colleagues at NIMH. (Photo courtesy of Steve McCaw)

CA2-related illnesses in humans

Work from other groups has found that some CA2 neurons are lost with schizophrenia, and that minor changes in Avpr1b sequence are associated with childhood aggression and some autistic traits. Although the hippocampus is more commonly associated with memory functions, Dudek said older studies indicated that it may also be important in modulating aggression. She hopes this work will lead to the development of pharmaceutical agents that may be used to treat some symptoms of psychiatric disorders.

“The neural pathways that vasopressin and oxytocin employ are complicated, but we know they can act with mechanisms that are similar to ones the brain uses for memory,” Dudek said.

Citation: Pagani JH, Zhao M, Cui Z, Williams Avram SK, Caruana DA, Dudek SM, Young WS. 2014. Role of the vasopressin 1b receptor in rodent aggressive behavior and synaptic plasticity in hippocampal area CA2. Mol Psychiatry; doi:10.1038/mp.2014.47 [Online 27 May 2014].

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A mother deer can be aggressive if she thinks her young are in danger. Dudek determined that oxytocin and vasopressin have a similar mode of action on CA2 neurons. Oxytocin may allow a mother deer to recognize and respond to threats. (Photo courtesy of Steve McCaw)

The economic costs of environmental health impacts

By Deepa Singh

Leonardo Trasande, M.D., engaged a room full of scientists with compelling evidence that exposure to environmental chemicals carries important economic costs, during a June 9 Keystone Science Lecture Seminar Series talk. [Trasande](#), an NIEHS grantee, is an associate professor in pediatrics, population health, and environmental medicine at the New York University (NYU) School of Medicine, and in health policy at the NYU Wagner School of Public Service.

“The broad and widespread environmental exposure that we experience today not only produces information asymmetry, but it is also causing market inefficiencies,” Trasande said. Information asymmetry refers to a difference in knowledge between buyers and sellers. Lack of information on the buyer’s part leads to uncertainty about the health hazards associated with the product. Such hazards can eventually lead to market inefficiency, through costs imposed by human health impacts, he explained.



Trasande, who has an M.D., as well as a master’s degree in health care policy, served as an advisor to Senator Hillary Clinton on children’s and environmental health. He is perhaps best known for a study published in the 2012 Journal of the American Medical Association associating BPA exposure in children and adolescents with obesity. (Photo courtesy of Steve McCaw)

Environmental hazards affect human health care costs

According to Trasande, exposure to environmental hazards may directly affect an individual's health, and indirectly increase health care costs, in both developed and developing countries. He pointed out that in 2008, the U.S. spent \$76.6 billion on diseases of environmental origin in children, or about 3.5 percent of U.S. health care costs. In the developing world, the annual costs associated with childhood lead exposure amounted to \$1 trillion, which roughly corresponds to 1.2 percent of global gross domestic product.

In 2010, the incidence of premature births that can be traced to exposure to air pollution, especially high in developing countries like India and China, was associated with a social cost of \$26 billion worldwide, Trasande noted.

Unfortunately these societal costs are not shared equally across all sectors of society. "The low-income populations, certain racial ethnicities, and subgroups have been disproportionately affected by these environmental exposures, and ultimately, the economic costs are disproportionately borne by these same sections of society," Trasande said. (See text box for summary of a related study.)



Kristianna Pettibone, Ph.D., health scientist administrator in the NIEHS Program Analysis Branch, hosted the event and spoke highly of the value of Trasande's work. (Photo courtesy of Steve McCaw)

Reducing PAH exposure may lead to higher IQ and economic benefits

Other researchers are finding economic impacts as well. Frederica Perera, Dr. P.H., Ph.D., and colleagues reported that a modest reduction in outdoor PAH levels can result in a significant improvement in lifetime earnings. The results were published May 8 in the *Journal of Public Health Policy*. PAHs are a group of over 100 different chemicals formed during the incomplete burning of coal, oil and gas, garbage, and other organic substances, like tobacco or charbroiled meat. The earnings estimate was based on the findings of a prospective cohort study in a low-income population of pregnant women and their children in New York.

The researchers, funded in part by NIEHS, estimated that a reduction in PAH levels to 0.25 nanograms per cubic meter, from the current estimated annual mean PAH concentration of 1 nanogram per cubic meter, would result in a gain in IQ of 0.86 points. Perera and colleagues further estimated the impact of the IQ gain to be a 0.96 percent increase in total earnings per person. Depending on the assumptions used, the increase could amount to \$46-\$215 million for each year's cohort of children. This suggests that substantial economic benefits could result from a moderate reduction in ambient PAH levels.

*Citation: Perera F, Weiland K, Neidell M, Wang S. 2014. Prenatal exposure to airborne polycyclic aromatic hydrocarbons and IQ: estimated benefit of pollution reduction. *J Public Health Policy*; doi:10.1057/jphp.2014.14 [Online 8 May 2014].*

Government intervention to prevent environmental pollution

The global eradication of lead from gasoline led to an economic benefit of \$2.45 trillion, due to the benefits of increased IQ in children born after lead was banned, as well as other health benefits and reduced criminality, said Trasande. More recently, he estimated the economic costs associated with childhood obesity and adult coronary heart disease, potentially due to BPA exposure, to be \$1.49 billion and \$1.50 billion, respectively.

Regulatory action to substitute BPA in the lining of aluminum cans with an alternative free of health effects could potentially produce \$1.74 billion in economic benefits — nearly equivalent to the \$2.2 billion cost of substitution with oleoresin, one proposed alternative.

Studies documenting health effects of BPA have led to gradual replacement with another alternative, BPS (bisphenol S). Trasande cautioned that BPS exhibits similar estrogenic effects and greater environmental persistence than BPA and may therefore have similar human health costs.

“If we swap out BPA with BPS, we’re potentially losing out on the opportunity to save on health care costs and other costs associated with human exposure to endocrine disrupting chemicals,” Trasande said. He recommended that economic costs be analyzed when studying health impacts of environmental exposures.

(Deepa Singh, Ph.D., is a visiting fellow in the NIEHS Mechanisms of Mutation Group.)

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Air pollution from planes impacts wide area

By Joe Balintfy

NIEHS-funded scientists at the Keck School of Medicine of the University of Southern California (USC) have shown that plane activity at Los Angeles International Airport (LAX) worsens air quality as far as 10 miles away.

The study, conducted with University of Washington researchers and published in the journal *Environmental Science and Technology*, found that particle number concentrations increased twofold over a 23 square mile area downwind from the airport.

“Our research shows that airport impacts extend more than 5 times further than previously assumed,” said Scott Fruin, D.Env., lead researcher and assistant professor of preventive medicine at USC. “Effects from planes that are landing appear to play a major role in this large area of impact.”

Far reaching impacts from landings

Previous research mainly focused on measuring air pollution levels in close proximity to airport runways. Scientists in those studies found that pollution concentrations decreased dramatically downwind, fueling the assumption that total airport impacts also rapidly declined with distance. The new research, however, refutes this assumption.



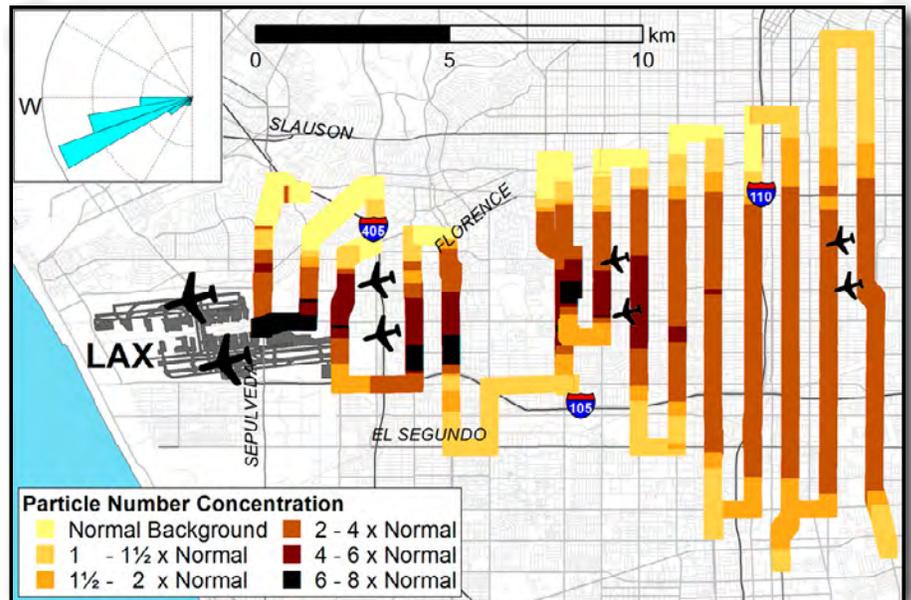
Fruin and his team measured air quality for more than five hours, under consistent wind conditions, to fully capture the extent of impact boundaries. (Photo courtesy of USC)

“LAX may be as important to LA’s air quality as the freeway system,” said Fruin. “The impact area is large, and the airport is busy most hours of the day. That makes it uniquely hard for people to avoid the effects of air pollution in affected areas.”

The study found that particle number concentrations were at least doubled 10 miles downwind, compared to baseline concentrations outside the LAX impact area. Also, concentrations were four to five times higher as far as six miles downwind.

Citation: [Hudda N, Gould T, Hartin K, Larson TV, Fruin SA. 2014.](#)

Emissions from an international airport increase particle number concentrations 4-fold at 10 km downwind. *Environ Sci Technol* 48(12):6628-6635.



Researchers measured particle number concentrations downwind from LAX over a 29-day period. (Image courtesy of USC)

(Joe Balintfy is a public affairs specialist in the NIEHS Office of Communications and Public Liaison.)

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International conference promotes environmental health research exchange

By Sara Mishamandani

NIEHS staff and grantees travelled to Cluj-Napoca, Romania, May 25-29, for the [Central and Eastern European Conference on Health and the Environment \(CEECH\)](#), to open new lines of communication and address issues related to the environment and human health.

“The meeting was an excellent way to bring together experts on risk assessment, environmental decision-making, remediation technologies, and other environmental health topics, to increase the knowledge transfer between the U.S. and Central and Eastern Europe,” said William Suk, Ph.D., director of the NIEHS Superfund Research Program (SRP) and invited speaker. “SRP has been supporting workshops and conferences to enhance collaboration between scientists in the U.S. and Eastern Europe for the last 20 years, with our first meeting in Romania in 1994.”



In his plenary lecture, Suk focused on the importance of interdisciplinary research and translation, to reduce the burden of disease. He used SRP as a model for better understanding hazardous substances, vulnerable populations, and improving human health. (Photo courtesy of Kelli Palmer)

Addressing broad research questions

The conference brought together a diverse panel of scientists to address emerging issues in environmental health science. They presented advances in environmental sciences, engineering, technology, and health sciences, within broad themes of the environment, environmental health, and military conflicts.

The gathering featured a series of workshops, plenary talks, and poster sessions. Topics included responsible mining, water quality and risk management, soil contamination, advances in human biomarkers, environmental genetics, omics technologies, children's environmental health, and environmental protection in the face of military conflicts. There was also a career opportunities panel for students.

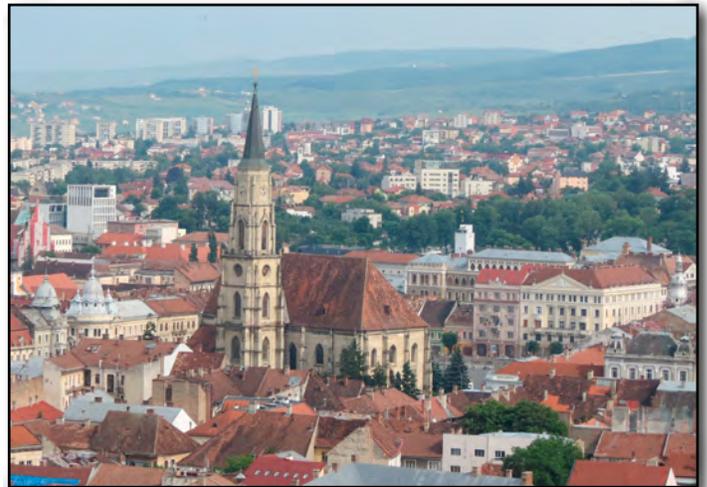
Superfund scientists lead the way

NIEHS-funded Louisiana State University (LSU) SRP members and NIEHS SRP staff were involved in committees that organized the conference and planned the scientific agenda.

NIEHS SRP staff Suk, Danielle Carlin, Ph.D., and Michelle Heacock, Ph.D., gave presentations related to hazardous substances and human health, toxic metals research, and electronic waste. Scientists from SRP programs at LSU, University of Arizona, University of Kentucky, and Oregon State University also participated in workshops, chaired sessions, and gave presentations.



Heacock, center, and Carlin, second from right, participated in breakout sessions related to advances in human biomarkers, and air pollution and health. They also took part in the career opportunities discussion for students. (Photo courtesy of Kelli Palmer)



The conference took place in Cluj-Napoca, Romania, the heart of Transylvania. (Photo courtesy of Kelli Palmer)



LSU SRP materials core leader and conference co-chair Slawo Lomnicki, Ph.D., worked with fellow co-chair Eugen Stelian Gurzau, Ph.D., from Babes-Bolyai University in Cluj-Napoca, to organize the meeting. Lomnicki gave a presentation on environmental challenges, risks, and research directions related to nanotechnology. (Photo courtesy of Kelli Palmer)



Heacock presented an overview of the global health issues related to disposal of electronic waste, and outlined exposure prevention and intervention strategies. (Photo courtesy of Kelli Palmer)



University of Arizona SRP director Raina Maier, Ph.D., described how increasing global demand for metals is straining the ability of the mining industry to physically keep up with demand. She suggested the application of sustainable mining solutions that account for community well-being, life cycle analysis, and the production, use, and reuse of metals. (Photo courtesy of Kelli Palmer)



Elisabeta Mitran, Ph.D., left, LSU SRP training core coordinator and CEECHE Executive Conference Board member, presented a certificate of achievement to LSU SRP trainee Elisabeth Feld for best student oral presentation. (Photo courtesy of Kelli Palmer)

(Sara Mishamandani is a research and communication specialist for MDB Inc., a contractor for the NIEHS Superfund Research Program and Division of Extramural Research and Training.)

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New research sheds light on melanoma formation

By David Stauth

NIEHS-funded researchers at Oregon State University (OSU) have identified a biochemical process that can cause normal and healthy skin cells to transform into cancerous melanoma cells. The [work](#), published May 8 in PLOS Genetics, may help predict melanoma vulnerability and also lead to future therapies. Melanoma is the deadliest form of skin cancer and more than 70,000 new cases are reported in the U.S. every year.

“We believe this is a breakthrough in understanding exactly what leads to cancer formation in melanoma,” said Arup Indra, Ph.D., associate professor in the OSU College of Pharmacy. “We’ve found that some of the mechanisms which ordinarily prevent cancer are being switched around and actually help promote it.”

“The results of this research highlight the complexity of interactions between cell types and tissues within the body, and the important role immune surveillance plays in the prevention or development of cancer,” said NIEHS Division of Extramural Research and Training health scientist administrator [Mike Humble, Ph.D.](#) “It nicely demonstrates how research on environmental exposures and genes can ultimately lead to the identification of new targets for the diagnosis and treatment of melanoma.”

Immune system in reverse

“In melanoma, the immune system is getting thrown into reverse,” [Indra](#) said. “Immune cells that previously were attracted to help deal with a problem are instead repulsed.” The key to this process, the researchers said, is a protein called retinoid-X-receptor, or RXR. When present in an adequate amount, the RXR protein helps the immune response in the skin.

Skin cells called melanocytes produce protective pigments, or melanin, in response to exposure to UV radiation in sunlight. However, even with the protection of melanin, both melanocytes, and skin cells called keratinocytes, routinely suffer genetic damage. Sometimes the damage is repaired, and at other times the immune response, in the presence of adequate levels of RXR in the melanocytes, kills the defective cells before they become malignant.

When levels of RXR are too low in the melanocytes, this protective process breaks down. Chemicals that can help control mutated cells are instead suppressed, and the conditions for cancer develop. DNA-mutated melanocytes begin to thrive, as other skin cells die and free up space for the growing, mutating melanocytes. The ultimate result can be melanoma, which in turn can spread throughout the body.

“When there isn’t enough RXR, the melanocytes that exist to help shield against cancer ultimately become part of the problem,” [Indra](#) said. “It’s routine to have genetic damage from sunlight, because normally those cells can be repaired or killed if necessary. It’s the breakdown of these control processes that results in cancer.”

Implications for treatment

According to [Indra](#), this process has not before been outlined in its entirety. “It’s quite possible that a new and effective therapy can now be developed, based on increasing the levels of RXR,” he said. One possibility would be a diagnostic test to determine when RXR levels are lower than they should be. Lower RXR levels would set the stage for melanoma and possibly other cancers. Careful monitoring of RXR levels could facilitate earlier diagnosis.

Researchers may also be able develop ways to stabilize or stimulate the levels of RXR expression, perhaps through diet or a drug that could deliver RXR to cells, forming the basis for a therapy, [Indra](#) said.

Citation: [Coleman DJ](#), [Garcia G](#), [Hyter S](#), [Jang HS](#), [Chagani S](#), [Liang X](#), [Larue L](#), [Ganguli-Indra G](#), [Indra AK](#). 2014. Retinoid-X-Receptors (alpha/beta) in melanocytes modulate innate immune responses and differentially regulate cell survival following UV irradiation. *PLoS Genet* 10(5):e1004321.

(This story was adapted from an [article](#) by David Stauth, a science writer with OSU News and Research Communications.)

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Indra’s laboratory studies the mechanisms of skin development using mouse genetics and biochemical, cellular, and molecular approaches. (Photo courtesy of Oregon State University)



The study outlined the process by which solar UVB radiation can cause melanocytes to alter their immune responses, leading to melanoma. (Graphic courtesy of Oregon State University)

Exploring interactions between microbes and environmental exposures

By Audrey Pinto

Cutting-edge research on microbial communities in the intestine and how they may contribute to obesity and brain metastases were highlighted in a May 21 NIEHS Partnerships for Environmental Public Health [webinar](#). Recent studies, including the National Institutes of Health [Human Microbiome Project](#), indicate that the microbiome, or all the microorganisms that live in and on the human body, can trigger disease as well as promote health. However, the role of these microbes and how they interact with the environment is poorly understood.

The webinar, hosted by Lisa Chadwick, Ph.D., health scientist administrator in the NIEHS Genes, Environment, and Health Branch, featured John Rawls, Ph.D., and Michal Toborek, M.D., Ph.D., both of whom study the role of intestinal microbes in human health and disease.

Fighting the obesity epidemic

“Evidence indicates that the complex interactions between the gut microbiota, diet, and the human or animal host contribute to a spectrum of human diseases including obesity,” said [Rawls](#), associate professor in the Department of Molecular Genetics and Microbiology, and director of the Center for Genomics of Microbial Systems at Duke University.

“Our goal is to understand the mechanisms by which environmental factors regulate fat storage, so that effective microbiome strategies can be developed, and even tailored for individuals, to reduce obesity,” he continued.

“For example, in both mice and zebrafish models, researchers have shown that increases in dietary intake are often associated with an increase in the abundance of Firmicutes — a large phylum of bacteria linked to obesity in humans — suggesting that this bacterium is instrumental in increasing the absorption of fat.”

With NIEHS funding, Rawls is now researching tributyltin (TBT), an environmental toxin known to promote obesity in vertebrates. Using the zebrafish model system, he hopes to define the impact of TBT on the obesogenic activity of gut microbiota. Developing techniques to moderate the effects of TBT and other obesogens could help prevent obesity.

PCBs, the gut microbiome, and brain metastases

[Toborek](#), professor in the Department of Biochemistry and Molecular Biology at the University of Miami Miller School of Medicine, and his team study the associations between the changes in the gut microbiome and the blood-brain barrier (BBB), which protects the brain’s internal environment. Toborek discussed the effects of PCBs on gut microbes and the BBB.



“Recent increases in the prevalence of obesity among adults and the tripling of rates in one generation among children and adolescents suggest a strong contribution from environmental factors,” said Rawls. (Photo courtesy of Duke University)

“We are all exposed to PCBs, which continue to be used in the United States. The main route of exposure to PCBs is through the food chain, and many studies show that there is a broad range of health effects from exposure to these toxicants that includes cancer and brain metastasis — a leading cause of cancer-related morbidity and mortality,” said Toborek.

Toxicity, the gut–brain axis, and exercise

According to Toborek, he and his team are the first to suggest a link between the gut microbiome and brain metastases. “Our research indicates that both the intestinal epithelium and the brain epithelium are highly susceptible to the toxicity of PCBs. Exposure to these toxicants alters protein expression and increases permeability of the gut and the BBB, which, in turn, disrupts their protective microenvironments,” he said. “We are now finding that alterations in the gut permeability have a profound effect on the BBB and influence the development and growth of metastases.”

In previous research, Toborek showed that exercise had a profound effect on the gut microbiome, reducing the PCB-induced changes. Taking these findings a step further, he then demonstrated that moderate to vigorous exercise — a powerful, modifiable behavior — helps increase the growth of beneficial bacteria, which protect against the development of brain metastases.

(Audrey Pinto, Ph.D., is technical editor for the journal *Environmental Health Perspectives*.)

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Work-related solvent exposure may increase breast cancer risk

By *Annah Wyss*

Women exposed to solvents before the birth of their first child may have an increased risk for breast cancer, according to a [study](#) published in the June issue of the journal *Cancer Research*. The study, led by NIEHS scientists, followed 47,661 initially breast cancer-free women who had a family history of breast cancer. The women were participants in a [Sister Study](#) cohort evaluating the relationship between lifetime occupational solvent exposure and the incidence of breast cancer.

“Our study is an important first step toward understanding how the timing of chemical exposures may impact breast cancer risk,” said Christine Ekenga, Ph.D., lead author and postdoctoral fellow in the NIEHS [Epidemiology Branch](#). “We hope that our findings will generate additional interest in the possible role of solvents and other chemicals in the etiology of breast cancer.”

Solvents, a group of chemicals characterized by their ability to dissolve other compounds, are commonly used in adhesives, paints, and cleaning products, as well as in the manufacturing of many goods. According to the authors, in animal studies, several solvents have shown strong associations with mammary tumors. Studies among humans have also identified associations between solvents and breast cancer, but few have investigated how the timing of exposure may affect breast cancer risk.



Toborek's lab evaluates how certain properties of the brain endothelium can influence migration of tumor cells into the brain, and how exercise can help protect against the development of brain metastases. (Photo courtesy of University of Miami)

Timing of solvent exposure

The researchers found that, overall, women in the Sister Study who were exposed occupationally to solvents were not at elevated risk for breast cancer compared to women who were not occupationally exposed to solvents. However, when the researchers examined the timing of solvent exposure, they found that women exposed before the birth of their first child had an increased risk of breast cancer, particularly estrogen receptor-positive breast cancers.

Further, breast cancer risk appeared to increase with duration of solvent use before a first childbirth. The authors suggested that these findings underscore a key window of susceptibility during a woman's lifetime. "The time between puberty and first birth is an important period of development when the breast may be more vulnerable to chemical exposures," explained Ekenga.

Breast cancer risk by occupation

The researchers also investigated the relationship between breast cancer risk and exposure to solvents in specific occupations. Of the 44 occupations considered, women who worked with solvents in three occupations — clinical laboratory technicians, maids and housekeepers, and factory workers — appeared to have an increased risk of estrogen receptor-positive breast cancer. However, the authors cautioned that occupation-specific results were limited by small numbers of breast cancer cases for some occupations, and lack of information on specific types of solvents used in each occupation.

"Additional research is needed to characterize the types of solvents used by women in different occupational settings, and the levels at which women are exposed to solvents in the workplace," said Ekenga.

In addition to outlining next steps for researchers, the authors also noted a message for general audiences. "All women should be familiar with the hazards that are present in their workplace and use personal protective equipment when appropriate," said Ekenga.

Citation: Ekenga CC, Parks CG, D'Aloisio AA, DeRoo LA, Sandler DP. 2014. Breast cancer risk after occupational solvent exposure: the influence of timing and setting. *Cancer Res* 74(11):3076-3083.

(Annah Wyss, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Genetics, Environment, and Respiratory Disease Group.)

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Explaining how she gathered the data for her analysis, Ekenga said, "When the women entered the Sister Study, we collected important data from them about their lifestyle, reproductive history, work history, and exposures at different time periods." (Photo courtesy of Steve McCaw)



Dale Sandler, Ph.D., chief of the NIEHS Epidemiology Branch, was senior author on the paper. She said her research team began this work because there had been very few breast cancer studies that focused on chemicals in the workplace. (Photo courtesy of Steve McCaw)

SRP promotes innovative research tools for environmental remediation

By Sara Mishamandani

NIEHS Superfund Research Program (SRP) staff participated in the 23rd National Association of Remedial Project Managers (NARPM) Training Program June 16-20 in Atlanta. They showcased SRP tools and resources available to U.S. Environmental Protection Agency (EPA) remedial project managers.

EPA remedial project managers plan, implement, and coordinate the cleanup of soil, groundwater, air, and solid waste pollution at hazardous waste sites. They are also involved in site assessments and monitoring the progress of the remediation. Part of the NARPM goal is to enable these managers to become knowledgeable and develop skills that will help them be successful at work. Toward this goal, NIEHS staff has shared SRP-funded tools and technologies at NARPM since 1995.

NIEHS staff manned a booth throughout the meeting that provided information about SRP, ways to collaborate with SRP researchers, and innovative research that may be useful.

Measuring contaminants and determining remediation effectiveness

Heather Henry, Ph.D., an NIEHS health scientist administrator, co-organized a full-day training course with Matt Lambert from the EPA Office of Superfund Remediation and Technology Innovation. The class covered measuring bioavailability of contaminants at sediment sites.

During the session, SRP grantees and other scientists provided an overview on how to use passive samplers for organic contaminants, and other newly developed tools. SRP-funded passive samplers help determine the effectiveness of remediation methods in reducing risks to people at hazardous waste sites.

Keith Maruya, Ph.D., an SRP grantee at the Southern California Coastal Water Research Project, described several state-of-the-science passive samplers. Upal Ghosh, Ph.D., an SRP grantee from the University of Maryland, Baltimore County, provided practical guidance on devices that measure organic contaminants. During his talk, Ghosh mentioned passive samplers that use SediMite technology, an SRP-funded product developed to reduce harmful chemicals in water and sediment (see [article](#)).



SRP program analyst Beth Anderson, left, chatted with Nadia Hollan Burke, a remedial project manager from EPA Region 9. "The SRP exposed me to the various engineering issues in the Superfund program and taught me to engage in cooperative relationships," Burke said. (Photo courtesy of Maureen Avakian)



Henry, left, Chris Eckley from EPA Region 10, center, and co-organizer Lambert discussed the importance of training sessions for those who need to set up passive sampling devices to monitor remediation. (Photo courtesy of Heather Henry)

Other sessions were led by remedial project managers, who focused on case studies using available tools to measure concentrations of important contaminants at hazardous waste sites.

(Sara Mishamandani is a research and communication specialist for MDB Inc., a contractor for the NIEHS Superfund Research Program and Division of Extramural Research and Training.)

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Shaughnessy to give keynote at upcoming Metabolomics Symposium

By Eddy Ball

NIEHS Health Scientist Administrator [Daniel Shaughnessy, Ph.D.](#), is one of two principal speakers at the Aug. 22 Metabolomics Symposium at RTI International. The event will run 9:00 a.m.-4:30 p.m., in the Dreyfus Auditorium, 3040 East Cornwallis Road, Research Triangle Park, N.C.

The event is cosponsored by the NIH Eastern Regional Comprehensive Metabolomics Core (RCMC) at RTI and the Waters Corporation, which will provide a complimentary lunch for attendees. Registration is free, but seating is limited.

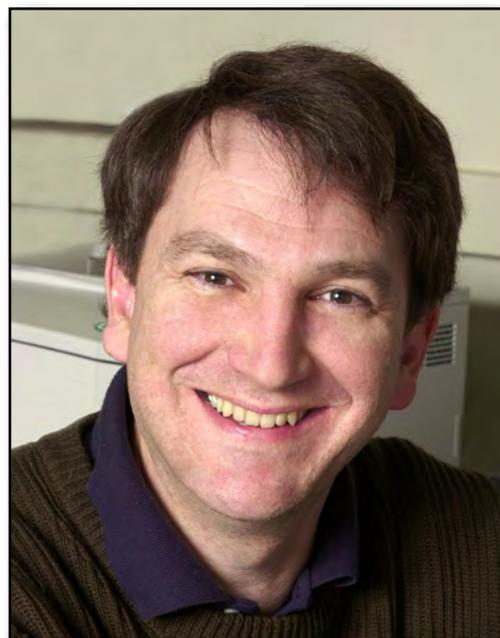
A registration site will be available later in July. Contact [Susan McRitchie](#) or [Sue Clark](#) for more information.

Morning session

Shaughnessy and Robert Plumb, Ph.D., director of metabolomic profiling at Waters Corporation and visiting professor of analytical chemistry at Imperial College, London, will present keynote talks. Shaughnessy will speak on “Metabolomics Studies and Environmental Health: Programs at NIEHS.” Plumb will address “Precision Medicine and Metabolic Phenotyping.”

Shaughnessy is part of the Exposure, Response, and Technology Branch in the NIEHS Division of Extramural Research and Training, where he manages grants related to DNA repair and mutagenesis. He oversees funding for the development and validation of biomarkers of response to environmental stress, a program initiated in the Genes, Environment, and Health Initiative Exposure Biology Program. He is also the program contact for the Small Business Innovation Research and Small Business Technology Transfer programs at NIEHS.

Plumb is considered an expert in the application of liquid chromatography-mass spectrometry and nuclear magnetic resonance to drug metabolism studies, metabolomics, and metabolite identification. He has published more than 100 papers on the application of these technologies to metabolism and metabolomics studies.



Prior to joining DERT, Shaughnessy conducted research on the risk and protective effects of dietary factors on DNA damage in humans as part of the NIEHS Laboratory of Molecular Genetics. (Photo courtesy of Steve McCaw)

Afternoon session

The symposium will also feature presentations by collaborators with the RCMC:

- Melinda Beck, Ph.D., University of North Carolina at Chapel Hill (Influenza)
- Steven Belinsky, Ph.D., Lovelace Respiratory Research Institute (Lung Cancer)
- Laura Cox, Ph.D., New York University Langone Medical Center (Antibiotic Exposure)
- Lee Graves, Ph.D., University of North Carolina at Chapel Hill (Leukemia)
- Snezana Petrovic, M.D., Ph.D., Wake Forest School of Medicine (Kidney Disease)
- Delisha Stewart, Ph.D., RTI International (Breast Cancer)

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This month in EHP

The July issue of Environmental Health Perspectives ([EHP](#)) examines the microbial environments of hospitals, and emerging initiatives to improve reproducibility of scientific findings.

Rethinking Sterile: The Hospital Microbiome

Hospitals, despite the historical emphasis on sterility of health care environments, are now understood to be microbial ecosystems unto themselves. Researchers are studying these hospital microbiomes, with an eye toward reducing hospital-acquired infections and optimizing health.

Research Wranglers: Initiatives to Improve Reproducibility of Study Findings

Funding agencies and research journals are crafting guidelines for well-designed studies, with the goal of ensuring published scientific findings are reproducible — especially those that provide a rationale for human clinical trials, or for new regulations and policies with public health impacts.

Featured research and related news articles this month include:

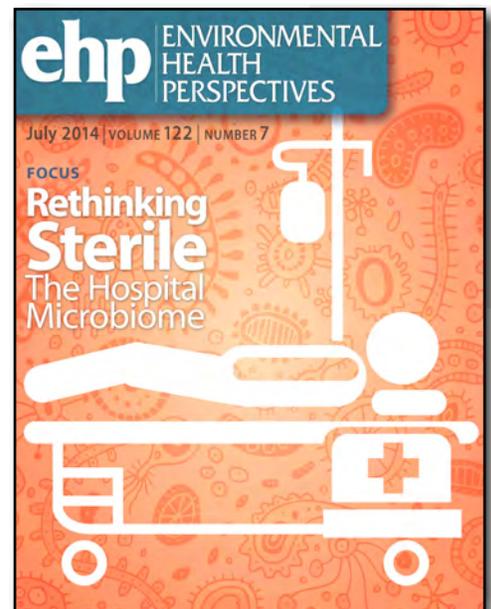
Science, Policy, and the Transparency of Values —

Science and Policy: Understanding the Role of Value Judgments

Long-Term Aircraft Noise Exposure and Body Mass Index, Waist Circumference, and Type 2 Diabetes: A Prospective Study — In the Neighborhood: Metabolic Outcomes Among Residents Exposed to Aircraft Noise



<http://twitter.com/ehponline>



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Extramural papers of the month

By *Nancy Lamontagne*

- [Prenatal exposure to flame retardants linked with lower IQ](#)
- [Technique for identifying safe alternatives to BPA](#)
- [Repairing UV-induced DNA damage](#)
- [High molecular weight phthalates linked to later puberty onset](#)

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

Prenatal exposure to flame retardants linked with lower IQ

NIEHS grantees report that prenatal exposure to polybrominated diphenyl ether (PBDE) flame retardants can lead to lower IQ and increase hyperactivity in children. These results support previous research linking PBDEs to developmental neurotoxicity, and the findings support efforts to reduce PBDE exposures, especially for pregnant women and young children.

PBDEs were widely used as flame retardants in furniture, carpet padding, car seats, and other consumer products, until most were removed voluntarily from the market a decade ago. However, nearly all homes and offices still contain some PBDEs. To study the effects of prenatal exposure to PBDEs, the research team measured PBDE levels in 309 women, at 16 weeks of pregnancy, from 2003 to 2006. Their children were then followed to age 5.

The researchers found that a 10-fold increase in PBDE concentrations during early pregnancy, when the fetal brain is developing, was associated with a 4.5-point decrease in IQ and a 3.3-point increase in hyperactivity at age 5. The authors call for further research to understand the impact of PBDE exposure on the developing brain, noting the importance of investigating chemicals and other flame retardants that have replaced PBDEs.

Citation: [Chen A, Yolton K, Rauch SA, Webster GM, Hornung R, Sjodin A, Dietrich KN, Lanphear BP. 2014. Prenatal polybrominated diphenyl ether exposures and neurodevelopment in U.S. children through 5 years of age: the HOME study. Environ Health Perspect; doi: 10.1289/ehp.1307562 \[Online 28 May 2014\].](#)

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Technique for identifying safe alternatives to BPA

Researchers funded by NIEHS developed a high throughput microscopy approach for examining how bisphenol A (BPA) and similar chemicals affect alpha and beta estrogen receptors, which are the primary targets of BPA and other endocrine disrupting chemicals. Applying this approach on a large scale could offer a faster, more cost-effective way to determine if BPA alternatives are safe.

Because of concerns surrounding BPA's possible effects on development, reproduction, and metabolism, BPA analogs, compounds with a similar molecular structure, are replacing BPA. Many of these analogs have not been thoroughly analyzed, so their potential for endocrine disrupting activity is unknown. The researchers developed a series of assays for use with high throughput microscopy that can cost-effectively reveal mechanisms of a chemical's endocrine disrupting activity on a cell-by-cell basis.

Using the new assays, the investigators studied BPA and 18 understudied BPA analogs. They found that BPA and nearly all the analogs bound to alpha or beta estrogen receptors. But even at the highest dose tested across multiple assays, some of the analogs were inactive or had very low activity in other functional endpoint assays, indicating that receptor binding alone should not be used to classify activity. The authors note that the assays allow classification and identification of a chemical's endocrine disrupting activity, and are highly complementary with the assays used in the U.S. Environmental Protection Agency [ToxCast program](#).

Citation: Stossi F, Bolt MJ, Ashcroft FJ, Lamerdin JE, Melnick JS, Powell RT, Dandekar RD, Mancini MG, Walker CL, Westwick JK, Mancini MA. 2014. Defining estrogenic mechanisms of bisphenol A analogs through high throughput microscopy-based contextual assays. *Chem Biol*; doi:10.1016/j.chembiol.2014.03.013. [Online 21 May 2014].

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Repairing UV-induced DNA damage

An NIEHS grantee and colleagues report new details on how cellular machinery detects and signals for repair DNA damage caused by ultraviolet (UV) light. The new findings help explain why people with xeroderma pigmentosum (XP), an inherited disease where the body is unable to sufficiently repair damage caused by UV light, are at an extremely high risk for developing skin cancer.

When DNA is damaged by UV light, a protein called human UV-damaged DNA-binding protein (UV-DDB) recognizes this damage and signals for repair. To better understand how UV-DDB recognizes the damage, the researchers examined the process by tracking single molecules of UV-DDB tagged with light-emitting quantum dots. This let them watch the molecules move from place to place, in real time, on both normal and UV-exposed DNA strands.

The experiments revealed that UV-DDB stops along the DNA strand and transiently attaches to it, causing a change in the protein's structure. If it comes to a spot damaged by UV radiation, two molecules of UV-DDB converge and stay bound to the site, signaling DNA repair machinery. The researchers also followed a quantum-dot labeled UV-DDB protein with a mutation associated with XP. The mutant UV-DDB could still bind to DNA, but continued to slide along the DNA, rather than remaining at the damaged site to signal that repair was needed.

Citation: Ghodke H, Wang H, Hsieh CL, Woldemeskel S, Watkins SC, Rapic-Otrin V, Van Houten B. 2014. Single-molecule analysis reveals human UV-damaged DNA-binding protein (UV-DDB) dimerizes on DNA via multiple kinetic intermediates. *Proc Natl Acad Sci U S A* 111(18):E1862-E1871.

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High molecular weight phthalates linked to later puberty onset

Researchers, who are part of the NIEHS Breast Cancer and the Environment Research Program, found that urinary concentrations of metabolites of high molecular weight phthalates are associated with later onset of puberty in girls. Phthalates are found in many consumer products, medical devices, and building materials. This research adds to the growing evidence that phthalate exposure may interfere with development.

The researchers measured phthalates in urine collected from 1,170 girls when they were enrolled in the study at ages 6 to 8 between 2004 and 2007. Phthalate concentrations ranged from less than 1 to more than 10,000 milligrams per liter. The researchers followed the study participants and collected information on body size, weight and height, as well as breast and pubic hair development stages, either once or twice per year throughout follow up until 2011. They found that 10-fold higher exposures to high molecular weight phthalates, including di(2-ethylhexyl) phthalate, as estimated from urinary concentrations of metabolites, were associated with an approximately eight-month delay of transition into puberty as marked by onset of pubic hair development. The relationship between phthalate concentration and later puberty was stronger among normal-weight girls.

After adjusting for confounders, the researchers observed no association between low molecular weight phthalate urinary metabolite concentrations and age of puberty onset as defined by onset of breast or pubic hair development. The researchers point out that more studies are needed to determine whether childhood exposures act alone or add to other earlier life insults, and to understand variability in early-life phthalate exposures.

Citation: Wolff MS, Teitelbaum SL, McGovern K, Windham GC, Pinney SM, Galvez M, Calafat AM, Kushi LH, Biro FM; on behalf of the Breast Cancer and Environment Research Program. 2014. Phthalate exposure and pubertal development in a longitudinal study of US girls. *Hum Reprod* 29(7):1558-1566.

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

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Intramural papers of the month

By Raj Gosavi, Mallikarjuna Metukuri, Jacqueline Powell, Staton Wade, and Sheila Yong

- [NTP review framework addresses environmental health questions](#)
- [Polymerase beta complements aprataxin function by catalyzing a de-adenylation reaction](#)
- [RORgamma regulates hepatic glucose metabolism and insulin sensitivity](#)
- [INO80 regulates embryonic stem cell fate and blastocyst development](#)
- [Novel structural insights into HIV reverse transcriptase](#)

NTP review framework addresses environmental health questions

Scientists in the NTP Office of Health Assessment and Translation (OHAT) recently published a flexible 7-step process to streamline the development of hazard identification conclusions. The principles of this systemic review process are intended to help environmental health scientists integrate evidence from a variety of sources. While systemic review methodologies are well-established in the area of clinical medicine, particularly for human clinical trials, environmental health questions involve unique challenges, due to the breadth of the relevant data, including results of human, animal, and mechanistic studies.

In 2011, OHAT began consulting with a variety of sources, including technical experts, the NTP Board of Scientific Counselors, and the public, to develop an efficient and standardized systematic review approach for literature-based environmental health science assessments. The resulting 7-step framework not only increases transparency and objectivity in the process of collecting and synthesizing scientific evidence for reaching conclusions, but also provides methods to increase data management efficiency.

The 7 steps provide guidance on problem formulation and protocol development, searching and selecting studies for inclusion, extracting data from studies, assessing the quality of individual studies, rating confidence in the body of evidence, translating confidence ratings into evidence of health effects, and integrating evidence to develop hazard identification conclusions. **(JP)**

Citation: Rooney AA, Boyles AL, Wolfe MS, Bucher JR, Thayer KA. 2014. Systemic review and evidence integration for literature-based environmental health science assessments. *Environ Health Perspect*; doi:10.1289/ehp.1307972 [Online 22 April 2014].

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Polymerase beta complements aprataxin function by catalyzing a de-adenylation reaction

A study published by NIEHS researchers found that human DNA polymerase beta (pol beta) removed the 5'-adenosine monophosphate group (5'-AMP) on the abasic site (5'-dRP) of base excision repair (BER) substrates. For aborted ligation products, pol beta, together with flap endonuclease 1 (FEN1), is reported to have the potential to complement the function of aprataxin (APTX) in cells that are deficient in APTX. Considering that lack of functional APTX is associated with neurodegenerative disorder ataxia oculomotor apraxia type 1 (AOA1), these findings highlight important cellular pathways that can take over during APTX deficiency.

The authors confirmed catalysis of pol beta in removing 5'-AMP-dRP from the DNA substrates, using *in vitro* assays, along with a new crystal structure of pol beta in complex with the substrates. Further verification of pol beta function was obtained by *in vivo* studies using *S. cerevisiae*. Studies with yeast strains containing deletion of Hnt3 or Rad27, yeast homologs of APTX and FEN1, respectively, affirmed complementary function of pol beta and FEN1 to that of APTX. Furthermore, live cells deficient in Hnt3 and Rad27 showed hypersensitivity to the genotoxic agent methyl methanesulfonate, which was rescued when pol beta was present.

The *in vivo* and *in vitro* studies both suggest alternative enzymatic processes in cells to fix aborted ligation products, which, if left unrepaired, may result in DNA double-strand breaks. **(RG)**

Citation: Caglayan M, Batra VK, Sassa A, Prasad R, Wilson SH. 2014. Role of polymerase beta in complementing aprataxin deficiency during abasic-site base excision repair. *Nat Struct Mol Biol* 21(5):497-499.

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RORgamma regulates hepatic glucose metabolism and insulin sensitivity

A recent study conducted by NIEHS researchers determined that retinoic acid-related orphan receptor gamma (RORgamma) regulates diurnal hepatic gluconeogenesis and insulin sensitivity. RORgamma is a nuclear receptor that functions as a ligand-dependent transcription factor by binding to ROR-responsive elements in target genes. The circadian clock plays a critical role in the regulation of many physiological processes, including metabolism and energy homeostasis. Disruption of circadian rhythm increases the risk for several diseases. In the liver, RORgamma exhibits a robust circadian pattern of expression that is under the direct control of the hepatic circadian clock.

In the present study, using ubiquitous and liver-specific RORgamma-deficient mice, the authors demonstrated that mice deficient in RORgamma exhibit improved insulin sensitivity and glucose tolerance. This is associated with reduced hepatic gluconeogenesis, particularly in the daytime, and is due to a reduced peak expression of several glucose metabolic genes. By using genome-wide cistromic profiling, gene expression, and promoter analysis, the authors further demonstrated that RORgamma directly regulates glucose metabolic genes downstream of the hepatic clock machinery.

Since RORgamma enhances gluconeogenesis and decreases insulin sensitivity and glucose tolerance, the authors propose that suppressing RORgamma activity by antagonists might be beneficial in controlling glucose homeostasis and the management of metabolic diseases, such as type 2 diabetes. **(MM)**

Citation: Takeda Y, Kang HS, Freudenberg J, DeGraff LM, Jothi R, Jetten AM. 2014. Retinoic acid-related orphan receptor gamma (RORgamma): a novel participant in the diurnal regulation of hepatic gluconeogenesis and insulin sensitivity. *PLoS Genet* 10(5):e1004331.

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INO80 regulates embryonic stem cell fate and blastocyst development

NIEHS researchers and their collaborators discovered that the INO80 complex maintains the pluripotency of embryonic stem cells (ESCs), allowing them to remain undifferentiated. Their findings provide insights into how ESCs selectively activate pluripotency genes and repress differentiation genes.

Using a combination of molecular biology, biochemistry, and systems biology techniques, the scientists showed that INO80 occupies promoters of genes involved in ESC self-renewal and pluripotency. INO80 does so with help from transcription factor OCT4 and histone methyltransferase complex component WDR5 — two other key pluripotency proteins. INO80 binding to the promoters maintains an open chromatin structure that allows transcription to occur. Subsequently, the Mediator protein and RNA polymerase Pol II are recruited, leading to increased transcription and expression of pluripotency genes.

Interestingly, when the researchers reprogrammed differentiated cells to produce induced pluripotent stem cells (iPSCs), they found that INO80 expression rapidly increased, followed by increased expression of pluripotency genes. Hence, they proposed that INO80 activates the pluripotency network in iPSCs. The researchers also observed an increase in INO80 expression during early embryonic development, reaching its peak at the blastocyst stage. INO80 expression in the blastocyst is required to establish pluripotency in the inner cell mass, which ultimately forms the embryo. **(SY)**

Citation: Wang L, Du Y, Ward JM, Shimbo T, Lackford B, Zheng X, Miao YL, Zhou B, Han L, Fargo DC, Jothi R, Williams CJ, Wade PA, Hu G. 2014. INO80 facilitates pluripotency gene activation in embryonic stem cell self-renewal, reprogramming, and blastocyst development. *Cell Stem Cell* 14(5):575-591.

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Novel structural insights into HIV reverse transcriptase

NIEHS researchers have provided the first detailed characterization of the structural changes that occur during the formation of HIV reverse transcriptase, the enzyme that makes DNA copies of the viral RNA genome. This process, which allows the subsequent integration of viral DNA into the host genome, is critical to the HIV life cycle. Structural insights provided by this work identify potential targets for the development of novel therapeutics for HIV.

HIV reverse transcriptase is constructed from two p66 peptides, which form an initial p66/p66' homodimer. Then, a complex series of conformational transformations result in partial unfolding of one subunit. This action makes its cleavage site available to HIV protease, producing the mature p66/p51 heterodimer. The researchers used NMR and X-ray data to construct a model of the p66 monomer, and to identify many of the complex conformational changes that both precede and follow formation of the p66/p66' homodimer.

The research team determined that the p66/p66' homodimer exists as a conformational heterodimer, in which the two chains, although having identical sequences, adopt different conformations. The conformational changes that occur in the p66' subunit ultimately result in the destabilization of one of the p66' domains — the ribonuclease H — so that it unfolds and is selectively destroyed by viral HIV protease. **(SW)**

Citation: Zheng X, Pedersen LC, Gabel SA, Mueller GA, Cuneo MJ, Derose EF, Krahn JM, London RE. 2014. Selective unfolding of one ribonuclease H domain of HIV reverse transcriptase is linked to homodimer formation. *Nucleic Acids Res* 42(8):5361-5377.

(Raj Gosavi, Ph.D., is a research fellow in the NIEHS Structure and Function Research Group. Mallikarjuna Metukuri, Ph.D., is a research fellow in the NIEHS Metabolism, Genes, and Environment Group. Former NIEHS postdoctoral fellow Jacqueline Powell, Ph.D., is a writer and analyst with Education and Training Systems International. Staton Wade, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Chromatin and Gene Expression Group. Sheila Yong, Ph.D., is a visiting fellow in the NIEHS Inositol Signaling Group.)

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Inside the Institute

NIEHS celebrates Bring Your Kids to Work Day

By Allison Ashley

Nearly 30 families participated in this year's Bring Your Kids to Work Day June 12. The annual event is organized by the NIEHS Administrative Services and Analysis Branch Employee Services group and the Health and Safety Branch.

Eager children arrived early in the morning to pick up schedules, donuts, and goodie bags. "My granddaughter has looked forward to today for weeks," said Denise Lasko, staff assistant in the National Toxicology Program (NTP). "She would take the agenda off of the refrigerator daily and say, 'Sit down and read this to me again.'"

There were a variety of activities to enjoy, including a fitness run, nature walk around Discovery Lake, tour of the Institute, and cake walk. There were also several science activities, including Fun with Histology, MRI and Magnets, and a video of Bill Nye the Science Guy.

Abee Boyles, Ph.D., health scientist in the NTP Office of Health Assessment and Translation, participated in the Meet the Scientists program, sharing her story about the career path that led her to NIEHS. She explained the scientific aspect of her job, emphasizing how being able to write well helps her explain her research.

Parents, grandparents, and children had a fun-filled day.



After the cake walk, program specialist Cynthia Radford, right, showed Tyler, grandson of NTP staff scientist Gordon Flake, Ph.D., how to make a DNA strand keychain. (Photo courtesy of Steve McCaw)



Children, parents, and grandparents gathered around the table to learn how to extract strawberry DNA. (Photo courtesy of Steve McCaw)



Visiting NIEHS science labs was once again a popular activity for families. Claire Long, of the Employee Services group, and others watched a demonstration of superconductivity by Geoffrey Mueller, Ph.D., staff scientist with the Nuclear Magnetic Resonance Group. (Photo courtesy of Steve McCaw)



Ava, daughter of chemist Andrea Adams, Ph.D., enjoyed the crafts table. (Photo courtesy of Steve McCaw)



NIEHS interior designer Amanda Thompson, left, and daughter Taylor enjoyed the Meet the Scientists program. (Photo courtesy of Steve McCaw)



Families enjoyed the NIEHS campus during the nature walk around Discovery Lake. (Photo courtesy of Steve McCaw)



The nature walk provided a chance to work off some excess energy, and learn about ways NIEHS supports the ecological health of its campus. (Photo courtesy of Steve McCaw)



NTP staff assistant Denise Lasko brought granddaughter Presley, whose hands were just the right size for Hands-on-Science. (Photo courtesy of Steve McCaw)

(Allison Ashley is a program specialist in the NIEHS Office of Communications and Public Liaison.)

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NIEHS cleans up local highway for World Environment Day

By Ian Thomas

NIEHS celebrated World Environment Day June 5 by cleaning up the 1.2-mile stretch of Hopson Road between its main campus and Keystone building in Research Triangle Park (RTP). As part of the North Carolina [Adopt-A-Highway Program](#), the effort reduces litter on RTP roadsides, helping preserve the natural beauty and health of both the Triangle and the state as a whole.

“NIEHS has been a part of the Adopt-A-Highway program since the mid-1990s, and as an employee of the Institute, it’s great to know that we hold that kind of legacy within our community,” said Paul Johnson, NIEHS Hazardous Waste Program manager and member of the Environmental Awareness Advisory Committee, who donned an orange vest, with several of his colleagues, to pick up trash.



From left, Campbell, Castranio, Schaaper, Thomas, Willis, Steinmetz, and Johnson bagged trash along Hopson Road. (NIEHS file photo)



Willis has been a part of Adopt-A-Highway since 1985. (Photo courtesy of Steve McCaw)

2014 NIEHS Adopt-A-Highway Participants

Michelle Campbell, Biologist, Laboratory of Molecular Genetics

Trish Castranio, Sustainability Specialist, Health and Safety Branch

Paul Johnson, Hazardous Waste Program Manager, Health and Safety Branch

Roel Schaaper, Ph.D., Mechanisms of Mutation Group Lead, Laboratory of Molecular Genetics

Bill Steinmetz, Environmental Compliance Specialist, Health and Safety Branch

Ian Thomas, Public Affairs Specialist, Office of Communications and Public Liaison

Bill Willis, Biologist, Laboratory of Reproductive and Developmental Toxicology

Established in 1988 as a response to growing public concerns on litter, the Adopt-A-Highway Program is managed by the North Carolina Department of Transportation, and includes representatives from government and private sector entities across the state.

“Given the status of NIEHS as a world leader in environmental health research, it’s great to see our Institute taking such an active role in programs like World Environment Day that help promote sustainability and environmental awareness around the globe,” said Michelle Campbell, NIEHS biologist.

World Environment Day is the principal vehicle of the United Nations for encouraging worldwide awareness and action for the environment. Over the years it has become a global platform for public outreach that is widely celebrated in over 100 countries.

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



*Campbell, left, joined Castranio during the cleanup.
(Photo courtesy of Steve McCaw)*



*Schaaper picked up trash along the Triangle Expressway ramp.
(Photo courtesy of Steve McCaw)*

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**National Institute of
Environmental Health Sciences**

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